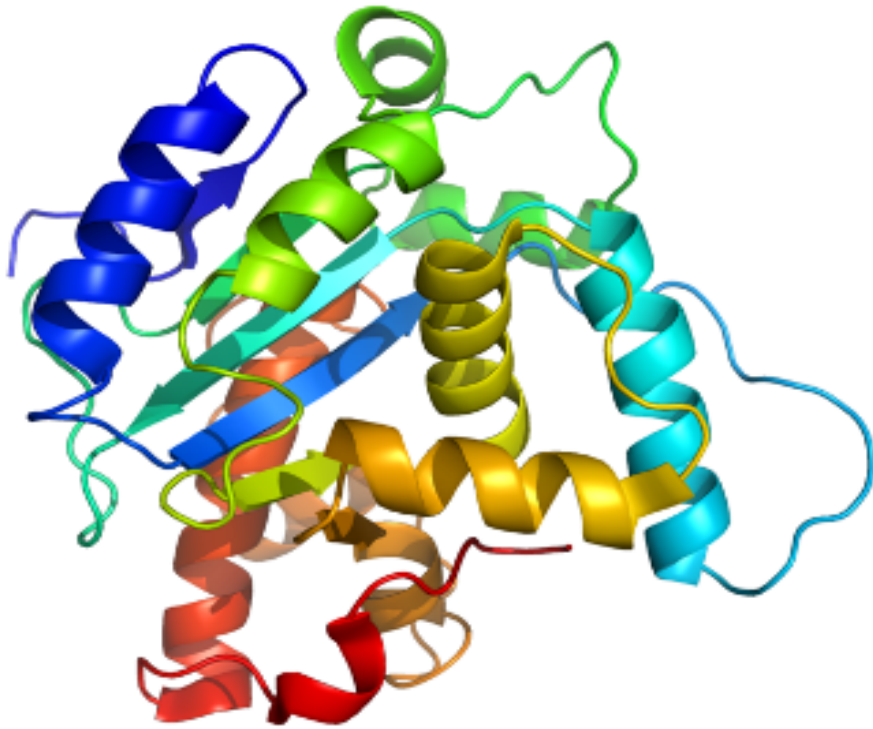


# **Role of Research Infrastructures for a Competitive Knowledge Economy – Lessons learnt from the EC RI actions**

**ERA – Vision 2020 - June 2009 – Hervé PERO, EC**

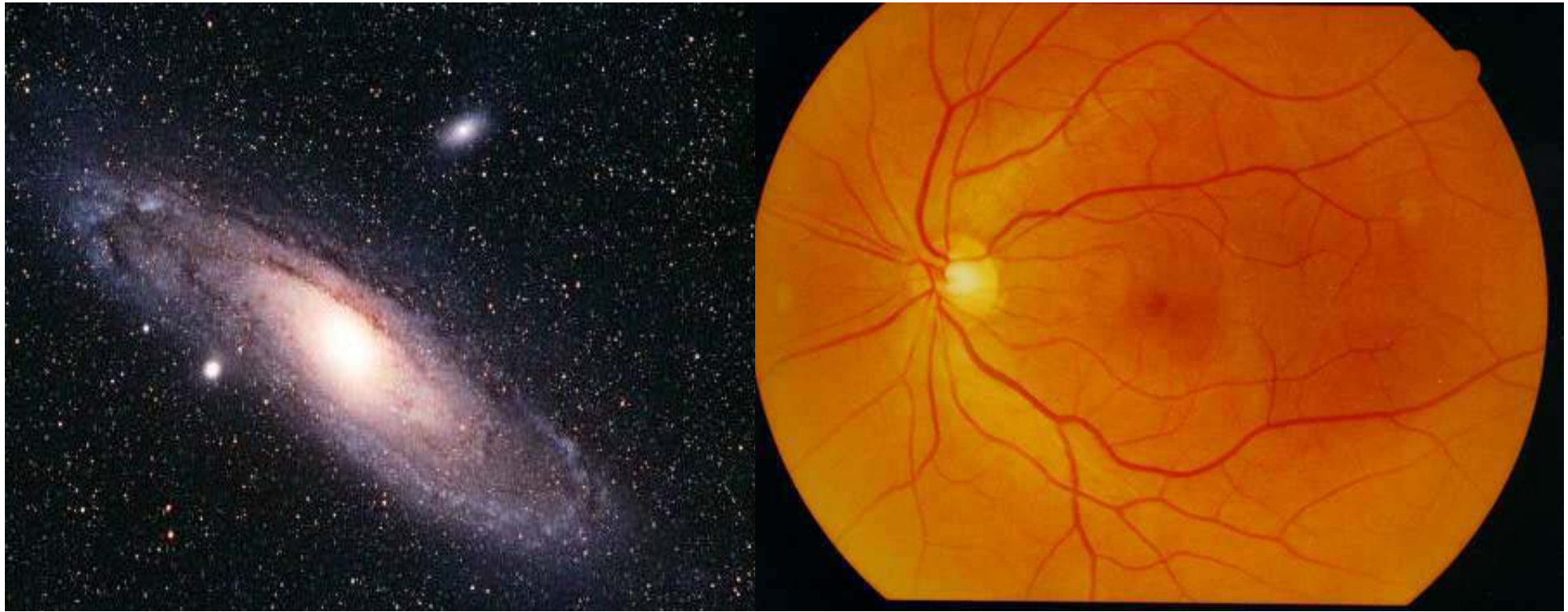
# Research Infrastructures (incl. e-infrastructures) are:

- High-level facilities, resources, and related services used by the scientific community for
  - Conducting leading-edge research
  - Knowledge transmission, knowledge exchanges and knowledge preservation
- Today Research Infrastructures include major scientific equipment, scientific collections, structured information, ICT-based infrastructures (single sited or distributed)



Research Infrastructures are facilities where basic research as well as applied research are interacting to generate innovations for our daily life





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## Short / medium / long term effects of RIs

Impacts can be generated ...

- **almost immediately**, i.e. procurement market, gains in scale and scope
- At **medium term**, i.e. capacity building, employment opportunities, regional impacts
- At **longer term**, i.e. organizational / societal changes, creation of spin-offs, knowledge and data for further (still unexpected) use





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## Direct / indirect effects of individual RIs

- By themselves, RIs generate shorter-term **direct impacts**, i.e. as demanders of new technology or through gains in scale and scope
- RIs generate also many medium to longer-term **indirect impacts**:
  - The results of the research work they allow,
  - The training of people,
  - The organizational changes they stimulate,
  - The opportunities they give for regions, etc.



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## Socio- economic effects of individual and networks of RIs

Impacts can be generated ...

- At **societal level**, i.e. generating changes in behaviour (e.g. use of internet, interest in science, understanding societal changes)
- At **health & environment level**, i.e. supporting development of new technologies, helping to understand climate change issues
- At **economical level**, i.e. gains in scale and scope, increased industrial competitiveness, new technologies / products



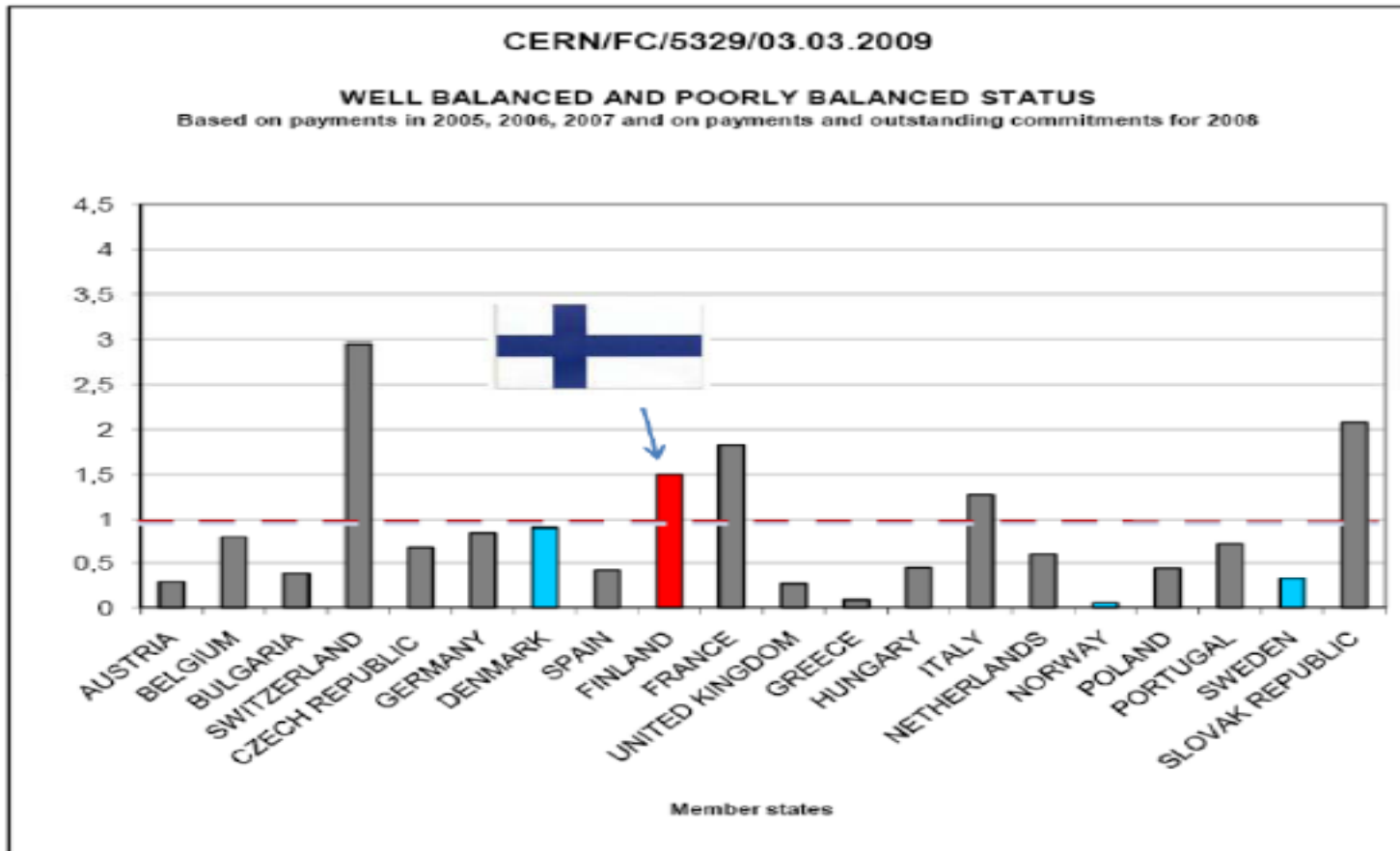


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# However, returns may vary according to local, regional or national environments...

Cf. case of CERN (source M. Makarow)





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## What more can be said about quantitative evaluation of impacts of actions at Community level?

Some years of EC experience using three main criteria in evaluation of research actions: Excellence (E), Implementation (M), potential Impacts (I)

Is this sufficient?

Evaluation of pertinence and impacts of FP6 RI actions (2007-2008) shows that much more work is needed...





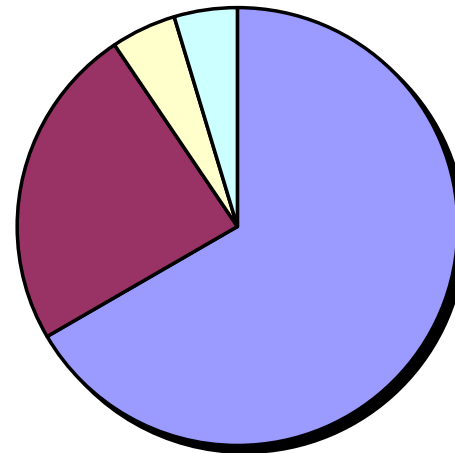
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## Case study findings of the RI-FP6 evaluation

83 RI FP6 projects, covering 9 scientific areas

Relative prominence of different impacts to projects



- Science Community and Research Infrastructures
- Research policy
- Economy/Industry
- Wider society

Identified data relate mainly to scientific outputs,  
not so much to industrial or societal outputs...

No comprehensive data to determine socio-economic impacts

Source: Matrix / Ramboll report (2009)



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## More impacts if networking of RIs...

### **In particular on research effectiveness:**

- ✓ Generation of new standards and protocols
- ✓ Opening to European and International users
- ✓ Access to critically important equipment
- ✓ Enhancement of inter-disciplinary research
- ✓ Increased speed of end-user access
- ✓ Improved standing and visibility of European RIs





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## **Additional impacts of Community actions, e.g.**

### **On the European Research Area:**

- ✓ Enable activities not possible otherwise
- ✓ Increased involvement of researchers from New MS and improvements in RIs in NMS
- ✓ Expand existing / new research networks
- ✓ Develop a European spirit versus national

### **On Human Resources**

- ✓ Access to the 'best' RI (7000 user groups)
- ✓ Mobility of Researchers (> 30.000 people), etc.





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## Lessons learnt from this impact study ...

- Unfortunately there was no FP6 predefined definitions / measures according to impacts
- Definitions / measures adopted were based on “expert opinions” and feedback from Delphi
- Impacts were measured using a combination of statistical methods and qualitative data

### **How better to measure in the future?:**

- Standardised data collected across projects
- Development of time series
- Better understanding of long term impacts





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## Success factors identified...

- Established User / supplier relationships: pre-existence of networks / business models is shown to be of high importance for impact generation
- Relevant expertise: mix of knowledge on socio-economic impact methodologies / relevant domains is also key to follow-up impacts studies

### **To analyse impacts, need for:**

- Awareness and Data: retrospective analysis is only possible if data collected and retained
- Representative Case Studies and datasets





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## Barriers to generation of impacts ...

- Non adequate planning of work or lack of business model towards users and/or suppliers
- Non-availability or lack of Critical Mass of data
- Lack of maturity of the Discipline or its Information Use
- Imperfect or Partial Indicators / methodologies
- Non-Availability of Relevant expertise and/or Personnel





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## First approaches to measure industrial impacts at European level ...

*(data from ERID Watch - 2008)*

- ✓ Rather big market ~8-9 B€ per year
- ✓ Increase of 5.5% over the last 10 years
  - o new products (e.g. Medical drugs)
  - o Leading edge technologies
  - o Secondary industrial products (e.g. DNA sensors)
- ✓ Marketing image & global markets for technologically-based companies



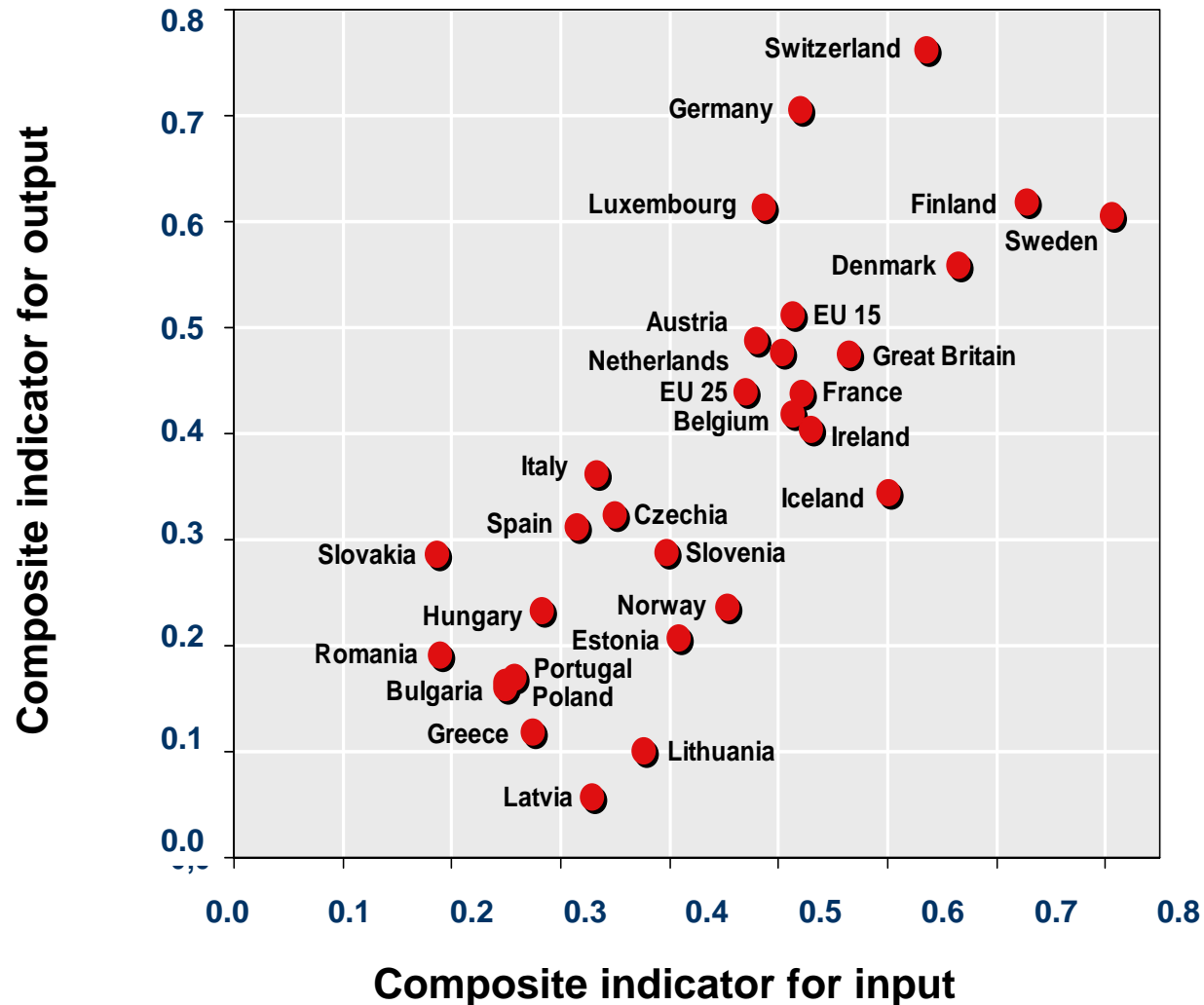




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# How to move forward? Innovation inputs and outputs



Source: European Innovation Scoreboard 2006

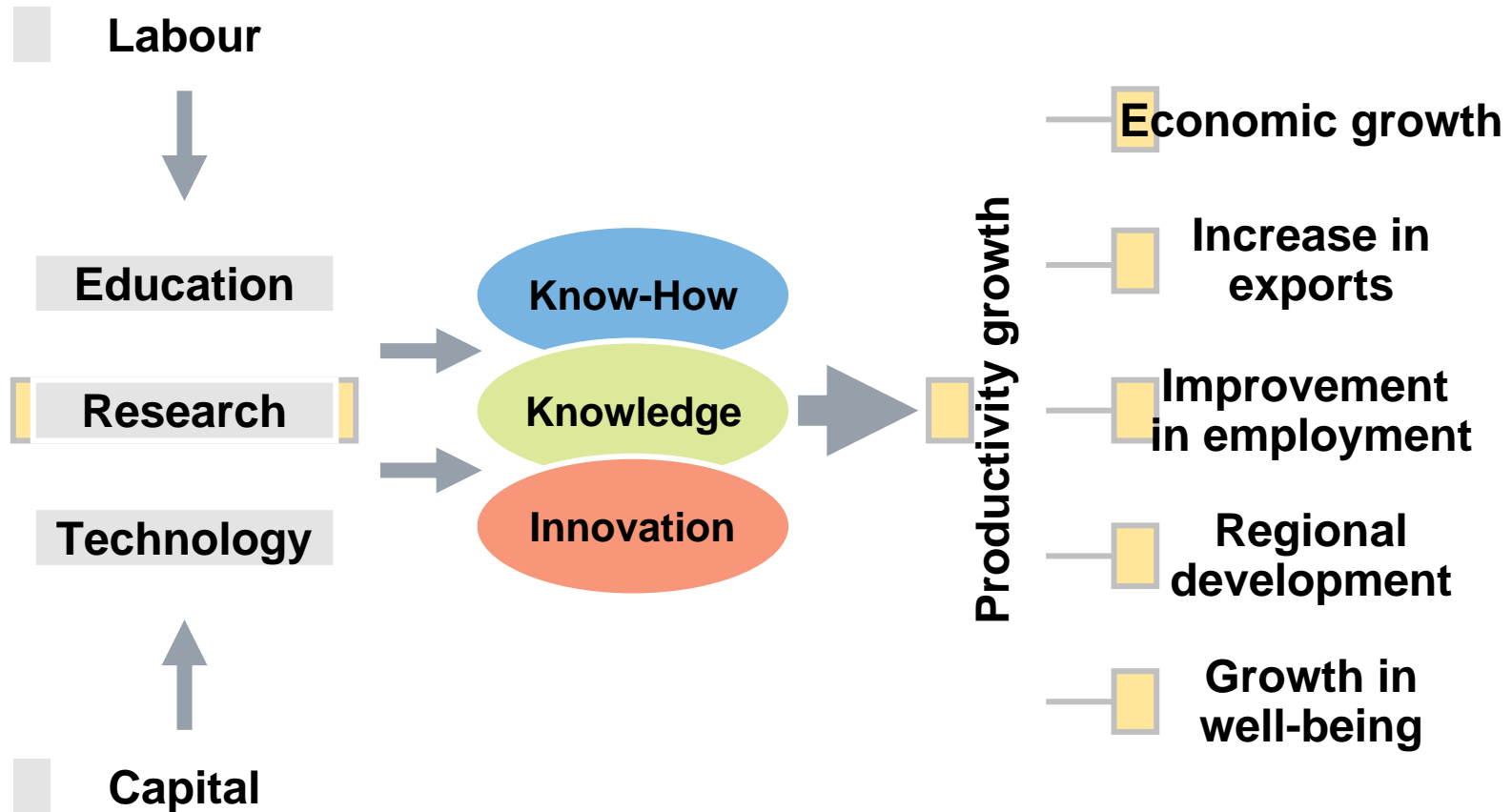




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# Sources of economic growth (another possible approach...)



**According to this growth model, economic growth is rooted in education, research and technology.**

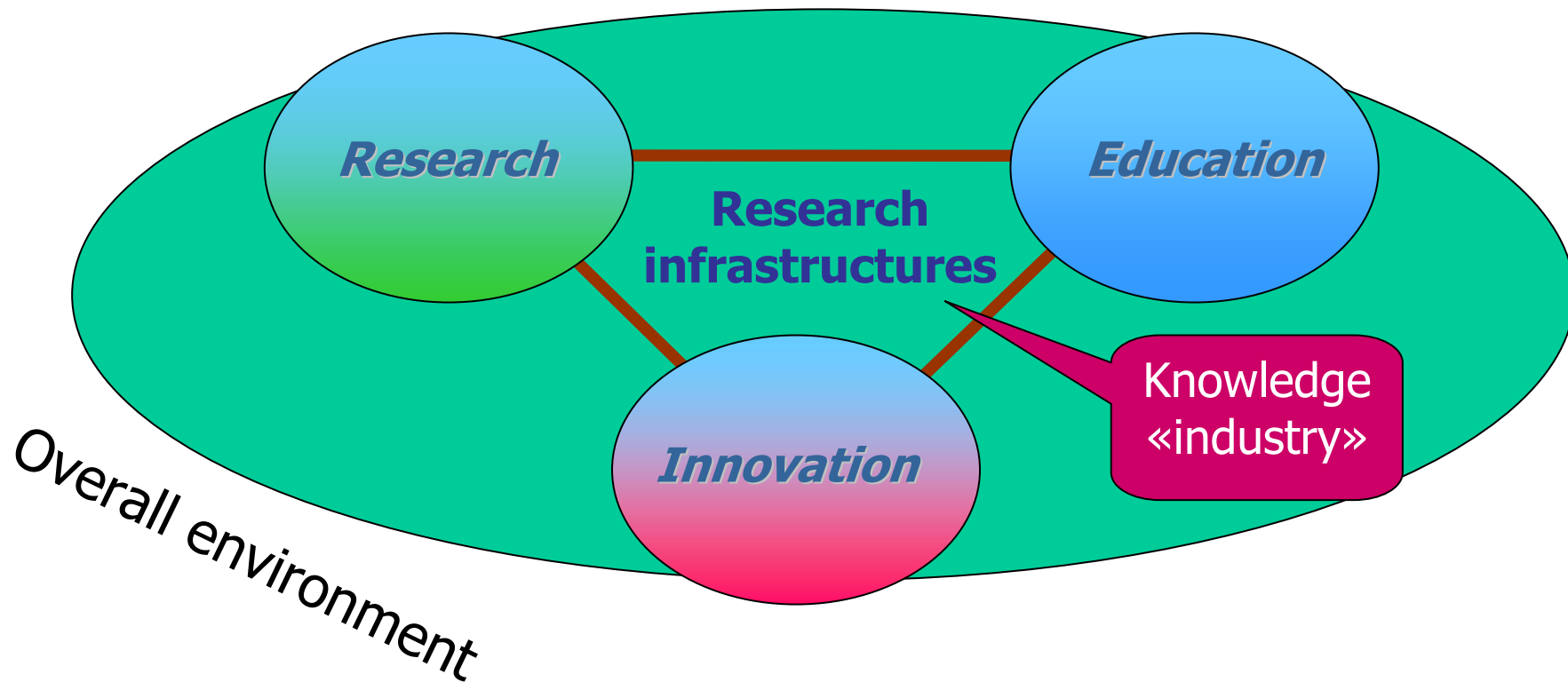




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# Impacts of Research Infrastructures, at centre of the knowledge triangle, relate also to an efficient environment





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## Towards an 'eco-system' of Research Infrastructures within ERA

- a) Large single-sited facilities
- b) Distributed European Facilities
- c) Network of national facilities

Based on

- a) a consistent roadmap from the European stakeholders
- b) Strong links with universities & schools
- c) Network of industrial suppliers / users



**this is a major challenge,  
not scientific but mainly political, possibly cultural...**





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# More work is needed !

## Need to identify better the inputs!

Not only...

- Excellence of service provided
- Quality of management of the facility(ies)
- Capacity to exploit, disseminate, train, etc.

But also...

- Political willingness to develop ERA
- Critical mass (scale & scope), etc.





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## **Need to better identify the outputs!**

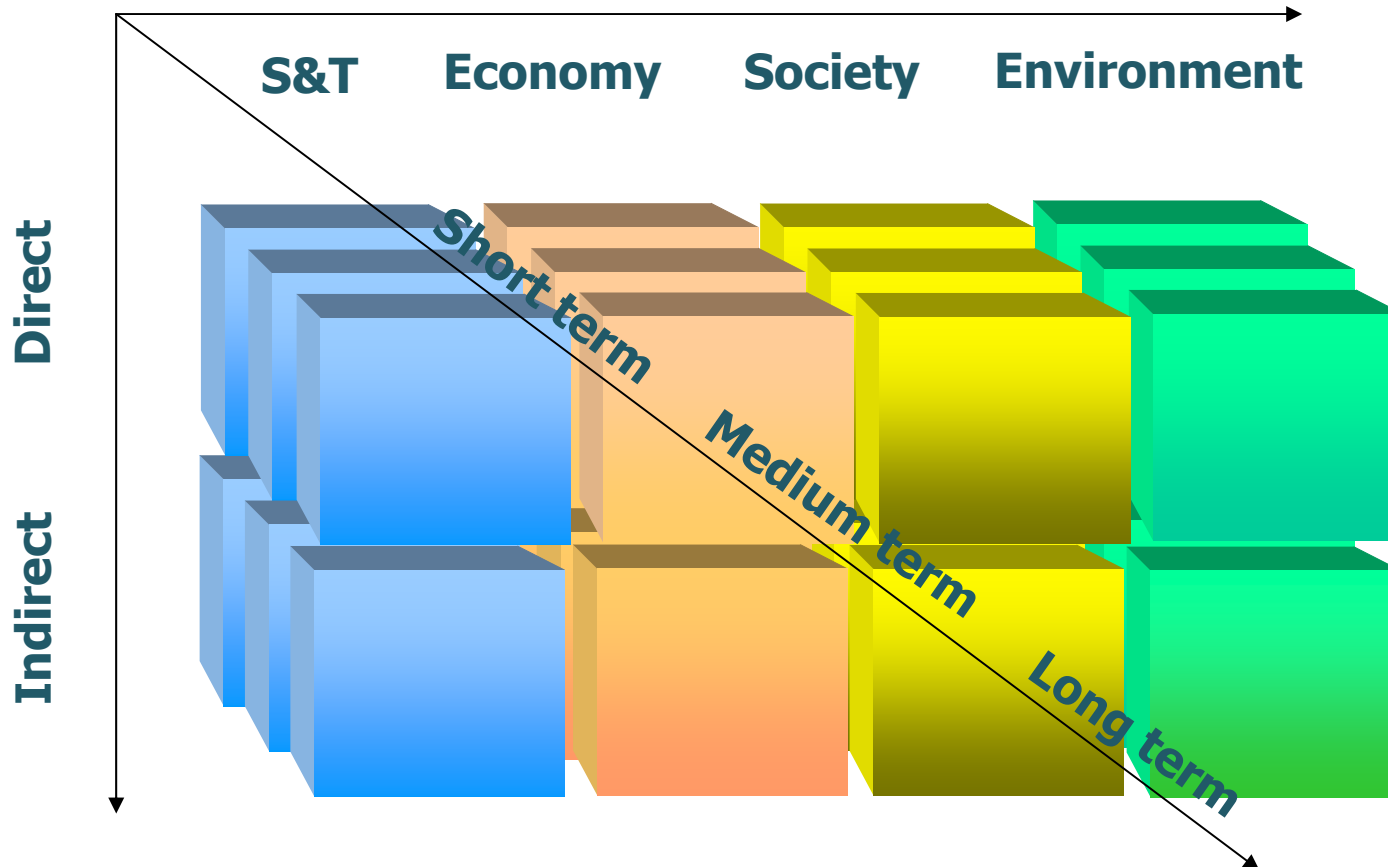
- New scientific & technical knowledge
- New visions (science, society, industry)
- New way of managing organisations
- Improved research conditions within ERA
- Improved environmental conditions
- Economic gains at micro level (e.g. efficiency)
- Economic gains at macro level (regions, Europe)
- Patents, licences, spin-off companies, etc.



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# Outputs... a three dimensional analysis (at least...) needed





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## Need to characterize the overall environment!

- Overall positive environment needed to generate impacts, although inputs are present...
  - Stimulating Working environment (W)
  - Socially-friendly hosting environment (S)
  - Favorable Financial / eco environment (F)
  - Politically « working together » (P)
- As if a theoretical equation was:

**Impacts: function (E, M, T, W, S, F, P...)**





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# Another possible evaluation matrix to be looked at...

		inputs			Overall RI environment
		E	M	I	
outputs	Science	Frontier research	Research services	Knowledge creation	
	Europe	EU S&T challenges	Governance	European leadership	
	Sustainability	Grand Challenges	Balanced budget	Socio-economic impacts	

Research-innovation bridge





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## How to advance further? Possibilities offered in WP 2010 ...

- **INFRA-2010-1.1 + 1.2** (integrating activities and e-infrastructures): impact studies within projects
- **INFRA-2010-3.2**: development of new or enhanced methods and indicators to measure the social, economic, environmental, direct and indirect impacts, including of scientific data repositories; another action for forward-looking and retrospective case studies
- **INFRA-2010-3.3** (e-Infrastructures): evaluation of the impact of the programme including establishment of appropriate indicators

**To be discussed again  
in the final round table discussion tomorrow...**

