



Smart data to assess the impact of publicly funded research

Robert-Jan Smits

Chairman of Eindhoven University of Technology's Board
and former Director General of Research and Innovation at the European Commission

3 Cases

1. Preparation of the Horizon Europe Proposal
2. The European Innovation Scoreboards
3. Eindhoven University of Technology

Case 1: Preparation of the Horizon Europe Proposal

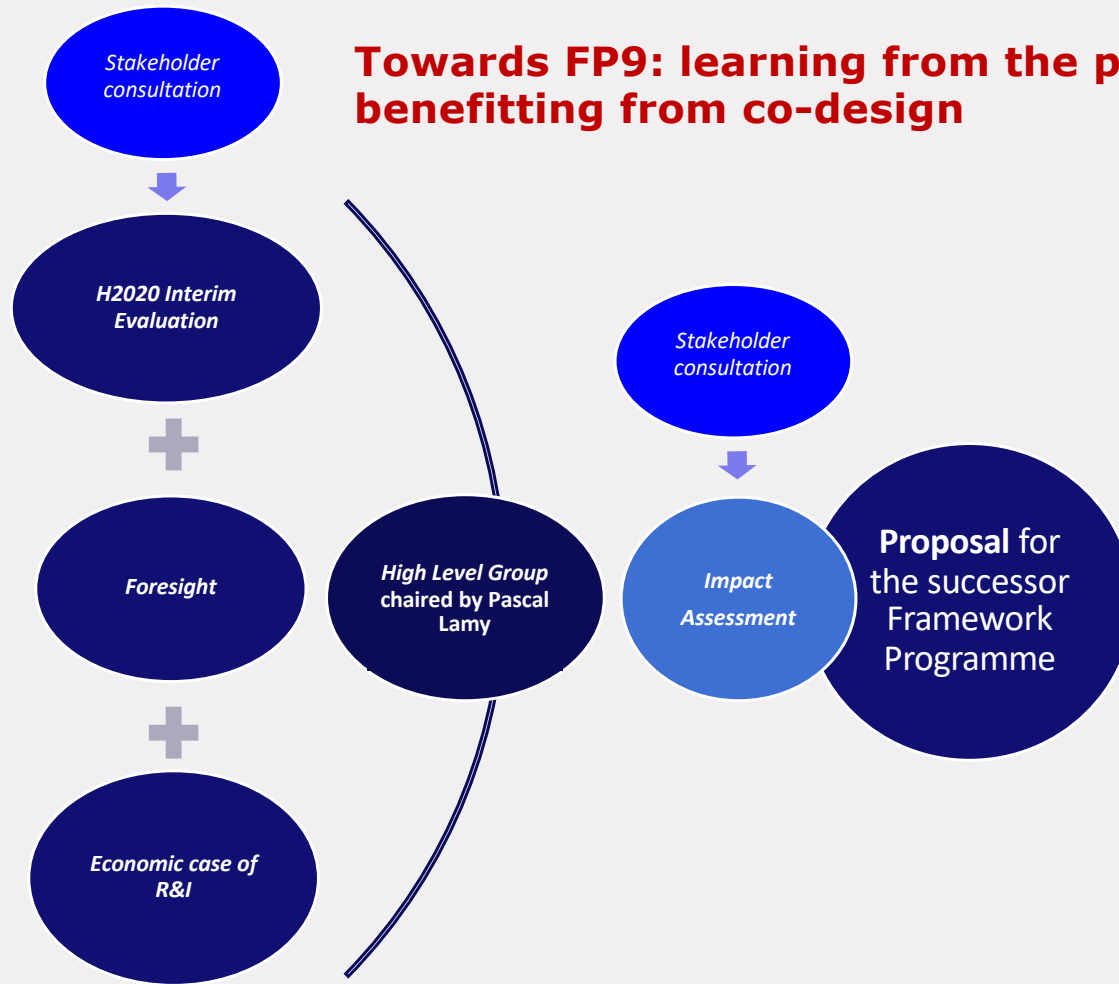


'The shaping of a new Framework Programme – experiences from Horizon 2020 and opportunities and challenges for FP9'

Robert-Jan Smits,
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Commission

Research and
Innovation

Towards FP9: learning from the past & benefitting from co-design



Political drivers:

EU budget under intense scrutiny: return on investment, impact on the ground, output-based funding, flexibility ...

Challenging **political climate:** EU added value; UK; EP elections

Programme drivers:

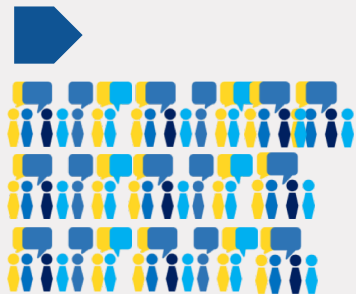
Strong steer from **Juncker priorities** and **objectives of Commissioner Moedas** (3 Os, EIC); simplification...

2017 Jan. Stakeholder consult. → July Lamy HLG report → 2018 summer(tbc) FP9 proposal

Stakeholder Consultation H2020 Interim Evaluation



TIME	From October 2016 until January 2017
AIM	To contextualise and enrich the interim evaluation of Horizon 2020
STRUCTURE	Online questionnaire (open and closed questions) + position papers



3483 responses and over **300** position papers

10 Key messages from the stakeholder consultation



High satisfaction with the programme.



Brings **EU Added Value** through unique opportunities to collaborate, access new knowledge and know-how and financing of projects which otherwise would not be supported.



Fosters **excellence** and should continue to be excellence based.



Collaborative projects are the key and most relevant feature of the programme.



Simplification of rules and procedures is an enormous success, but the job of simplification is never finished.

Icons made by Gregor Cresnar, Freepik, Iconnise from www.flaticon.com

10 Key messages from the stakeholder consultation



Increased budget is needed and programme oversubscription is an urgent issue.



Funding landscape remains **complex** to understand and needs to be rationalised.



Should better address citizens' needs.



Should further support market-creating innovation but at the same time there should be balance between research and innovation.



Some aspects of the proposal **evaluation process** could be further improved.



Foresight: The BOHEMIA project

- *A strategic foresight study towards the proposal for FP9.*
- *Part of a strategy for engagement and co-design.*

Phase 1:

Extensive review of available foresight to produce meta-scenarios relevant for Europe and deeper insights in topical fields (2016)

Phase 2:

Delphi survey to gain insights on future technologies, societal issues, and R&I practices based on the scenarios (April-May 2017)

Phase 3:

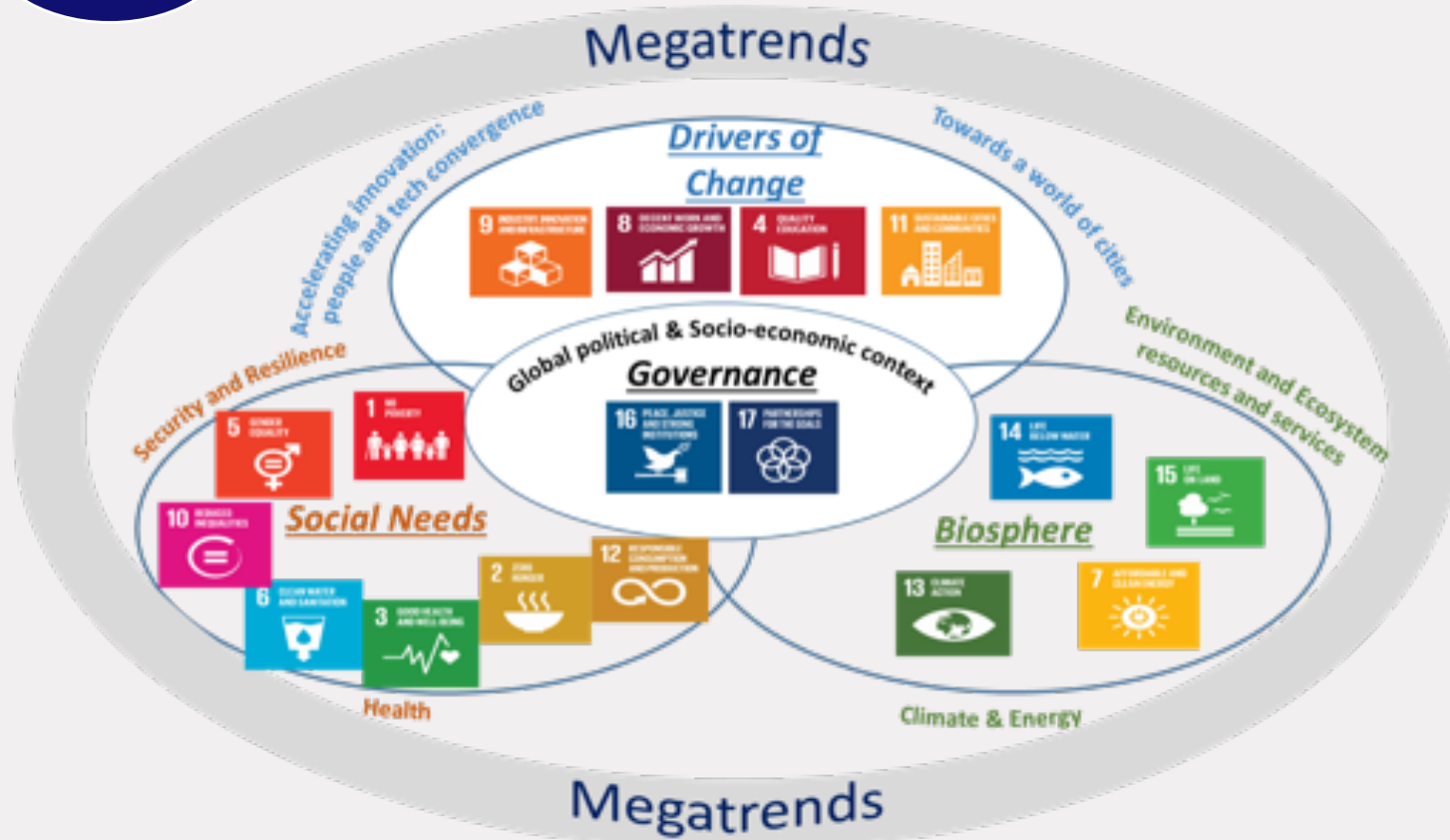
Analysis and policy recommendations (April-October 2017, with final report in October 2017)

Report available:

<https://bookshop.europa.eu/en/new-horizons-pbKI0417246/?CatalogCategoryID=7QwKABstDHwAAAEjK5EY4e5L>



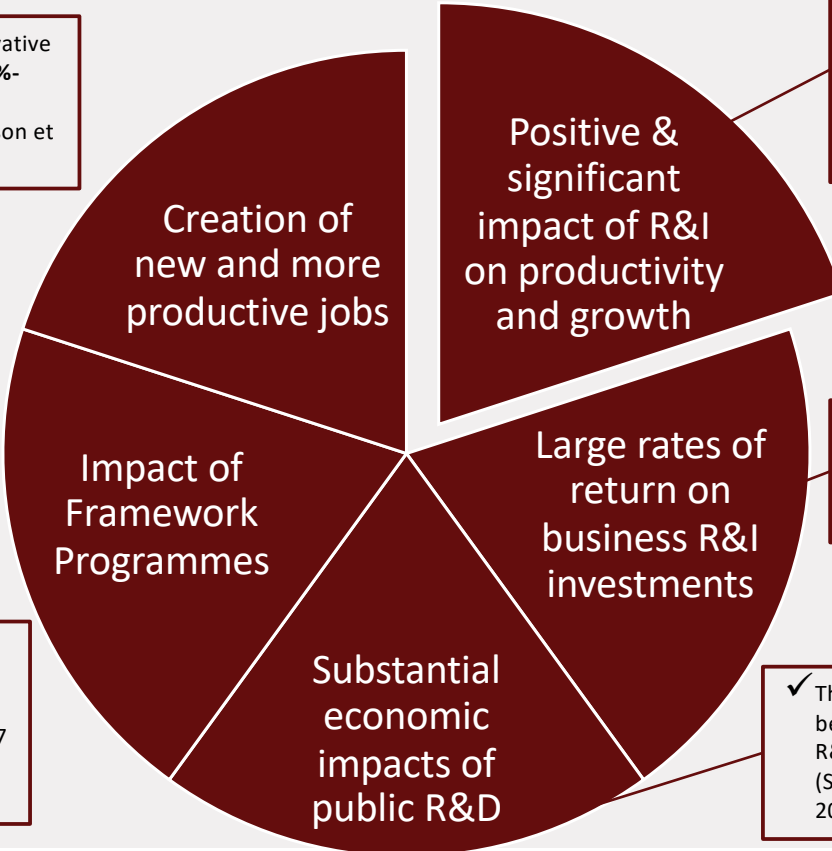
The Bohemia scenarios



The economic case of R&I

Economic case of R&I

✓ Companies with innovative products generate **30%-40% of new jobs in manufacturing** (Harrison et al 2014)



✓ **62% of growth in Europe** from 1995 to 2007 derives from R&I (NESTA, 2013)
✓ An **increase in R&D investment of 0.2% of GDP** can lead to an **increase of 1.1% of GDP**, i.e. five-fold in absolute terms (Donselaar and Koopmans, 2016)

✓ On average, the net **benefits** for a company that **invests 100 € in R&D** are **20 €**, and **up to 54 €** for R&D intensive companies (Hall et al, 2010)

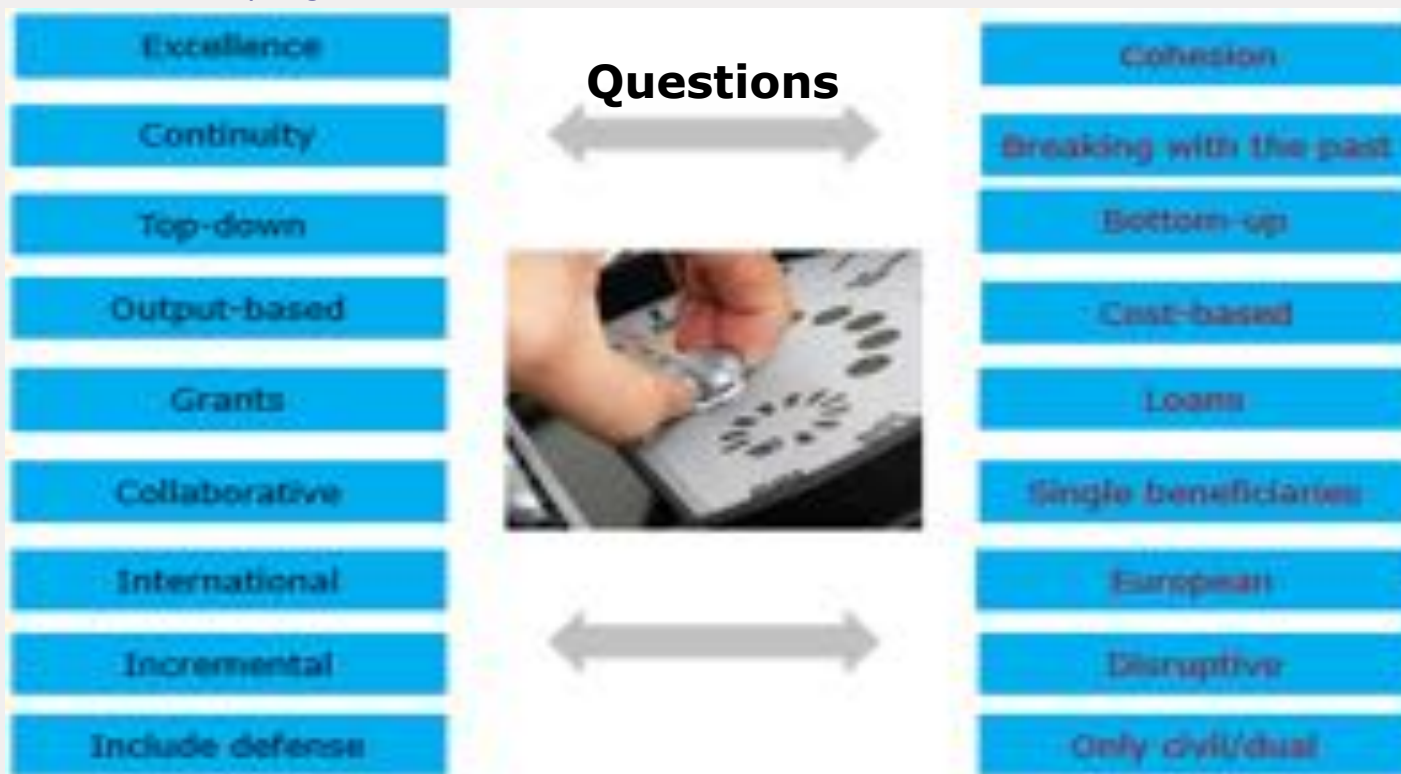
✓ Economic growth: contribution of a **0.15% annual GDP growth** until 2030 (FP7 ex post evaluation, 2016)

✓ The **rate of return to public R&D** is estimated to be **around 20%**, i.e. for every 100 € of public R&D funding, the net benefit is of 20 € (Sveikaucas 2012, Haskel et al. 2014, Georghiou 2015)

High Level Group
chaired by Pascal
Lamy

High Level Group chaired by Pascal Lamy

- Tasked to formulate a vision for future EU Research and Innovation (R&I) & draw strategic recommendations on maximising the impact of EU R&I programmes in the future.



Case 2: The European Innovation Scoreboards



The European Innovation Scoreboards



European Innovation Scoreboard & Regional Innovation Scoreboard



- What? Why? How? For whom?
- Measurement framework
- Selected 2017 results
- Complementary resources and policy use
- The road ahead

European Innovation Scoreboard

- Comparative assessment of EU innovation performance
- Member States, regional neighbours, global benchmarks
- Published annually since 2001, refined in 2017:
 - Investments, skills, digital readiness, entrepreneurship, public-private coop.
 - Contextual indicators (structural differences between countries)
- Reference for European Semester and national policies



Indicator selection criteria

- **Relevance for policy-making**

Rapidly changing innovation megatrends, practices, and framework conditions

- **Quality**

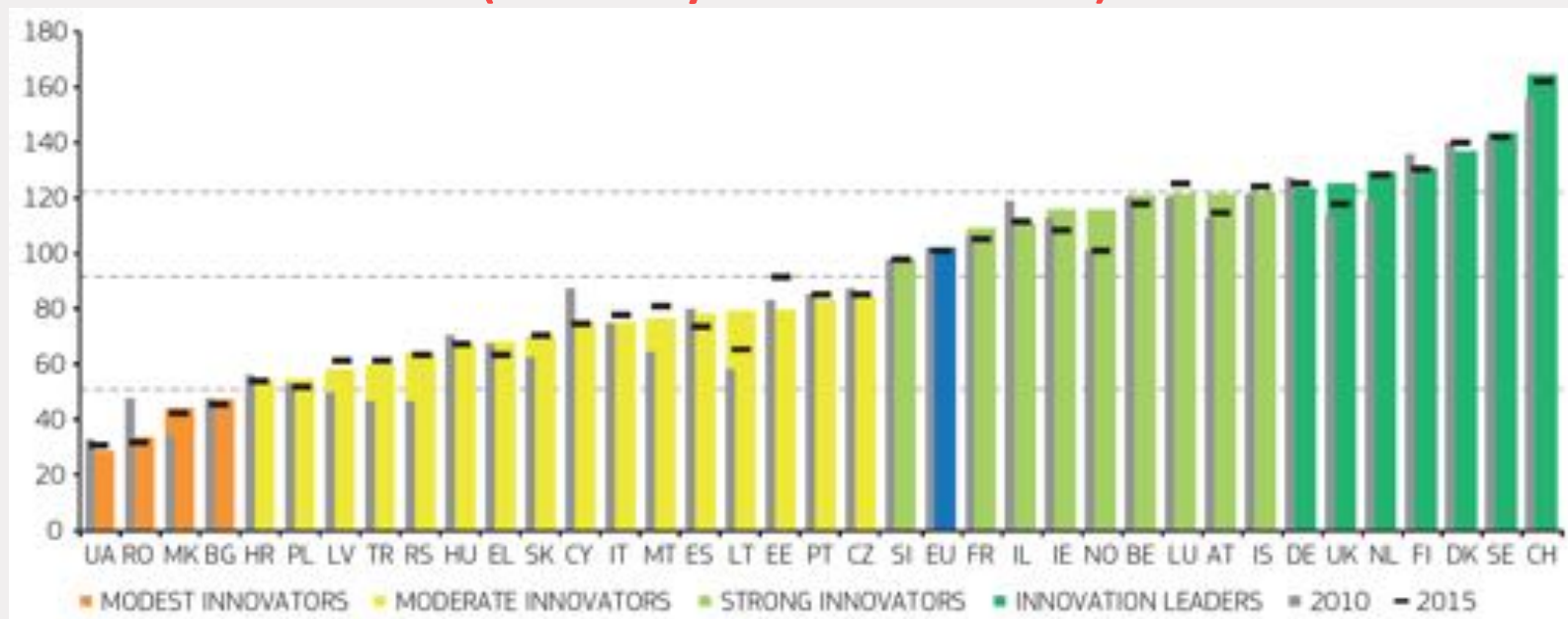
- Analytical soundness
- Reliability
- Transparency
- Comparability
 - Between countries
 - Over time
- Timeliness



EIS 2017: performance indicators

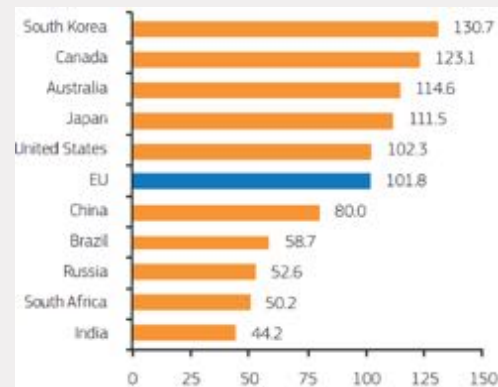
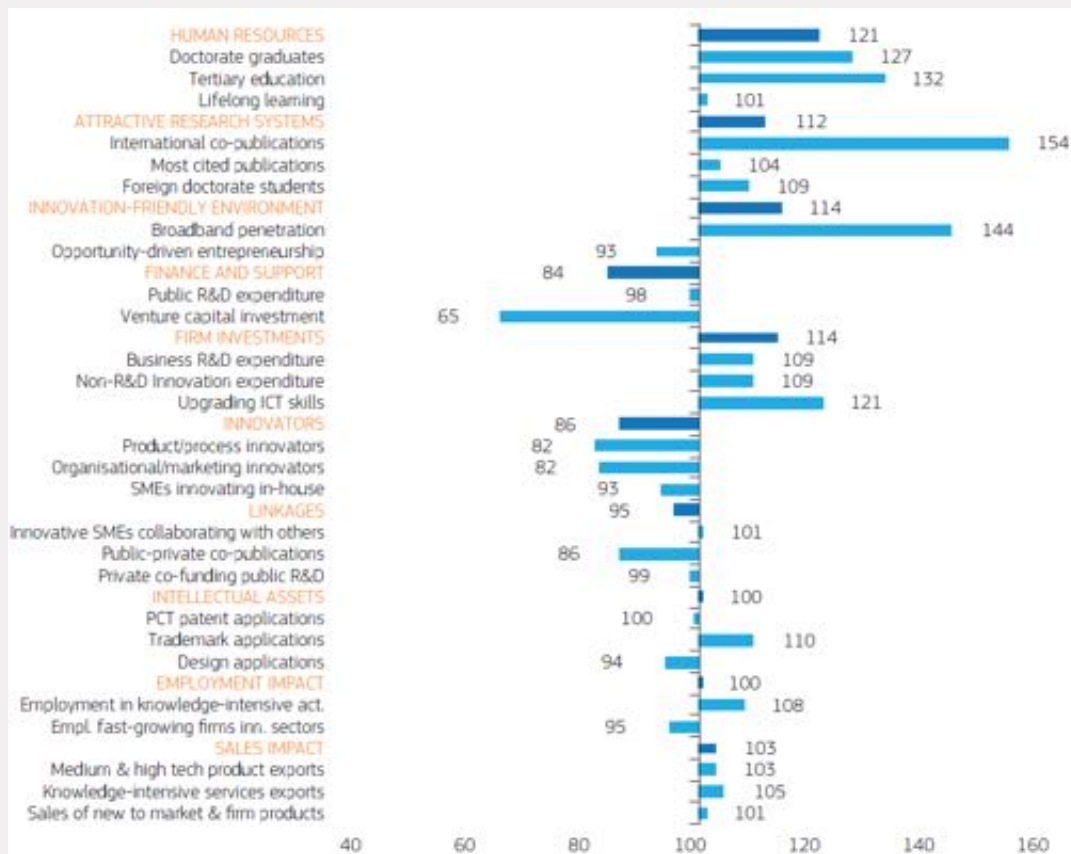
FRAMEWORK CONDITIONS	INNOVATION ACTIVITIES
Human resources	Innovators
1.1.1 New doctorate graduates	3.1.1 SMEs with product or process innovations
1.1.2 Population completed tertiary education	3.1.2 SMEs with marketing or organisational innovations
1.1.3 Lifelong learning	3.1.3 SMEs innovating in-house
Attractive research systems	Linkages
1.2.1 International scientific co-publications	3.2.1 Innovative SMEs collaborating with others
1.2.2 Scientific publications among top 10% most cited	3.2.2 Public-private co-publications
1.2.3 Foreign doctorate students	3.2.3 Private co-funding of public R&D expenditures
Innovation-friendly environment	Intellectual assets
1.3.1 Broadband penetration	3.3.1 PCT patent applications
1.3.2 Opportunity-driven entrepreneurship	3.3.2 Trademark applications
INVESTMENTS	3.3.3 Design applications
Finance and support	IMPACTS
2.1.1 R&D expenditure in the public sector	Employment impacts
2.1.2 Venture capital investments	4.1.1 Employment in knowledge-intensive activities
Firm investments	4.1.2 Employment fast-growing firms innovative sectors
2.2.1 R&D expenditure in the business sector	Economic effects
2.2.2 Non-R&D innovation expenditure	4.2.1 Medium & high tech product exports
2.2.3 Enterprises providing ICT training	4.2.2 Knowledge-intensive services exports
	4.2.3 Sales of new-to-market/new-to-firm innovations

EIS 2017 country ranking (Summary Innovation Index)



Since 2010: EU +2.0% (15 MS ↑, 13 MS ↓)
 LT +21.0%, MT +12.2%, UK +11.7%, NL +10.4%, AT +8.9%, LV +8.5%, SK +8.0%
 RO -14.1%, CY -12.7%, FI -5.1%, DE -3.7%, EE -3.6%, CZ -3.5%, HU -3.5%

EU performance change 2010-16



2016



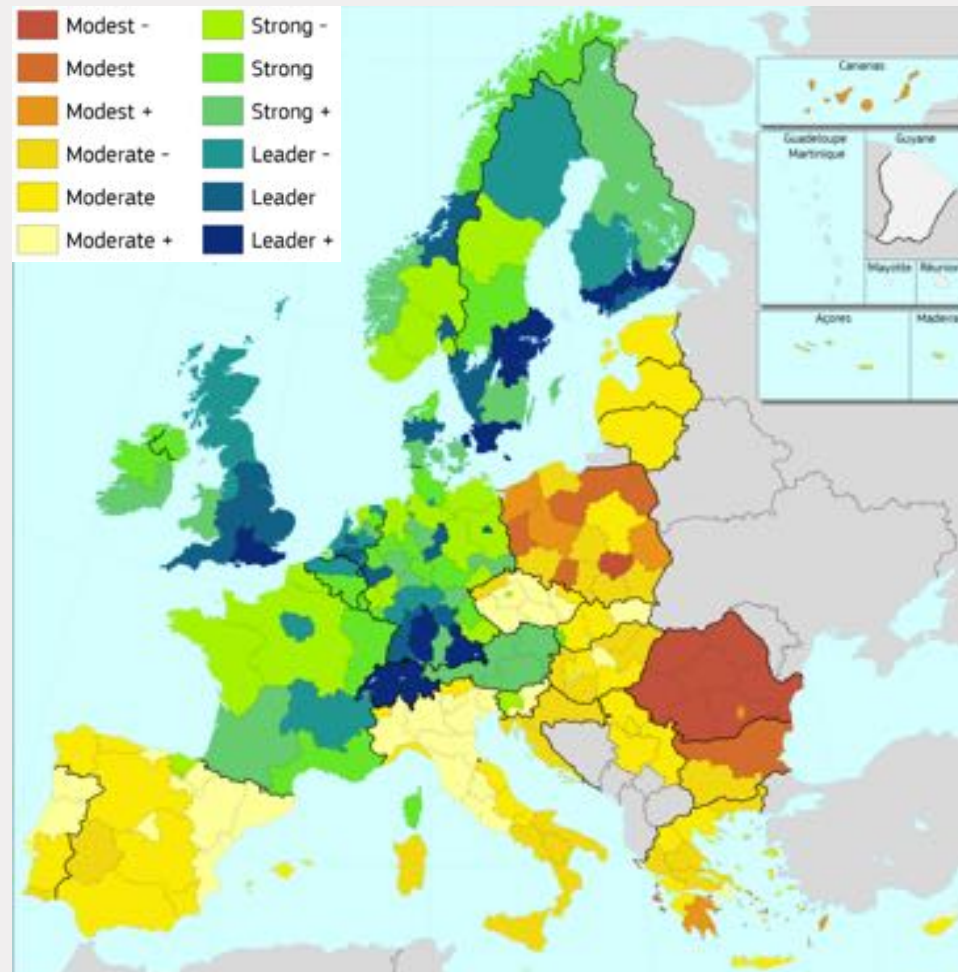
Regional Innovation Scoreboard

18 of 27 EIS indicators

220 regions in 22 MS
+ NO, RS, CH

Most innovative
EU regions:
Stockholm (SE),
Hovedstaden (DK),
South East (UK)

Since 2011:
128 regions ↑, 88 regions ↓



Policy use of EIS/RIS results



- **EU:** performance benchmarking, progress tracking, country-specific recommendations



- **Austria:** STI Strategy 'Innovation Leader' (2011)



- **Lithuania:** FDI promotion (Invest Lithuania)



- **Malta:** key source for the country



- **Sweden:** relating inputs to outputs



- **Saxony (DE):** using RIS to promote region



- **China:** inspiration for developing own scoreboard

The road ahead

2018-19: further refinement of analytical framework

- Open innovation
- Global value chains
- Social innovation
- Big data
- Contextualisation



Community Innovation Survey 2018

Case 3: Eindhoven University of Technology

An aerial photograph of the TU/e campus in Eindhoven, Netherlands, taken at dusk. The image shows several modern, multi-story buildings with illuminated windows, set against a backdrop of a city skyline and a darkening sky. The foreground is dominated by a large, semi-transparent red rectangular area that serves as a background for the title text.

The use of data analytics in relation to policy making

Smart data to assess the impact of publicly funded research

Data analytics at Eindhoven University of Technology

The “Why”

- To assess the quality of scientific research and education
- To enable to assess the contribution to the grant societal challenges
- To provide full transparency about the university
- To support applications for public funds
- To enable providing evidence for branding and communication of our university
- To allow the university to make well-founded policy decisions

Current set of main indicators

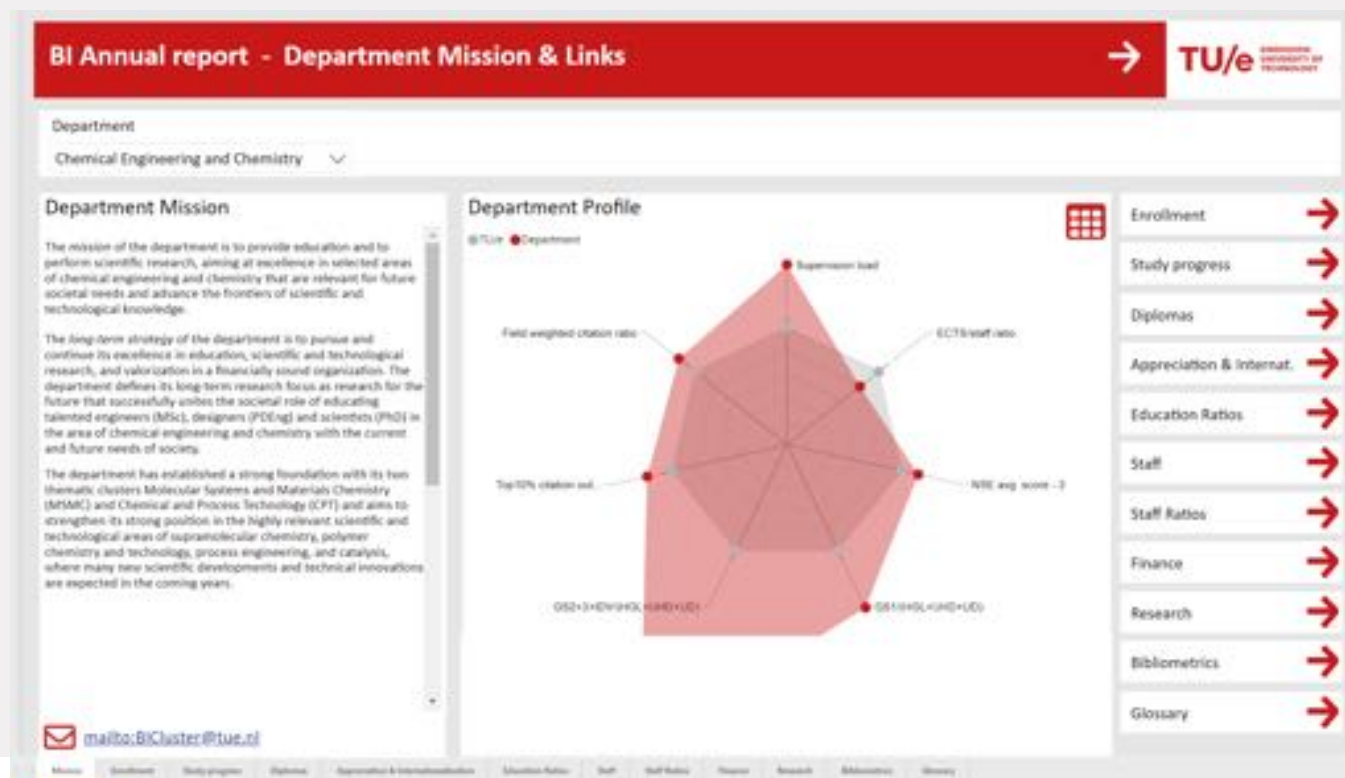
Starting point: focus on a limited but diverse set of main indicators

- **Education**
 - supervision load
 - study points / academic staff
 - national student survey
- **Finance**
 - government income for education & research / academic staff
 - external funded research income / academic staff
- **Research (bibliometrics)**
 - top 10% citation output
 - field weighted citation ratio

Example of data analytics on a strategic level

Used for the department Chemical Engineering and Chemistry

7 main indicators followed by detailed information pages in 10 categories



Possible new indicators, an ongoing development

- Patents
- Licenses
- Start-ups
- Spin-offs
- Part time professors from industry
- CORDIS, H2020 database
- PhD trends (including intake, study success rate & drop-out)
- Open access publications
- Open data in FAIR Repositories
- Altmetrics
- Education and Labour Market

Challenges

- Avoiding a “one size fits all approach”
- Extract reliable data from source systems
(scientists hate to do more paperwork or fill in extra questionnaires)
- The missing of mature metrics to assess the impact on the grant societal challenges
- The complex higher education system with many external influences makes it challenging to measure the direct impact
- Correctly interpret the data and draw conclusions

Conditions to make data analytics a success

- Making data analytics a priority at strategic level
- Having a dedicated unit of high qualified staff
- Identifying a robust set of indicators (ongoing development)
- Developing a simplified reporting tool
- The actual use of the analyses for policy making at a strategic level
- The actual use for policy making
- Feedback from users to improve data analytics

***“Not everything that counts can be counted,
and not everything that can be counted counts”***

Attributed to Albert Einstein

Beyond the numbers, the importance of success stories and storytelling

3 examples at Eindhoven University of Technology:

- 3D Printed Houses
- Artificial Womb
- Pedestrians comfort zone at train stations

3D Printed Houses

“In the city of Eindhoven five 3D-printed concrete houses will be built.

The project is the world’s first commercial housing project based on 3D-concrete printing.

The first aim of the project is to build five great houses that are comfortable to live in and will have happy occupants. But behind that there is the ambition to boost 3D concrete printing science and technology such that printed housing, with all it's advantages, will soon be a reality that is widely adopted”

<https://www.3dprintedhouse.nl/en/>



Artificial Womb

“In maternity care, more use of technology can help make labor and delivery safer for mother and child while keeping it natural and unmedicalized as much as possible.”

Full Professor at the TU/e and gynecologist at the Máxima Medical Center, Guid Oei.

Photo: Bart van Overbeeke
<https://www.cursor.tue.nl/en/news/2019/april/week-1/artificial-womb-dream-or-nightmare/>



Pedestrians comfort zone at train stations

“Pedestrians are constantly avoiding collisions with oncoming people.

Meters in advance they unconsciously change their walkway to pass each other. Physicists of Eindhoven University of Technology analyzed, in collaboration with American and Italian researchers, 5 million pedestrian movements at the train station of Eindhoven. They discovered that people want to keep an average distance of at least 75 cm.”

Photo: Alessandro Corbetta
<https://www.tue.nl/en/news/news-overview/14-12-2018-pedestrians-keep-a-75-cm-comfort-zone-to-prevent-collisions/>





Thank you for your attention

Robert-Jan Smits