

KISTEP - BETA meeting

on innovation, science and regional indicators

Laurent BACH - Jean-Alain HERAUD - Emmanuel MULLER

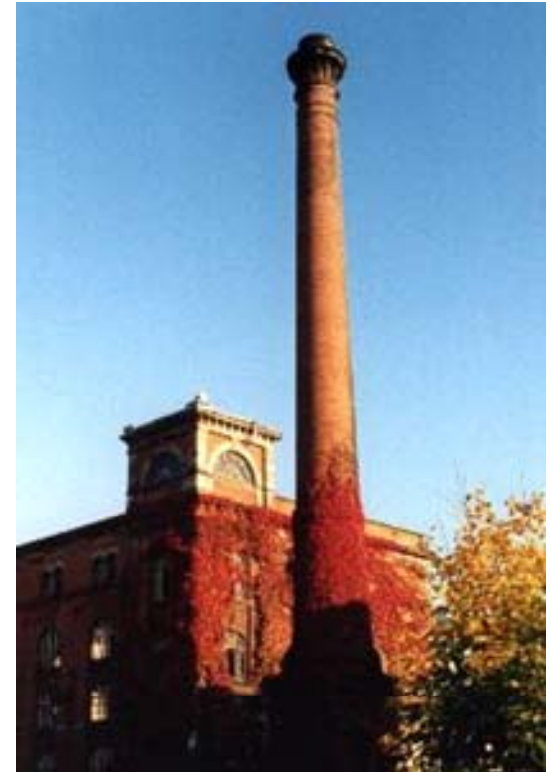
December 12, 2013





P.E.G.E.

**European Pole
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The University of Strasbourg

- One of the largest single University in France
- Three Nobel-awarded scientists (in activity, 16 in total) :
 - J.-M. Lehn, 1987 (chemistry)
 - J. Hoffman, 2011 (medicine)
 - M. Karplus, 2013 (chemistry)
- Approx. 5.000 employees (4.000 researchers) and 43.000 students
- Annuel budget > 500 millions Euros
- Regional (direct) impact > 700 millions Euros



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Mission (in innovation research) :

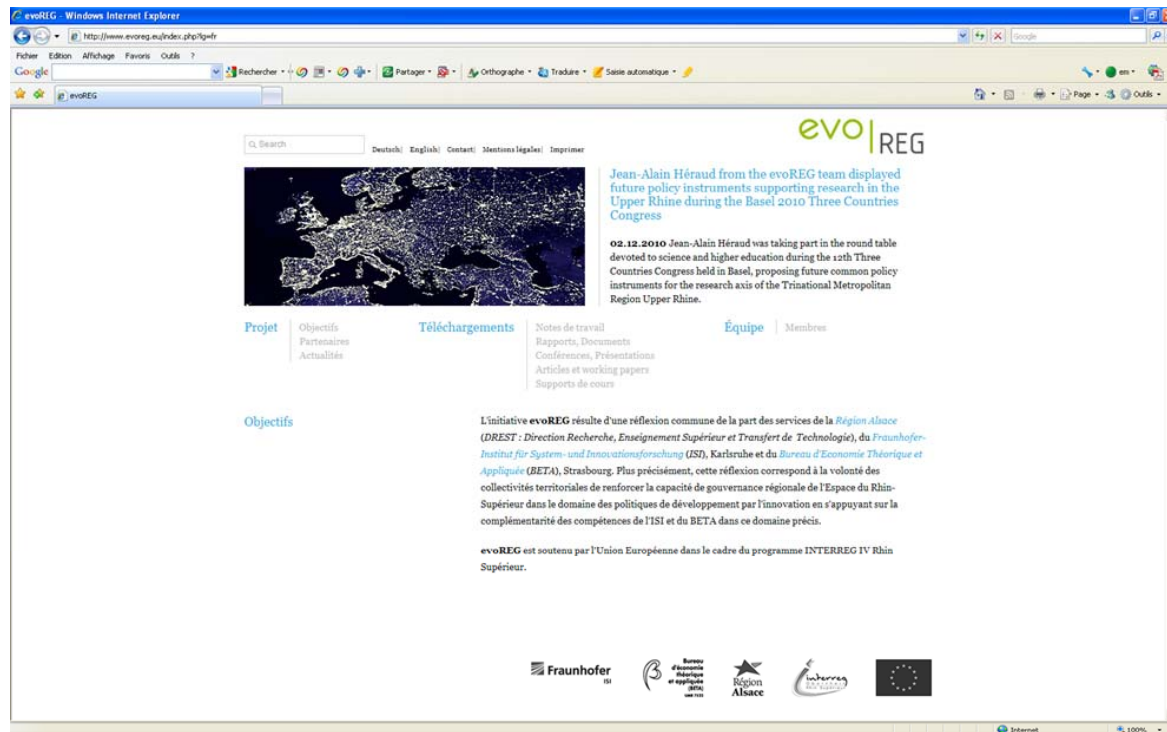
- Economic theory of innovation and creativity
- National and regional systems of innovation
- Indicators and science policy studies
- Policy evaluation applied to large public programs (typically at international level)

Key facts :

- Founded in 1972 (same year as Fraunhofer ISI !)
- About 200 members : 100 research and teaching scientists, 15 supporting employees, 55 PhD students and some 45 associated researchers
- Total annual budget : approx. 8 millions Euros



The evoREG initiative



The evoREG initiative results of a common reflection by the Région Alsace, the Fraunhofer Institute Systems and Innovation Research ISI, Karlsruhe and the Bureau d'Economie Théorique et Appliquée (BETA), Université de Strasbourg

Think-tank aiming at strengthening the innovation policy governance capacity of the Upper Rhine Area

Supported by Région Alsace and co-funded by European Union (INTERREG IV, 2009-2011); currently a research chair (2013-2023)

www.evoREG.eu



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Identity (ies) ?

L'Alsace s'Elsàss dasElsaß



Strasbourg Stràsburgi Straßburg



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History

Tradition of creativity and innovation in the Upper-Rhine area

Johannes GUTENBERG

Born: Mayence (Mainz)
around 1400

Has worked in Strasbourg

Religion: protestantism

Litterature: Sebastian Brandt

Painting,

Architecture,

etc.



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A political construction : The Upper Rhine Trinational Metropolitan Region (RMT/TMO)

-
When small Europe(s) attempt
to contribute to the big one

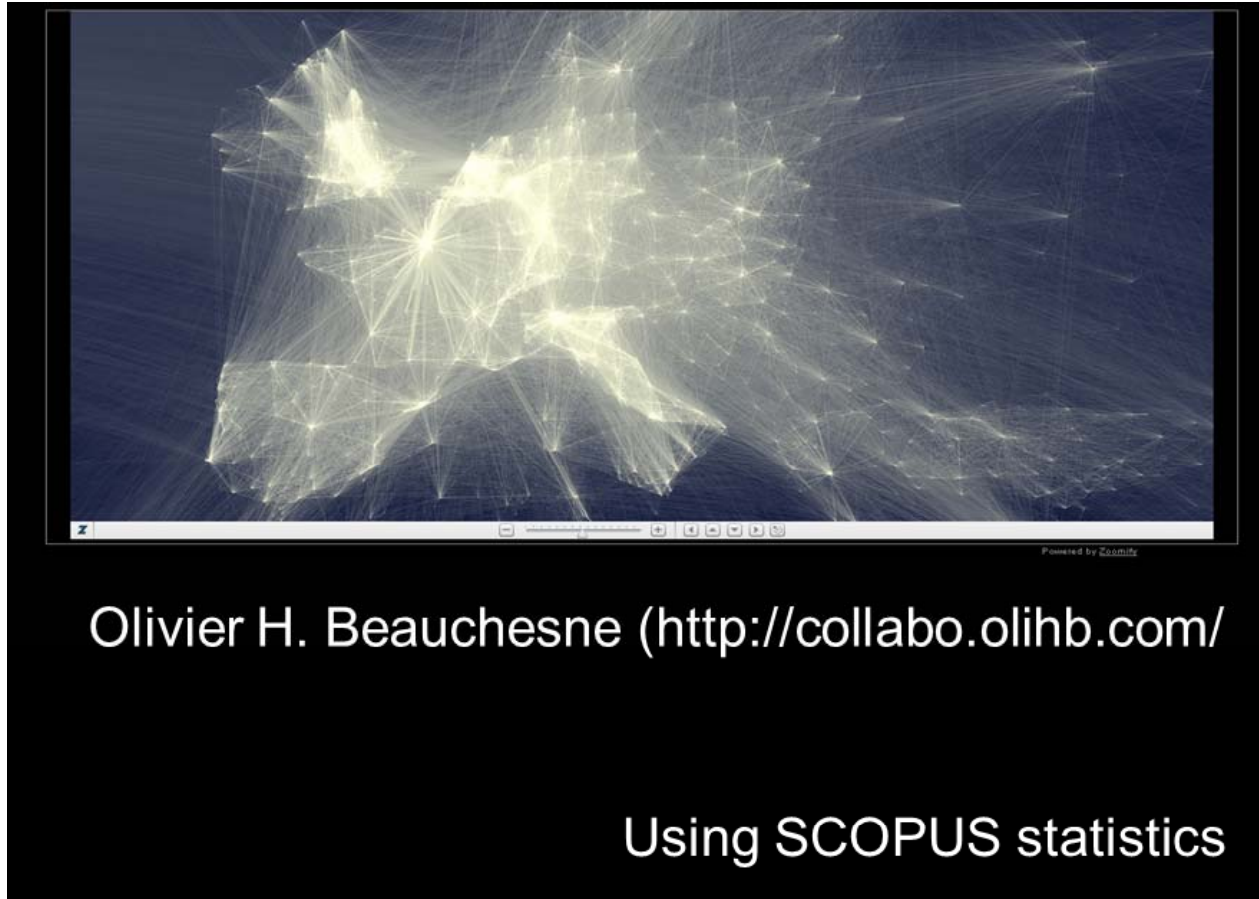


Conseil rhénan

Eurodistrict Strasbourg-Ortenau



Map of scientific collaborations 2005-2009



Issues

- Analysis of scientific *connectivity* at regional level as a major aspect of regional research and innovation policies;
- Application to the Upper-Rhine Valley cross-border area: perimeter RMT-TMO
- Production of indicators of scientific (and technological) connectivity in order to characterize URV area and compare to other European territories.



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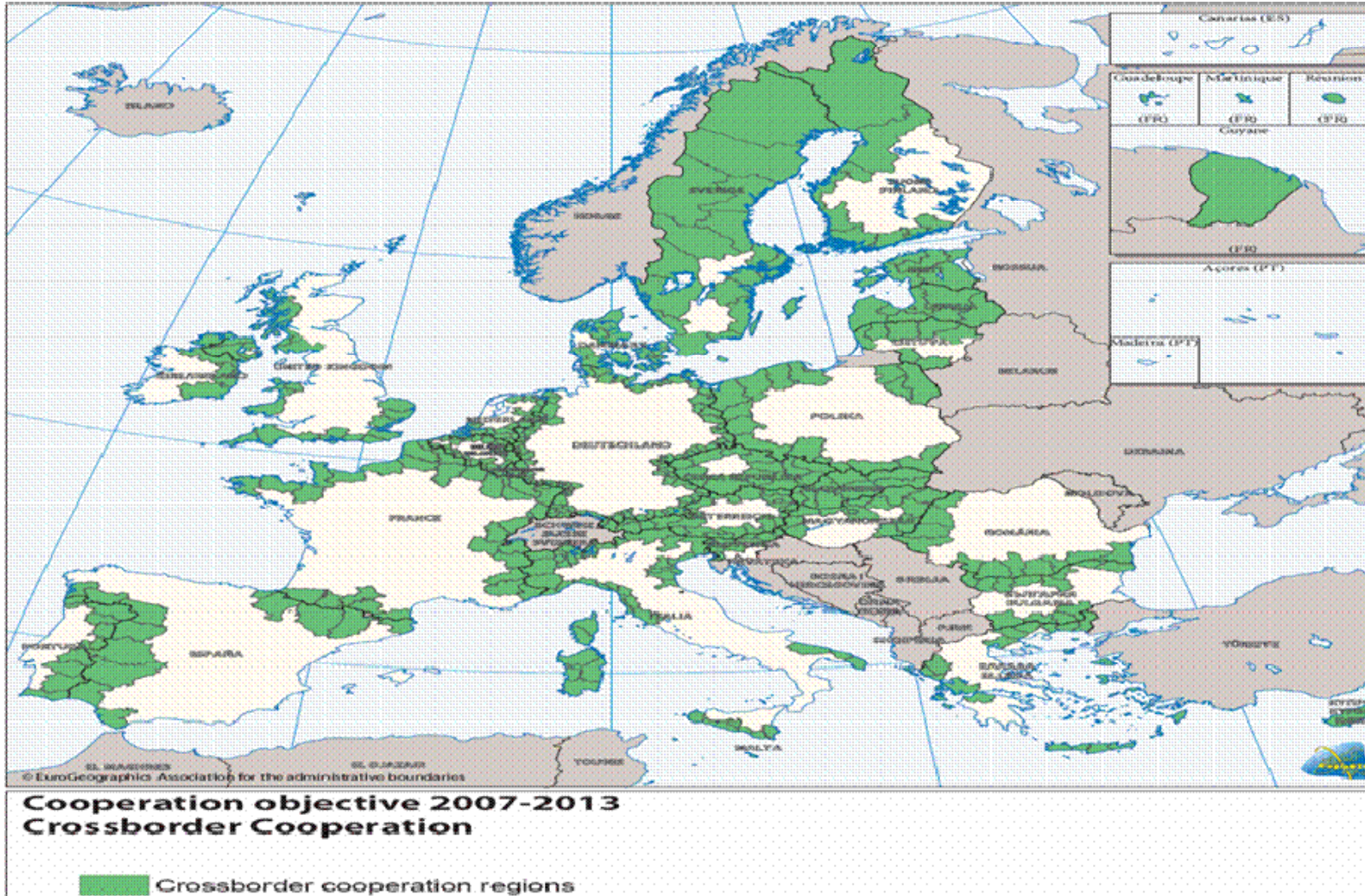
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Cross-border cooperation regions In Europe



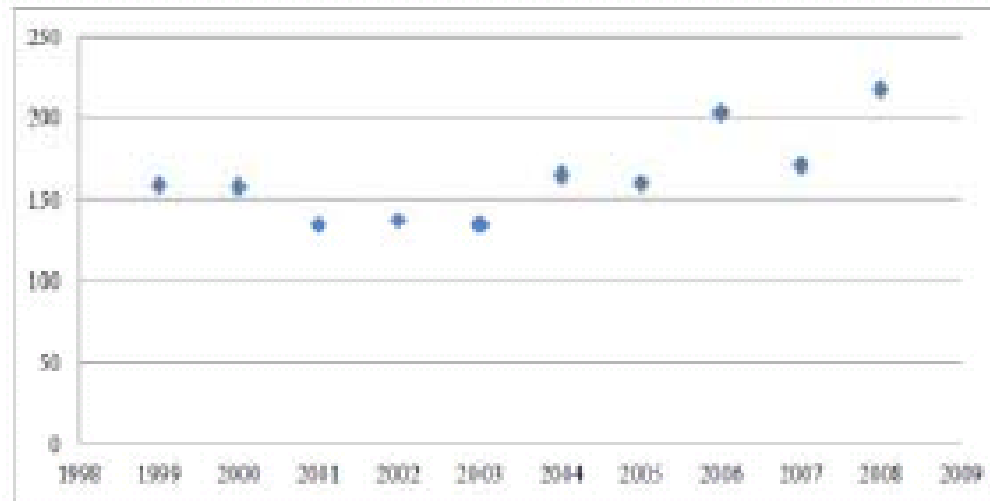
The stakes: Upper Rhine scientific production in Europe (EUR27+ , % , year 2008)

• Chemistry	2,61
• Physics	2,02
• Engineering sciences	1,89
• Basic biology	1,71
• Sciences of the universe	1,59
• Medical Research	1,46
• Applied biologie - ecology	1,19
• Mathematics	1,11

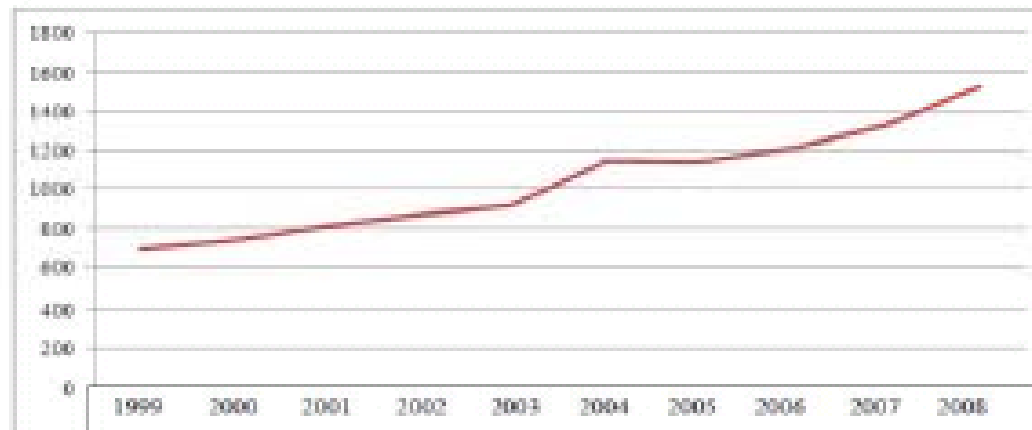
Example of scientific connectivity measure:
international copublications of Alsace as compared to France
(for 8 scientific domains)

<i>Co-publications/publications (%)</i>	Alsace	France
Basic biology	29,5	22,0
Medical research	15,1	11,1
Applied biology and ecology	30,0	25,9
Chemistry	29,2	24,6
Physics	38,5	31,6
Sciences of the universe	39,6	33,7
Engineering sciences	17,8	19,7
Mathematics	20,7	23,4
<i>All disciplines</i>	<i>26,8</i>	<i>21,5</i>

Volume of transborder co-publications (within URV)



Volume of transborder co-inventions (within URV)



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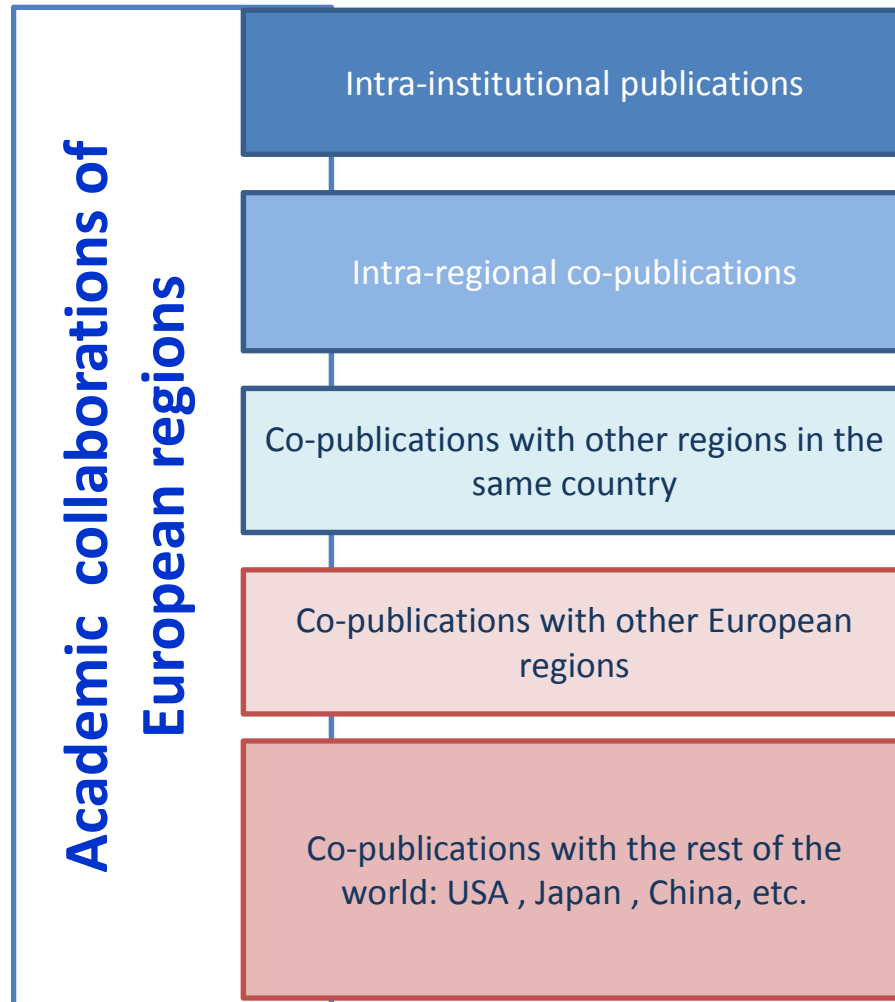
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Other types of connectivity for Alsace

- **Co-publications with Europe (2007)**
 - *13,1% as compared to 9,9%*
 - **Co-publications within the region (2007)**
 - *22,4% as compared to 28,9%*
 - **Co-publications within URV*(1999-2008)**
 - 2,3% co-publications with German part of URV
 - 1,9% co-publications with Swiss part of URV
- *RMT/TMO**
- Total on the Upper Rhine area: about **4%**
 - Looks modest! But should we expect more? Why? How to get more integration if needed?

Scientific connectivity of European regions : towards a typology of cooperative schemes



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Four types of regions

- **Type 1 « national standard »** : 135 regions more oriented towards national (and international) networks. Few intra-regional connectivity
- **Type 2 « European network »** : 43 regions more oriented towards European and international networks. Fewer national connectivity
- **Type 3 « autarcic »** : 27 regions with low connectivity; researchers mainly oriented towards intra-institutional links.
- **Type 4 « regional system »** : 38 regions with higher intra-regional connectivity.



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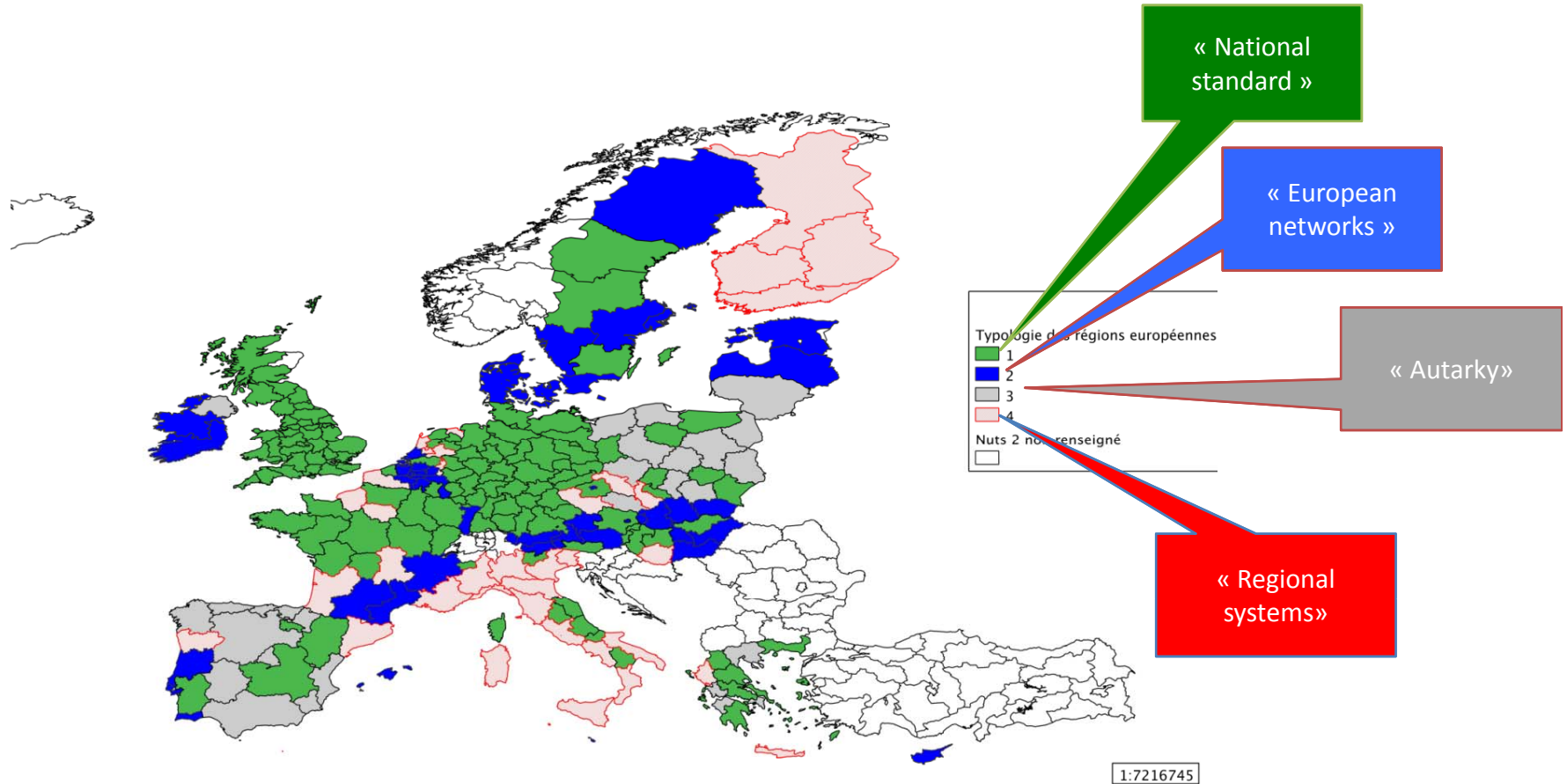
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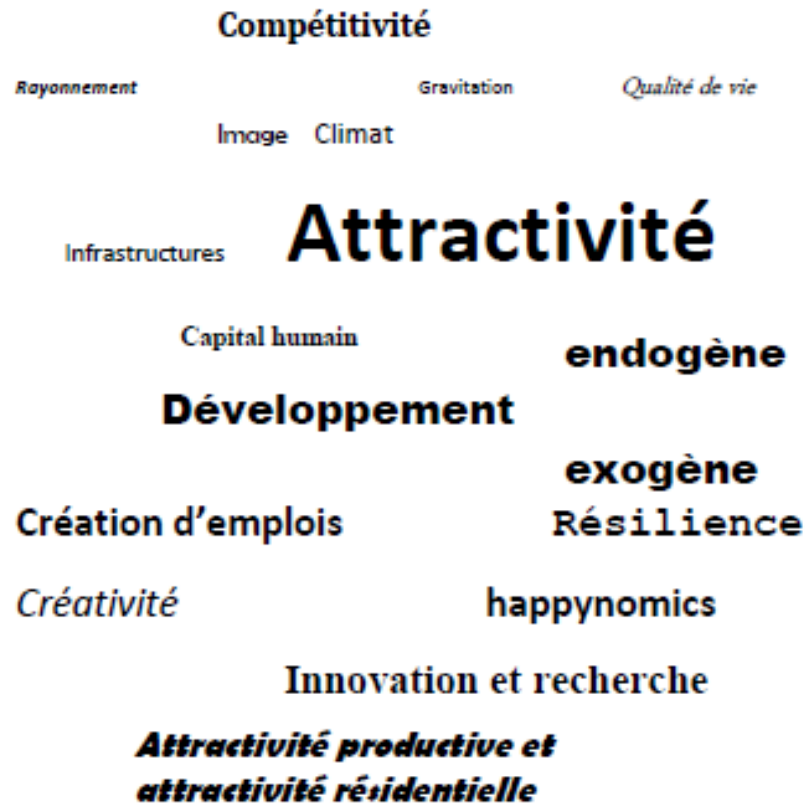
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Who are the regions?



Attractiveness & the city : what are we talking about ?

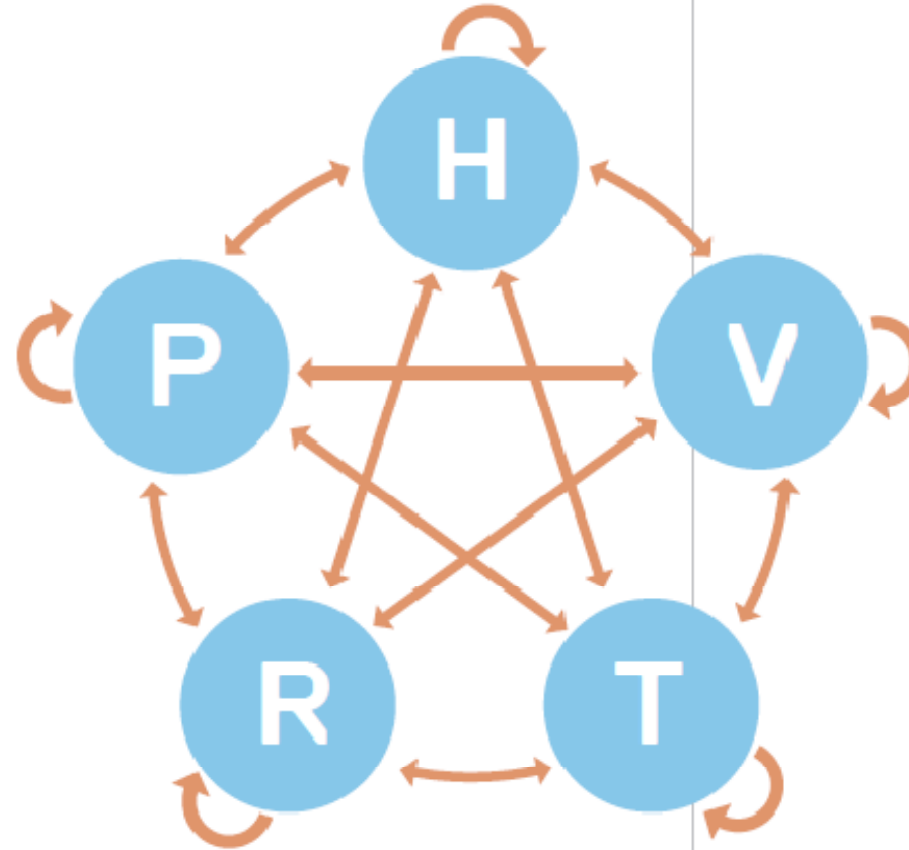


Définition de l'INSEE :
"L'attractivité
économique d'un
territoire repose sur
sa capacité à capter
des ressources
extérieures "

Concept(s) -> Indicators -> Policy recommendations ++ Realizations ++ Foresight ++

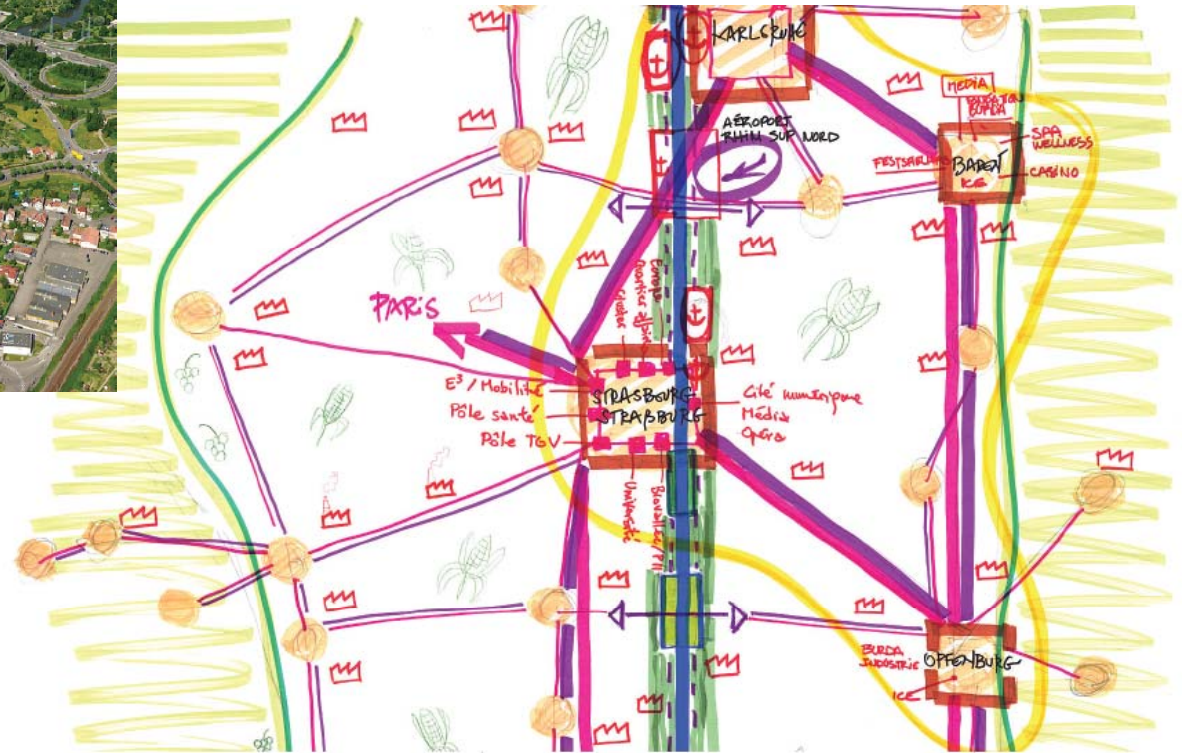


The core concept : analyzing interrelations



source : ADEUS, 2013

Work in progress...



... to be continued



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The BETA evaluation approach

- Evaluation of (part of) the economic impact of public policy supporting R&D
=> ***Focus : learning processes and their economic value***
- Initially developed in late 70s/early 80s for evaluating publicly supported R&D projects => many projects on various public programs, also partly used for EUREKA, by DPCT/GEOPI (Brazil) projects ...
- Recently adapted for evaluating Research Infrastructure at EU level, incl. in the EvaRIO project



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BASIC ASSUMPTION

Any RD activity allows the RD program participant to generate new knowledge and to access existing knowledge. These knowledge are very diverse, in various domains of RD prg part activities : research, management, organisation, relations to other actors ...

BETA approach tends to:

- **identify this knowledge generation/appropriation**
- **identify the ways it is further used and exploited by the RD program participant**
- **propose a minimal estimation of the economic value or benefit this use and exploitation brings back to the RD program participant**

The "Iceberg" Model

(EUREKA 2006 Survey + Case studies - partly based on BETA approach)



Sales of innovative product

Reduced process cost

Licence income

Firm strategy, organisation and method learning

Use of technology in other parts of the business

New contracts/networks & prestige

Employment, competences and training

Spillovers to non participants

Use and social benefits

Scope of relevance of "Original" Beta approach : R&D programs/projects

- ***absolutely required*** : RD content
- ***required in principle*** : "project"
characteristics (incl. breakdown in projects) :
 - goals
 - limited in time
- ***more suited when*** :
 - companies involved
 - collaborative RD

Name of programme or organization in charge	Type of programme	Main features year of study release; sector; number of participants covered (by interviews unless otherwise stated)	Bibliographic source
EUROPEAN SPACE AGENCY			
All activities	Procurement policy through public agency	1980; space; 128	(BETA, 1980) (BACH et al., 1992)
Danish participation		1987; space; 7	(BETA, 1987)
All activities		1988; space; 67	(BETA, 1988) (BACH et al. 1992)
Canadian participation		1989; space; 10	(BETA/HEC Montréal, 1989)
Technology transfers		1989; space; 67	(BETA, 1989)(BACH et al., 1992)
Canadian participation		1994; space; 8	(HEC Montréal/BETA, 1994)
Tech. transfers / Life science		1996; space; 14	(BETA, 1996a)
Tech. transfers / Microgravity experimentations		2000; space; 21	(BETA/NOVESPACE, 2000) (BACH et al., 2002)
SMEs in space activities		2003; space; 196 (postal survey)	unpublished report from Bramshill Consultancy Ltd
CERN	Procurement policy through public agency	1975; suppliers of CERN infrastructure; 127 1985 (1); suppliers of CERN infrastructure; 160	(SCHMIED, 1975) (BIANCHI-STREIT et al., 1985)
EUROPEAN COMMISSION			
BRITE-EURAM	Subsidize for RD activity	1993-1995; all; 310	(BETA, 1993, 1997a, 1996b) (BACH et al., 1995, 2003)
ESPRIT		1997; NTIC; 45	(BETA, 1997b)
AFME - France	Technical centers dedicated to sectors	1990; all; 12	(BETA, 1990)
Private Company - France	Private programme	1992; construction; 1	unpublished report from BETA
ANVAR (on region Alsace) - France	Subsidize for RD activity	1995; all; 22	(BETA, 1995a)
MATERIAL IRELAND - Ireland	Technical centers dedicated to sectors	1995; all; 31	(BETA, 1995b)
ECOPETROL - Colombia (1)	RD projects of public company	1996; software; 18	(GARCIA et al., 1996)
PETROBRAS - Brazil	RD projects of public company	1999; oil industry; 9	(FURTADO et al., 1999)
CBERS - Brazil (1)	Procurement policy through public agency	2001; space; 8	(FURTADO et al., 2001)
National R&D program for Medical and Welfare Apparatus - Japan	Subsidize for RD activity	2003; medical instrumentation; 34 (interviews) + 115 (postal survey)	unpublished report from PREST Univ. Manchester et al.

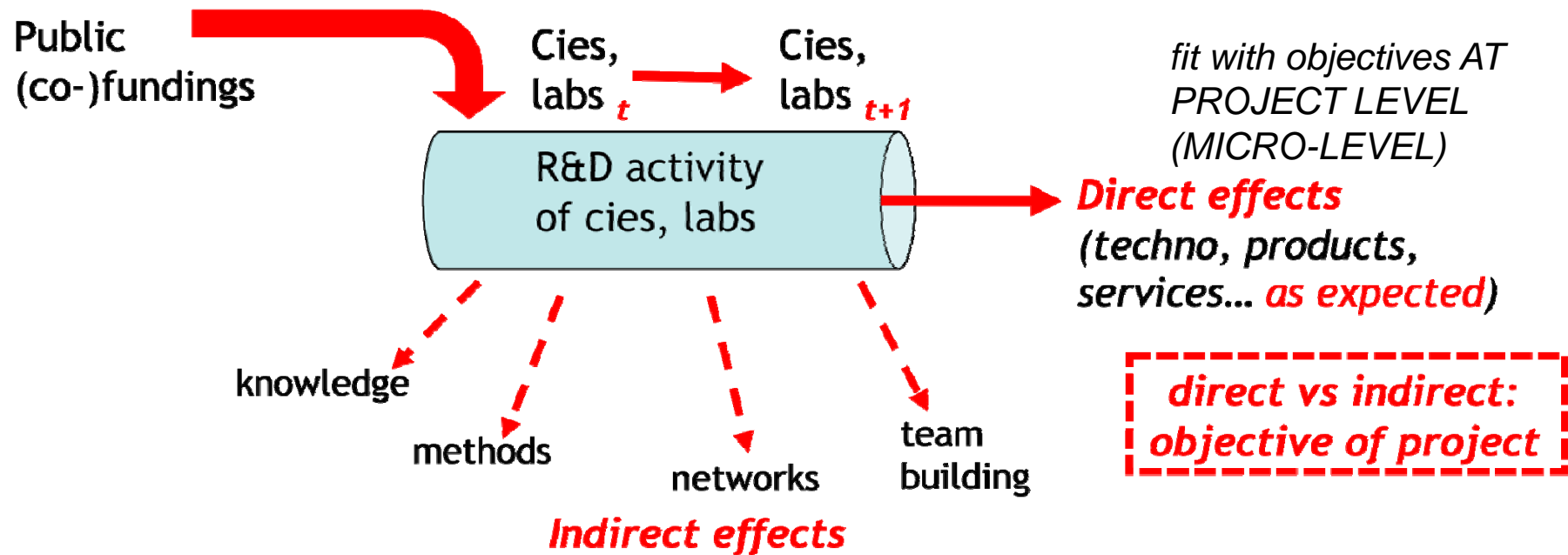
(1) without BETA laboratory participation

"Original" Beta approach :

main features

- **Learning processes at micro-level**, that induce economic benefits :
 - first for the RD prog participants
 - then, progressively, for the rest of the economy (« second circle »)
- Focus on RD prg participants :
 - benefits for them = **ONLY PART OF THE IMPACT** (*not second circle*)
- Sampling (participants / projects)
- Data collection based on direct interviews
- Identification + quantification of each case of effect, based on a typology of effects and a range of quantification methods
- Micro evaluation and sum up of results at sample level

Direct & Indirect effects



beyond objectives - various learning effects affecting other activities than those related to evaluated programmes/projects

Measurement and quantification

General rule for quantification

$$\text{Benefit} = \sum_{t=0}^T X_t \times Q$$

Where :

X : impact on firm's Added Value of sales increase/cost reduction that derive from evaluated program

t : index for time interval

Q : specific influence of evaluated program = « attribution coefficient »

Measurement and quantification

TYPE OF EFFECT		QUANTIFICATION
DIRECT EFFECTS		depending on the programme (often : sales / cost reductions / new contracts)
INDIRECT EFFECTS		
Technological		
	Transfer of product knowledge	sales / new research contracts
	Transfer of process knowledge	cost reduction / new research contracts
	Transfer of service knowledge	sales / new research contracts
	IPR	Application and maintenance cost (proxy value)
Network effect		sales / cost reductions / new research contracts
Reputation effect		sales / cost reductions / new research contracts
O&M		
	Project management	cost reductions
	Other methods	cost reduction
	Organization	cost reduction / sales / new research contracts
Competence & training (work factor)		monetary equivalent of man-hours (proxy value)

Measurement and quantification

- products/services sales, cost reductions, new research projects, revenues from licenses etc
- proxy value" : "value" of critical mass, IPR
- "coefficient of attribution" : almost never 100%
- minimal estimates



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The case of BRITE-EURAM programmes

- evaluation mid 90s; on 85 to mid90s programmes
- new materials, production technologies (now "NMP")
- collaborative RD scheme (the "EC classic") :
 - at least 3 partners from different countries
 - at least one univ or PRO lab
 - 3-4 years
 - 50% companies RD cost/up to 100% univ/PRO lab RD cost
 - 0.5 – 10 millions euros
- sample: 50 projects, 176 participants : 75 large firms, 38 SMEs, 30 univ, 33 PR (+ second wave : more than 300 participants interviewed in 2.5 years); \pm 39 millions "euros"



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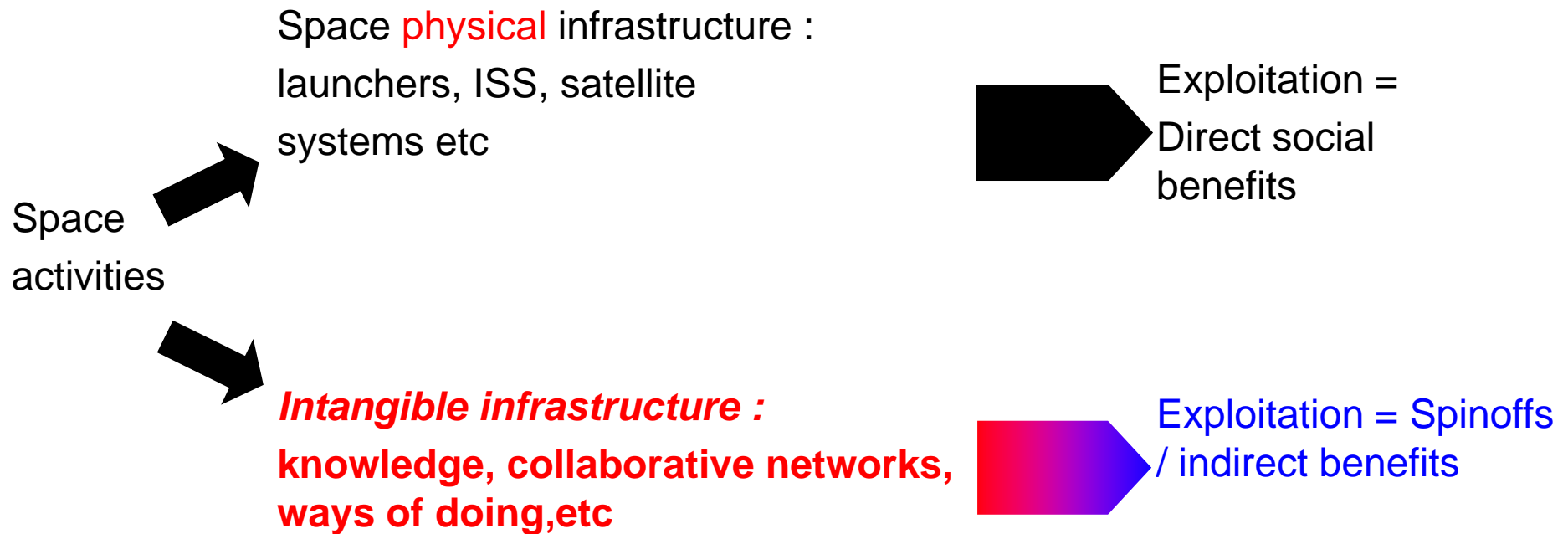
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The case of BRITE-EURAM programmes

- 611 measured effects
- ratio Direct effects / EC funds : 13.3 (highly skewed profile – "nuggets")
- ratio Indirect effects / EC funds : 2.9 (excl. Work factor)
- on all indirect effects (incl work factor) :
 - - Techno : 47%
 - - Cial : 5%
 - - Netw : 5%
 - - O&M : 12%
 - - WF : 31%
- direct AND indirect effect : yes for large firms, no for SMEs, equal for others
- failures : still indirect effects (even if less)

The case of European Space Agency space programmes



The case of European Space Agency space programmes

- space maturity and independant trajectory
- loss of "leading " role in collabo, O&M
- learning and effects depends on role in networks
- management affects the importance of effects

	ESA 1980	ESA 1988	Canada 1989
Period covered	64-82	77-91	79-93
Number of firms in the panel	128	67	10
Total indirect effects	7 551 (MAU 86)	12 680 (MAU 86)	256 (MAU 89)
● among ESA contractors	6 023 (MAU 86)	9 214 (MAU 86)	189 (MAU 89)
Ratio effects / contracts	≥ 2.9	≥ 3.2	≥ 3.5
Indirect effects outside space sector	50 %	21.1 %	24.4 %
Indirect effects on exports	28.2 % (out of ESA Member States)	12.8 %	66.4 %
Nature of the effects (% of contractors' effects)			
Technological	25	32	40
Commercial	27	8	18
Org. & Methods	19	6	18
Work factor	29	54	24

Recent developments on RI

EvaRIO project (*)

Towards a method of **Evaluation** of **Research Infrastructures** in **Open** innovation and research systems

developing a new approach for
evaluating the impacts of RIs, on the
basis of the BETA approach

() following and partly based on BBMRI Project*



About EvaRIO context

Research infrastructures in Europe

RIs as facilities, resources or services of a unique nature
that are needed by the S&T communities
to conduct basic or applied R&D
+ the associated human resources

(EC 2010, ESFRI Roadmaps, ESF 2007 definitions)

- Big Science and more generally open access to different types of resources: → **instruments, collections, data, competences**
- ESFRI (*European Strategy Forum on Research Infrastructures*) since 2002 → Roadmap for best development and use of RIs of Pan-European relevance



About EvaRIO project

EvaRIO: Coordination and Support Action (Contract n° 262281)
Under FP7 Infrastructure programme (RI INFRA-2010-3.2)
Duration 34 months

Objective: to develop an evaluation framework, methods and tools well suited to RIs in today's changing environment of open innovation and research

→ to be tested on some RIs of the BMS field

One participant : BETA (University of Strasbourg / CNRS)

200 people including a team specialised in knowledge economics with an established competence in R&D evaluation

→ cf the so called "BETA method"



Case study selection

CASE STUDY	ESFRI link	BMS subfield	Type of RI resources	Organisat ^o status	Stage of evolution	Feature(s) of interest
4 in-depth case studies						
SOLEIL Saclay, FR	BIOSTRUCTX	Structural biology	instrument (X-Ray crystallography)	standalone RI	recent operation	<i>synchrotron beamlines</i>
CERM Florence, IT	INSTRUCT + BIO-NMR	Structural biology	instrument (NMR)	standalone RI	long standing operation	<i>typical instruct core center</i>
EMMA HMBU-IEG Munich, Ger IMG Prague, CZ; Karol. Inst. Stockholm, SWE...	INFRAFRONTIER	Translational research	collection (archive of mutant mice)	network	medium standing operation	<i>collection, network, geographic. variety</i>
EMBL-EBI Hinxton, UK	ELIXIR	Bioinformatics	data&software	standalone RI	long standing operation	<i>RI for data in BMS</i>
5 additional small cases studies						
EORTC Brussels, BELG	ECRIN	Clinical trials	human resources	network	long standing operation	<i>network of human resources</i>
IGBMC CBI Illkirch, FR	INSTRUCT	Structural biology	instrument + data (multi-platform: EM, NMR, sample prod ^o , image processing)	RI hosted in lab	long standing lab but recent RI operation	<i>multi-platforms RI and part of a lab</i>
CNB-CSIC I2PC Madrid, SP	INSTRUCT	Structural biology	data&software (image processing)	RI hosted in lab	long standing lab but new RI operation	<i>new RI and Instruct associated center</i>
OPPF Oxford, UK	INSTRUCT	Structural biology	instrument (sample prod ^o)	standalone RI	long standing operation	<i>core Instruct center and sample prod^o</i>
MPIB-DMSB Martinsried, GER	INSTRUCT	Structural biology	instrument (EM)	RI hosted in lab	long standing lab but new RI	<i>new RI part of a lab</i>

EvaRIO : filling a gap between existing approaches

Evaluation of RI
performance

EvaRIO – BETA learning impacts "around" RI

- Focus on individual actors
- Architecture of effects reflecting learning processes and related value creation
- Framework, typologies, metrics , adapted to the variety of RI and scientific domains
- Retrospective view based on various sources of information incl. interviews

Standard
economic
impact

Economic
impacts on
society



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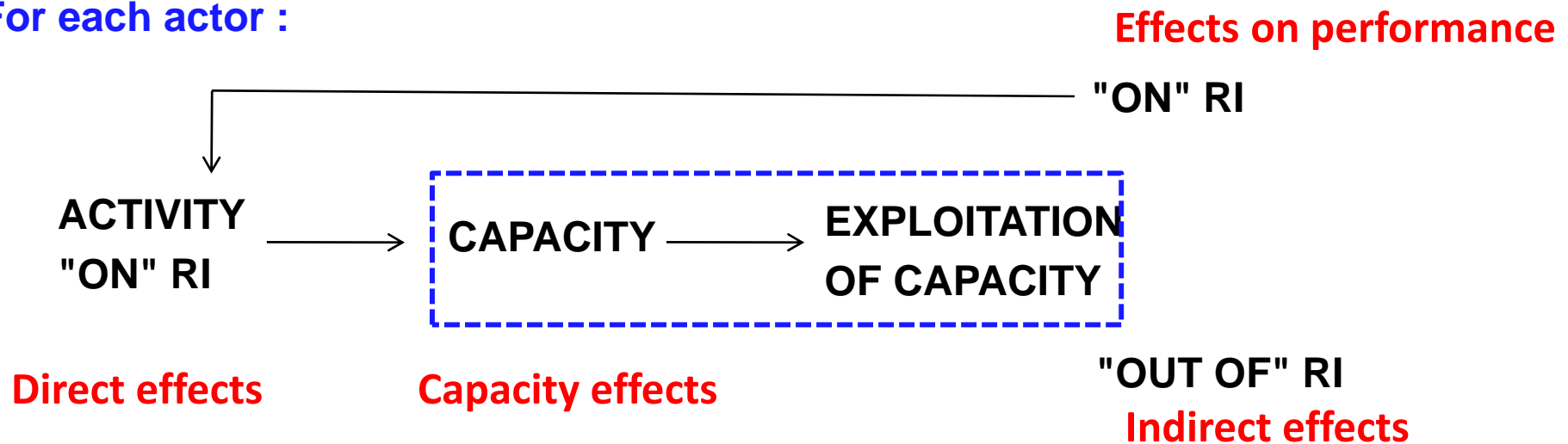
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EvaRIO : focus on actors and learning processes

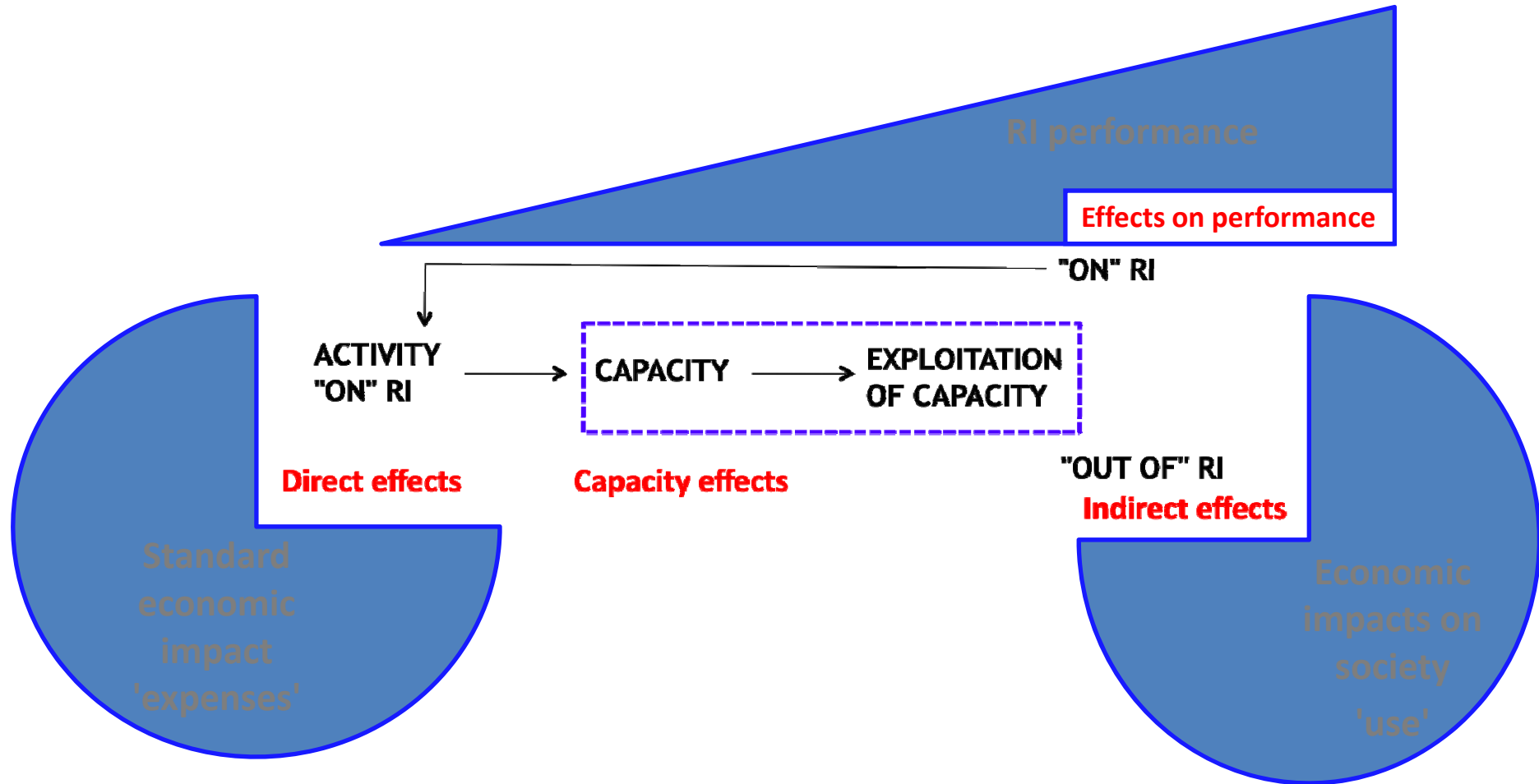
- Focus on individual actors : 3 types of roles
Operators of RI - Suppliers of RI - Users of RI
- Architecture of effects reflecting learning process

For each actor :



CAPACITY : *assets + capacity to mobilize them and make them evolve*

EvaRIO : filling a gap between existing approaches

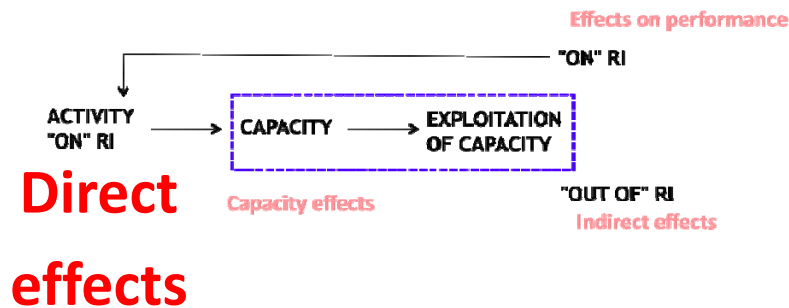


EvaRIO : Typology of effects

	RI OPERATOR(S)	RI SUPPLIERS	RI USERS
Direct effects	volume of activities corresponding to the building and operating of RI	volume of activities corresponding to the supplying of resources open as RI	<ul style="list-style-type: none"> • volume of activities corresponding to the research projects using RI • <i>direct advantage from using the RI</i>
Capacity effects (capacity : assets + capacity to mobilize and make them evolve)	change in the capacity due to the operating of the RI, in the field of S&T, Network, Organisation & Methods, Reputation, Human Capital	change in the capacity due to the supplying of resources to the RI, in the field of S&T, Network, Organisation & Methods, Reputation, Human Capital	change in the capacity due to the use of the RI, in the field of S&T, Network, Organisation & Methods, Reputation, Human Capital
Effects on performance of RI-related activities	exploitation of the capacity for enhancing the performance as operator of the RI	exploitation of the capacity for enhancing the performance as supplier of the RI	exploitation of the capacity for enhancing the performance as user of the RI
Indirect effects	exploitation of the capacity for generating economic benefit for the actor "out of RI" : <ul style="list-style-type: none"> • same research field of actor but not on RI • in other field of research of actor • downstream market/society applications 	exploitation of the capacity for generating economic benefit for the actor "out of RI" : <ul style="list-style-type: none"> • same research field of the actor but not on RI • in other field of activity of the actor • downstream market/society applications 	exploitation of the capacity for generating economic benefit for the actor "out of RI" : <ul style="list-style-type: none"> • same research field of the actor but not on RI • in other field of research of the actor • downstream market/society applications



Evaluation of effects : metrics and examples



- **O** : RI budget : building-operating costs (€)
 - **S** : Contracts awarded (€)
 - **U** : Projects including the RI use (€)
- Comparative advantages of using the RI

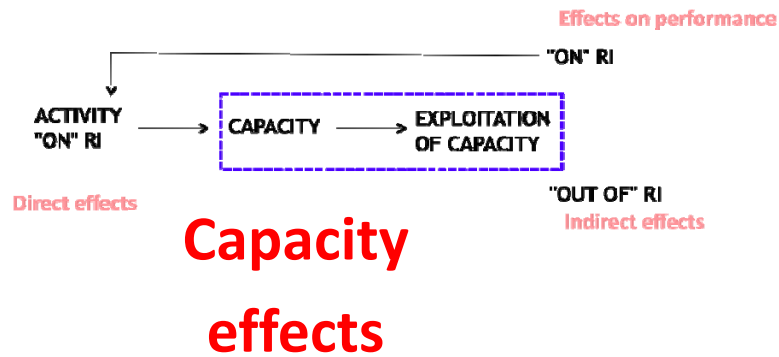
Ex SOLEIL

- 2002-2012: total budget of 609 M€ divided into:
 - Salaries: 249 M€ - Running costs: 91 M€ - Investments: 269 M€
- 2012: annual budget of 63M€ divided into:
 - Salaries: 32 M€ - Running costs: 18 M€ - Investment: 13 M€ + pay-for-access use: 130K€

Ex I2PC

- **BCU budget:** 500 000 €/y
- “Instruct represents 70% of total yearly budget of BCU” (350 000 € national)
- **Follow-up projects on RI**
- Spanish Instruct-I2PC infrastructure support by the Ministry of Economy and Competitiveness
- 2010: € 200 000 (ACI-A-2010-1088)
 - 2011: € 780 000 (AIC-A-2011-0638)
 - 2012: € 410 000 (AIC-A-2011-0638)
 - 2013: € 364 000 (AIC-A-2011-0638)

Evaluation of effects : metrics and examples



- **Qualitative insights from interviews**
- A whole range of ad hoc indicators based on "external" data + "objective" info from interviews

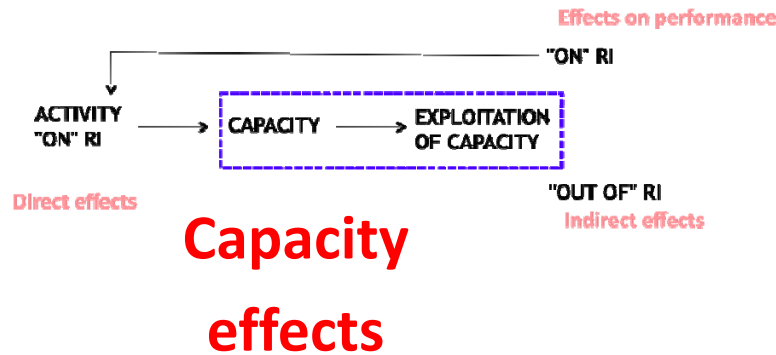
- Tracking of the main evidences of capacity increase/building
- Structuring them in different categories :
 - *Science & technology*
 - *Networking/relational*
 - *Reputation/commercial*
 - *Organization & Methods*
 - *Human capital*

Evaluation of effects : metrics and examples

Ex CERM suppliers

TYPE OF EFFECT		DESCRIPTION OF EFFECTS
Capacity <i>Increase in capacity resulting from RI activity non monetary</i>	S&T <i>Improvement/enlargement of the scope of scientific & technological resources and competences</i>	<p>Supplier 1</p> <ul style="list-style-type: none"> • Biobank system design and implementation • Enhanced knowledge on product and system integration related to new liquid nitrogen vessels (safer small neck model bought to external suppliers, high efficiency using vapour and not only liquid reducing liquid nitrogen consumption) as well as to monitoring control system (in-house design) <p>Supplier 2</p> <ul style="list-style-type: none"> • Helium recycling and liquefaction system design and implementation (coupling collection, liquefaction and redistribution of products), especially as regards piping system material and design specifications (constraints related to buildings, labs and sensible equipment etc) and modularity (possibility to add new pieces of equipment - compressors, liquefier -, new pipelines and to connect new instruments) • Enhancement of system performance by the use of Nitrogen (Nitrogen gas also collected from the labs instruments connected on the site). <p>Supplier 3</p> <ul style="list-style-type: none"> • Development and enhancement of probes technologies (catalyzing innovation research and development), especially cryoprobes to address the issue of low sensitivity, MAS probes for solid state samples, advanced automation hardware/procedures/protocols, methodological development... • Direct day-to-day access to fine and detailed feedback, scientific info on biomarket • Connections / hyphenation with other techniques at CERM, at CERMpartners (chromatography, chemical techniques, neutron and X-ray diffraction, electron microscopy...)
	Network <i>Improved ability to form, join and exploit R&D partnerships and networks</i>	<p>supplier 1</p> <ul style="list-style-type: none"> • Extension of potential markets thanks to the direct contact of users of CERM facilities (bc they PhD, post-doc or "RI clients") with suppliers hard/soft • Better knowledge about who-is-who and who-knows-what in the NMR and structural biology areas • Relational capital signalled by daily interactions with CERM
	Reputation <i>Improved visibility and acknowledgment by third parties</i>	<p>supplier 1</p> <ul style="list-style-type: none"> • General gain in reputation helping to attract and convince new potential clients of bio-repository systems. <p>supplier 2</p> <ul style="list-style-type: none"> • General gain in reputation helping to attract and convince new potential clients of helium recycling systems and/or of related services; especially important in a context of increasing price of helium and shortage of (public) funds of helium consumers <p>supplier 3</p> <ul style="list-style-type: none"> • General gain in reputation helping to attract and convince new potential clients of NMR systems (CERM reference as a world-leader)

Evaluation of effects : metrics and examples

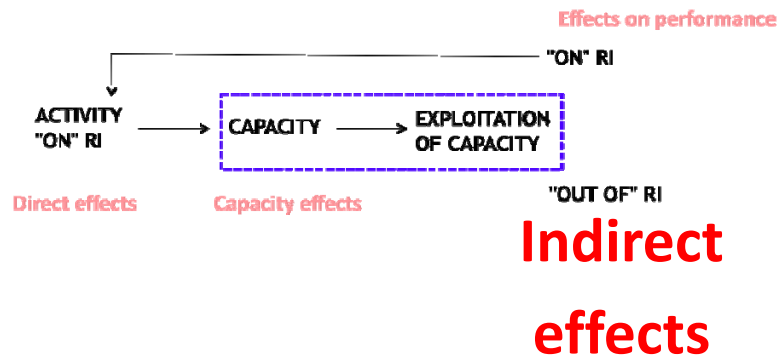


- Qualitative insights from interviews
- A whole range of ad hoc indicators based on "external" data + "objective" info from interviews

- Publications (source WoS)
 - number of publications
 - "quality" of publication : impact factor of publications
 - diversity of scientific fields covered by the publications
- Patents inventor – applicant (source: ESPACENET/EPO)
 - number of patents
 - diversity of scientific fields covered by the patents
- Biological reference materials (source: EMBL-EBI)
- PhD thesis (source: self-declarative) u

Science & technology

Evaluation of effects : metrics and examples



- Beta standard metrics (sales, fundings, cost reductions...)
- *in €*

- Coefficient of fatherhood (influence of RI related activity on creation of revenue)
- Minimal estimate

sales of products
sales of process
sales of services, including training
cost reductions : in terms of resources (materials, instrumentation, ...) and/or time (access to collection, partners seeking, ...)
research fundings (contracts, grants etc)
revenues from awards, prizes, donation etc
revenues from licensing, royalties
revenues from spin-off

Evaluation of effects : metrics and examples

Ex SOLEIL
suppliers

TYPE OF EFFECT		DESCRIPTION OF EFFECTS	Number of effects	Number of users concerned (out of 2)	Number of effects quantified	Amount in K€
<p>Direct</p> <p>Increase in capacity resulting from R&D activity</p> <p>non arbitrary</p> <p>Potential (not necessarily plotted)</p>	S&T	<i>TOTAL valorization of the gains in capacity identified above</i>	5	1	1	504 k€
		<p><i>Evidence of effects as reported during the interviews</i></p> <p>Supplier 2</p> <p><u>Effect 1</u> Project with Soleil for supplying services/consultancy to India, ie Soleil expertise as support for exports (not realized yet)</p> <p><u>Effect 2</u> Development made for Soleil, although being always specific (as it is for any client of such system) is partly re-used to develop other systems</p> <p><u>Effect 3</u> Possibility of sales of gratings co-developed and patented with Soleil (not realized yet)</p> <p><u>Effect 4</u> Re-use of knowledge in disassembling-reassembling a beamline (from LURE-SOLEIL to Daresbury-Anka)</p> <p><u>Effect 5</u> (perimeter LURE ie before providing equipment to SOLEIL) Thanks to knowledge developed for LURE, birth of a new activity, chamber: about 8 sales to synchrotrons in Germany, Switzerland, UK, Canada,...</p>				
	Network	<i>TOTAL valorization of the gains in capacity identified above</i>	3	2	1	90 k€
		<p>Supplier 1</p> <p><u>Effect 1</u> Sales of 3 HPLC systems to clients who went to Soleil and then contacted the supplier</p> <p><u>Effect 2</u> Consumable and maintenance contracts for these systems</p> <p>Supplier 2</p> <p><u>Effect 1</u> New clients who were at Soleil (India)</p>				
	Reputat°	<i>TOTAL valorization of the gains in capacity identified above</i>	3	2	2	92,6
	<p>Supplier 1</p> <p>NB: mixed with Network Effects 1 above - not counted here</p> <p>Supplier 2</p> <p><u>Effect 1</u> Partly thanks to experience and reputation acquired with sales to LURE/SOLEIL, 2 sales of systems (chambers) to synchrotrons in India</p> <p><u>Effect 2</u> Partly thanks to experience and reputation acquired with sales to LURE/SOLEIL, supply of gratings to other synchrotrons</p>					
O&M	<i>No Evidence of effects reported during the interviews</i>					

Strengths

- mix qualitative and quantitative approach
- theoretical framework
 - ... could be improved (knowledge-base analysis, techno trajectories/irreversibilities, open innovation...)
- extremely detailed analysis at micro-level → fine understanding of learning processes

Limitations

- time consuming (interviews)
- data requirements
- self-evaluation
- additionality - attribution
- ambiguity between private and public point of view (V.A., benefits...)

(focus on RD prg part, not "second circle")



감사합니다 - Thank you for your attention - Merci



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