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Some aspects of the development and present state of EU Innovation and R&D Policies and Programmes

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Outline

• Setting the stage: reconsidering innovation
• The EU context: a growing community of nations
• Evolution of the EU R&D and innovation policy
• The EU RTD Framework Programmes
• Lisbon Strategy
• Europe 2020 and the Innovation Union
• Open Innovation
• Some conclusions
Innovation

• An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.


• Characteristics of innovation
  – New, making a difference
  – Adopted by the market, users
  – Value added

• Incremental, breakthrough, disruptive innovation
Aspects of a culture of innovation

- A climate supporting creative thinking
- Openness towards collaboration and sharing
- Support for acting on one’s own initiative
- Readiness towards accepting change and putting the present state in question
- Critical thinking
- A positive approach to failure – willingness to learn
- High trust within and between organisations and society as a whole
Types and models of innovation

Types of innovation:
• Product innovation
• Process innovation
• Marketing innovation
• Organisational innovation

OECD, Oslo Manual, 2005, p. 17

Models:
• Linear model
  – Technology push, market pull, coupling
• Non-linear models
  – Interactive models, network models, open innovation

The EU context: a growing community

- 1957: Belgium, Germany, France, Italy, Luxembourg, The Netherlands
- 1969: Denmark, Ireland, United Kingdom
- 1981: Greece
- 1986: Spain, Portugal
- 1995: Austria, Finland, Sweden
- 2004: Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Slowak Republic, Malta, Cyprus
- 2007: Bulgaria, Romania
- 2013: Croatia

- 28 Member States that are different in many respects
The evolution of EU R&D and innovation policy

The first 30 years

- Dominance of the **linear model**!
- 1950ies: The emergence of research policy at European level (ECSC, JRC, EURATOM,COST, ESF,…)
- 1950ies & 1960ies: innovation coupled with research policy
- Initiatives of Commissioners towards research cooperation and innovation – Spinelli, Dahrendorf, Davignon
- **COST**: intergovernmental agreement of research coordindation
- 1970ies: link of innovation and industrial policy
- 1980ies: combined research-, industry- and innovation policy – **ESPRIT** as a pioneering programme
- 1984: A step change: the 1st **Framework Programme for R&D**
The development of European R&D
Fostering transnational R&D cooperation

• 1984: 1st Framework programme FP1 (1984-87)
  – Collaboration as a new dimension in European R&D
• 1987: 2nd Framework Programme FP2 (1987-91)
  – VALUE Programme for exploitation of research results
• 1990: 3rd Framework Programme FP3 (1990-94)
  – CRAFT – SME programme
  – Specific Programme for Innovation; Demonstration projects (RTD)
  – Problem orientation: key actions, integration of social sciences and humanities
  – Generic (enabling) R&T activities; research infrastructures
  – Supporting the European Research Area (ERA)
  – Integrated projects, networks of excellence; ERA-NETs
  – ESFRI European Strategy Board for Research Infrastructures
Budget increases from FP1 to H2020

Average annual budgets FP1 to H2020

Framework Programmes

Average annual budgets (bn EUR)
The 'real' start of EU innovation policy

- 1993: White Paper on Growth, Competitiveness and Employment:
  - 'the linear model of innovation, …, has in today's world been replaced by complex mechanisms': innovation requires constant and organised interdependence between the upstream phases linked to technology, and the downstream phases linked to the market'

- 1995: Green Paper of Innovation:
  - Strengthening the capacity for innovation needs a policy mix:
    - Industrial policy, RTD policy, education and training, tax policy, competition policy, regional policy and policy on support for SMEs, environment policy, etc.
  - Concept of 'knowledge based economy'
  - European Parliament: how about social and ecological criteria?
The innovation ecosystem

• **Different actors** taking part in the process
  – Large and small companies, incl. start-ups
  – Universities, RPOs
  – VCs, research-funding organisations and other financial institutions
  – Government actors

• **Innovation policy mix**
  – Research and development policy
  – Industrial and SME policy
  – Education and skills policy
  – Regional and cohesion policy

• **Framework conditions**
  – Financial environment, state aid and tax policy;
  – Public procurement, single market and competition, regulations and standards, IPR
  – Partnerships and cooperation
  – Culture of innovation

• **Sectoral policies**
  – Digital, energy, environment, health, transport, etc.
Innovation eco-system

Source: L. Georghiou cited in House of Commons Select Committee on Science & Technology Report
Bridging the valley of death: improving the commercialisation of Research, March 2013
EU Innovation Policy Mix

Supply side

- Research and development policy
- Industrial and SME policy
- Education and skills policy
- Regional and cohesion policy

Demand side

- Financial support
- State aid and tax policy
- Public procurement
- Single Market and competition
- Regulation framework
- Standards
- Intellectual property rights
- Partnerships and coordination initiatives
- Culture of innovation

2000: The Lisbon Strategy

• **European Research Area (ERA)**
  – Internal market for research
  – Free circulation of researchers, knowledge and technology
  – National research systems, transnational cooperation, researchers, gender equality, access and circulation of scientific knowledge

• **3% of GDP for R&D**

• „**Fragmentation“** of the European innovation system – responsibilities of the Member States for a conducive framework

• **European Innovation Scoreboard**, benchmark national policies

• **European Technology Platforms, Joint Technology Initiatives**

• **European Institutes of Innovation and Technologies (EIT)**

• **7th EU RTD Framework Programme**

• **Joint programming Initiatives (JPIs)**
The European Innovation Scoreboard 2006

- **Support benchmarking activities** assessing European innovation performance
- Published **annually**
- Capturing the **main drivers** of a knowledge-based economy and measuring of **innovation outputs**
- **25 indicators** structured in three groups and eight innovation dimensions:
  - **3 groups**: Enablers, Firm activities, Outputs
  - **8 dimensions of innovation**: Human resources, open, excellent research systems, Finance and support; firm investments, Linkages and entrepreneurship, intellectual assets; innovators, economic effects

Measurement framework of the European Innovation Scoreboard

European Innovation Scoreboard 2015, p. 8
EU Member States’ innovation performance

Note: Average performance is measured using a composite indicator building on data for 25 indicators going from a lowest possible performance of 0 to a maximum possible performance of 1.

European Innovation Scoreboard 2015, p. 12

The challenge of EU R&D, innovation and regional policy:
Managing diversity towards convergence and cohesion
ETPs, JTIs, EIT, CIP, JPIs

• **2003:** European Technology Platforms (ETPs)
  – Voluntary stakeholder platforms lead by industry: Vision, Strategic research and innovation agenda

• **2004-2005:** Joint Technology Initiatives (JTIs)
  – Public-private joint undertakings building on some of the European Technology Platforms

• **2005:** EIT European Institute of Innovation and Technology
  – Making knowledge triangle – HE, research, innovation – a reality
  – March 2008: EIT incubator for KICs - Large PPPs of HEIs, ROs, companies financial institutions and other stakeholders

• **2006:** Competitiveness & Innovation Framework Programme:

• **2008:** Joint Programming Initiatives
  – Coordinating national policies and programmes addressing challenges of mutual interest between Member States
European Technology Platforms (ETPs) 1

• Voluntary **public-private partnerships and stakeholder fora lead by industry** involving main stakeholders aiming to improve innovation, knowledge transfer and European competitiveness

• Main activities encompass:
  – developing a **visions** and **strategic research and innovation agendas** including technology roadmaps and implementation plans
  – encouraging **industry participation in Horizon 2020**
  – fostering **networking opportunities** with other ETPs and other partners along the value chain addressing cross-sectoral challenges and promoting more open models of innovation
  – identifying **opportunities for international cooperation**;
  – providing **external advice** for the **Framework Programmes**
  – driving force behind the launch of ambitious **public-private partnerships: Joint Technology Initiatives**
## European Technology Platforms (ETPs) 2

<table>
<thead>
<tr>
<th>Bio-based economy</th>
<th>Energy</th>
<th>Environment</th>
<th>ICT</th>
<th>Production and processes</th>
<th>Transport</th>
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<td>Photonics 21</td>
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European Technology Platforms (ETPs) 43

An example: ACARE

- **ACARE Advisory Council for Aviation Research and Innovation in Europe**
  - **Members**: manufacturing industry, airlines, airports, service providers, regulators, research centers and academia
  - **Flightpass 2050 Vision** addressing two objectives:
    - to serve society’s needs for safe, more efficient and environmentally friendly air transport
    - to maintain global leadership for Europe in this sector with a competitive supply chain including large companies and SMEs
  - **Addressing key challenges**
    - Challenge 1: Meeting market and societal needs
    - Challenge 2: Maintaining and extending industrial leadership
    - Challenge 3: Protecting the environment and the energy supply
    - Challenge 4: Ensuring safety and security
    - Challenge 5: Prioritising research, testing capabilities and education
  - **Developing Strategic Research and Innovation Agenda (SRIA) 2050**

See: [http://www.acare4europe.com/](http://www.acare4europe.com/)
Joint Technology Initiatives (JTIs) 1

• **Large scale long-term Public-Private Partnerships (PPPs)**
  – To implement the Strategic Research and Innovation Agendas of some European Technology Platforms
  – Implemented by dedicated structures: Joint Undertakings
  – Funding: from industry and the public sector
  – JTIs promote research projects on the basis of calls for proposals

• **Current JTIs** and their fields of action
  – **Innovative Medicine 2 (IMI)**: next generation vaccines, medicines and treatments, such as new antibiotics
  – **Clean Sky 2 (CS2)**: cleaner and quieter aircraft
  – **SESAR**: to develop the new generation European air traffic management system
  – **Fuel Cells and Hydrogen 2 (FCH)**: develop and demonstrate clean and efficient fuel cell and hydrogen technologies for stationary and mobile applications
  – **Biobased Industries (BBI)**: to use renewable natural resources and innovative technologies for greener everyday products
  – **Electronic Components and Systems for European Leadership (ECSEL)**: boosting Europe’s electronics manufacturing capabilities.comibining the JTIs: **ARTEMIS**, Embedded Systems, **ENIAC** - Nanoelectronics and **EPoSS**
  – **Shift2Rail (S2R)**: better trains and railway infrastructure
Joint Technology Initiatives (JTIs) 2
An example: Clean Sky 2 Joint Undertaking

• Europe’s most ambitious aeronautical research programme
• Members: companies, universities, public laboratories, innovative SMEs and the European Commission
• Mission: Developing new generations of greener aircraft
• Specific objectives:
  – increasing aircraft fuel efficiency, thus reducing CO2 emissions by between 20 to 30%; and
  – reducing aircraft NOx and noise emissions by between 20 to 30% compared to “state-of-the-art” aircraft entering into service as from 2014
• Budget: EUR 4 bn – European Commission EUR 1,8 bn, Industry: EUR 2,2 bn, plus EUR 1 bn from others
  – 40% earmarked for founding members, 30% for core partners via calls for proposals, 30% distributed via open calls for proposals
• Implementation: Joint Undertaking
• Management: Governing Board Commission and Industry

See: http://www.cleansky.eu/
European Institute of Innovation and Technology (EIT)

- Realising the **Knowledge Triangle** of research, innovation and education
- Reinforcing the EU’s innovation capacity and addressing societal challenges by promoting new structures

**Knowledge and Innovation Communities (KICs)**

- Large distributed partnerships of all actors of the innovation chain working together in **4 to 5 Co-location Centres** each:
  - **2012**: KIC InnoEnergy, KIC ICT Labs, Climate KIC
  - **2014**: Healthy living & active ageing, Raw materials, Food4future
  - **2018**: Added-value manufacturing, Urban mobility

- **EIT Headquarter** in Budapest, Hungary
- **Budget 2014-2020**: EUR 2,35 bn
The EIT: a new type of institution

- The EIT is pioneering institutional development devoted to **knowledge management and innovation**
- The EIT as a new type of **hybrid organisation**:
  - Integrating the Knowledge Triangle functions at local/regional level based on proximity, and
  - Combing distributed collocation centres providing local-"global" connectivity
- Inducing innovation and innovators in and across **European regions**
- **Main activities**: entrepreneurship, start-ups, exploitation
- A **change agent** for all partners involved
- Contributing to developing **EU innovation eco-system**
Joint Programming Initiatives (JPIs) 1

• **Aim:** pooling national research resources, programmes and efforts for addressing major societal challenges

• **Process:** Member States agree, on a voluntary basis and following a partnership approach, on common Visions and Strategic Research Agendas (SRA)

• **Implementation:**
  – Participating countries: analyse the options, assess expected impacts and define the best mix of instruments to be used e.g. joint calls for proposals
  – The Commission: supports the initiative e.g. through financing support actions for their management or coordination actions for co-funding joint calls
Joint Programming Initiatives (JPIs) 2

1. Alzheimer and other Neurodegenerative Diseases (JPND)
2. Agriculture, Food Security and Climate Change (FACCE)
3. A Healthy Diet for a Healthy Life
4. Cultural Heritage and Global Change: A New Challenge for Europe
5. **Urban Europe** - Global Urban Challenges, Joint European Solutions
6. Connecting Climate Knowledge for Europe (CliK'EU)
7. More Years, Better Lives - The Potential and Challenges of Demographic Change
8. Antimicrobial Resistance- The Microbial Challenge - An Emerging Threat to Human Health
9. Water Challenges for a Changing World
10. Healthy and Productive Seas and Oceans

Joint Programming Initiatives (JPIs) 3
An example: Urban Europe

- **Partnership:** 21 European Countries
  - Ministries, funding agencies, research organisations
- **Objectives:**
  - Transnational, mission-oriented, forward-looking **R&I initiative on sustainable urban development**
  - **Providing evidence** for new urban policies and strategies and by that enhancing cities’ capacities for transition
  - Addressing urban development and sustainability in its complexity and **generating radical new knowledge and concepts** to tackle the urban challenges (cross-sectoral, inter-disciplinary)
  - **Teaming up with cities and urban stakeholders** of all kinds to raise the impact of our research and support the exploitation of technological and social innovation (trans-disciplinary, societal impact)
- **Activities:**
  - Strategic Research Agenda, joint calls, aligning national programmes, establishing Urban Europe Research Alliance
  - **Outreach to China:** MoU with CCUD; preparing a Joint Call with NSFC; networking with Chinese organisations addressing problems of sustainable urbanisation – exchange of experiences, mutual learning, inducing collaboration
The Seventh Framework Programme (FP7) 2
2007-2013 – 55,000 MECU

<table>
<thead>
<tr>
<th>Cooperation</th>
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<tbody>
<tr>
<td>Health</td>
<td>Environment (incl. Climate change)</td>
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<tr>
<td>Food, Agriculture, Biotechnology</td>
<td>Transport (incl. Aeronautics)</td>
</tr>
<tr>
<td>Information &amp; Communication Technologies</td>
<td>Socio-economic sciences and humanities</td>
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<tr>
<td>NanoS&amp;T, Materials, New production technologies</td>
<td>Space</td>
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<tr>
<td>Energy</td>
<td>Security</td>
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**Ideas (European Research Council ERC)**
Competitive funding of investigator driven frontier research

**People (Marie Curie Actions)**
Mobility and career development of researchers

**Capacities**

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<tr>
<th>Research Infrastructures</th>
<th>Science in Society</th>
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<tr>
<td>Research for the benefit of SMEs</td>
<td>Coherent development of research policies</td>
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<tr>
<td>Regions of Knowledge</td>
<td>Activities of international cooperation (INCO-Nets, BILATs, ACCESS4EU)</td>
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<tr>
<td>Research Potential</td>
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The 7th Framework Programme (FP7) 3
Some results at a glance

• New: A **seven years** programme
• Budget: EUR **55 bn** – 3% of total RTD expenditure in Europe and 25% of competitive funding
• 139,000 proposals submitted – **25,000 proposals selected**
  – **130,000 participants** - teams or individual beneficiaries (ERC, MCSA)
  – 674 Chinese participants
• **Participating groups**
  – 44% higher education institutions
  – 27% research and technology organisations
  – **11% large private companies**
  – **13% SMEs**
  – 3% public sector
  – 2% civil society organisations

Source: Commitment and Coherence. Ex-Post-Evaluation of the 7th EU Framework Programme (2007-2013)
The 7th Framework Programme (FP7) 4
Main achievements

1. **Scientific excellence** at individual and institutional level
2. Promoted **ground-breaking research** through the ERC
3. **Industry and SMEs** engaged strategically
4. Supported **new modes of collaboration** and an open innovation framework – JTIs, EIT
5. Strengthened the **European Research Area** through collaborative projects and networks
6. Addressed **societal challenges**
7. Encouraged **alignment** of national RTI systems and policies
8. Stimulated **mobility** of researchers in Europe and beyond
9. Promoted investments in **European research infrastructures**
10. Reached a critical mass of **research collaboration** across Europe and worldwide

*Source: Commitment and Coherence. Ex-Post-Evaluation of the 7th EU Framework Programme (2007-2013)*
2011: Europe 2020: The Innovation Union 1

- Europe 2020 strategy for smart, sustainable and inclusive growth addressing:
  - employment; research and development; climate/energy; education; social inclusion and poverty reduction

Flagship Initiatives:
- Smart growth:
  - Digital Agenda for Europe
  - Innovation Union
  - Youth on the move
- Sustainable growth
  - Resource efficient Europe
  - An industrial policy for the globalisation era
- Inclusive growth
  - An agenda for new skills and jobs
  - A European platform against poverty
Europe 2020: The Innovation Union 2

- **Innovation Union:** flagship initiative aiming at
  - Improving **framework conditions** and **access to finance for research and innovation**
  - Turn **innovative ideas into products and services** that create growth and jobs
  - Shift to **open innovation**

- **Six priority areas:**
  1. Strengthening the knowledge base and reducing fragmentation
  2. Getting good ideas to the market
  3. Maximising social and territorial cohesion
  4. European Innovation Partnerships
  5. Leveraging EU policies externally
  6. Making it happen

- 34 detailed commitments
Europe 2020: Innovation Union 3
Some achievements

1. Strengthening the knowledge base and reducing fragmentation
   - Progress in **European Research Area** and launch of **H2020**
   - Focus on **human resource development for research**
   - New multidimensional benchmarking system: **U-Multirank**

2. Getting good ideas to the market
   - Better **access to finance** and engagement of industry, including H2020’s access to risk finance
   - Important steps taken towards **European Unitary Patent**
   - Initiative towards “**better regulation**”
   - **Innovation dimension in public-procurement**
   - Enforced role for **non-technical innovation**
Europe 2020: Innovation Union 4
Some achievements

3. Maximising social and territorial cohesion
   – European Structural & Investment Fund (ESIF) will contribute EUR 118 bn to smart growth on the basis of Smart Specialisation Strategy
   – Social and public innovation initiatives have gained attention

4. Pooling forces to achieve breakthroughs: European Innovation Partnerships (EIP)
   – Five EIPs launched:
     • Active and Healthy Aging
     • Agricultural Productivity and Sustainability
     • Smart Cities and Communities
     • Water
     • Raw Materials
   – Across the whole innovation chain, EIPs bring together all relevant actors at EU, national and regional level in a specific sector

Europe 2020: Innovation Union 5
Some achievements

5. Leveraging our policies externally
   - New strategic approach to international cooperation including roadmaps and flagship initiatives with international partners as well as co-funding agreements for participating in H2020
   - Excellent working opportunities for non-EU researchers
   - Scientific Visa

6. Making it happen
   - Self-assessment tools for Member States national reforms
   - Country review pilots and mutual learning seminars
   - Policy Support Facility
   - Recommendations on R&I in the European Semester reports
Horizon 2020 – The new FP 2014-2020

What is new?

- Objectives based on **Europe 2020, Innovation Union**
- A single programme bringing together programmes and initiatives that were separated before
- **Three pillars**: Excellence, Industrial leadership, Societal challenges facing EU society plus the EIT
- Specific measures supporting **SMEs**
- A focus on research and **innovation** (higher TRLs…)
- New financial instruments, e.g. support for **innovation procurement, pre-competitive procurement, risc financing**
Horizon 2020
2007–2020 – 74,800 MECU

Societal Challenges
- Health, demographic change and well-being
- Food security, sustainable agriculture, marine an maritime research and the bio-based economy
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Climate action, resource efficiency and raw materials
- Europe in a changing world
- Secure societies

Industrial Leadership
- Industrial and Key Enabling Technologies (KET)
  - Information and Communication Technologies (ICT)
  - Nano-technology
  - Advanced materials
  - Biotechnology
  - Advanced manufacturing systems
  - Space
- Access to risk finance
- Innovation in SMEs

Excellent Science
- European Research Council
- Future & Emerging Technologies (FET)
- Marie Curie Actions
- Research Infrastructures

European Institute of Technology (EIT)

Spreading of Excellence and Widening Participation
Phasing out of the Innovation Union

- **December 2015: State of the Innovation Union 2015**
  - The Innovation Union introduced a **more strategic and broad approach to innovation** by including actions that aimed to tackle both the supply and demand-side elements of the innovation ecosystem.
  - **Decisive actions** have been taken on all commitments, but the response has been uneven throughout the Member States.
  - It is not certain that all legislative actions will be implemented or that they will deliver the intended impact:
    - Inconsistencies of rules and practices regarding the single market
    - Need for closer investment by society to create an innovation culture
    - Improving the inclusiveness of innovation
    - Addressing the skills shortage
  - “.. The world has evolved … and new elements need to be taken into account so as to better tackle the challenges of innovation in Europe”

Open Innovation 1
The new EU innovation policy paradigm

June 2015: Commissioner Carlos Moedas: Open Innovation, Open Science, Open to the World *)

• Open Innovation:
  – H. Chesbrough 2003: open innovation „use of purposive inflows and outflows to accelerate internal innovation“
  – The concept developed towards dynamic, networked, multi-collaborative innovation ecosystems
  – "Helping Europe to capitalise on the results of R&I and create shared economic and social value by bringing more actors into the innovation process, boosting investment, maximising the impact of innovation and creating the right innovation ecosystem"
  – A specific innovation to be seen „as outcome of a complex co-creation process involving many actors as well as knowledge-flows across entire economic and social environment“

Open Innovation 2

• Different actors in open innovation
  – The public sector
  – The financial sector
  – Innovative businesses
  – Academia
  – Citizens: users, civil-society organisation, society at large

• Linking supply and demand
  – Co-development and co-creation

• Involving citizens: Responsible Research & Innovation

• An emerging new approach to EU innovation policy
Open Innovation 3
Open Innovation mechanisms

• **Outside in:**
  - Licensing in
  - Acquisition
  - Short-term fellowships
  - Spinning in
  - Venturing
  - User driven innovation
  - Innovation driven by suppliers/competitors

• **Inside out:**
  - Licensing out
  - Divestments
  - R&D for other companies
  - Spinning out

• **Coupled processes:**
  - Alliances
  - Cooperation
  - Joint venture
  - Joint R&D
  - Co-creation
Open Innovation 4
The Commission’s three pillars of action

**PILLAR 1: Reforming the Regulatory Environment**
- Scientific Advice Mechanism (SAM)
- InnovRefit
- Innovation Deals
- Policy Support Facility for Member States

**PILLAR 2: Boosting Private Investment in Research and Innovation**
- European Fund of Funds
- Maximise use of EFSI

**PILLAR 3: Maximising impacts**
- Seal of excellence
- European Innovation Council
- Merge digital into thematic priorities (health, energy, food, water)
- Horizon 2020: second wave of simplification

EU Open Innovation Strategy: Work in Progress
Some conclusions

• **EU RTD policy and programmes**
  – A success story of more than 30 years increased cooperation
  – Learning from the past and preparing for the next phase 2020+

• **EU innovation policy mix**
  – A complex interactive process between various actors
  – An „umbrella“ for different complementary policies, programmes and instruments needing **policy coordination**
  – Continuous learning and experimentation and step-wise progress

• **Challenges of multi-level governance in Europe**
  – EU, Member States, Regions
  – Mix of competences and responsibilities
  – Problems created by departmental borders and „silos“
  – Diversity between Member States and Regions – differences in priorities and potentials – diversity as a challenge and an opportunity

  ➢ Optimistic view: there are signs that it is a convergent process!
Thank you for your attention!

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