

# **Networks of Innovation in Information Society: Development and Deployment in Europe**

*Franco Malerba*

*Nicholas Vonortas*

*Caroline Wagner*

*Lorenzo Cassi*

*Nicoletta Corrocher*

**American Evaluation Association Annual Meetings**

**8 November 2007**

**Baltimore**

## *Evaluation Objectives*

The *core objectives* of the evaluation study are:

- To assess the **effectiveness of network collaboration and knowledge transfers between RTD, innovation and deployment** activities related to IST;
- To suggest **ways of strengthening the links between IST-RTD, innovation and deployment** at the EU and regional levels

## *Evaluation Questions (1)*

1. Do IST-RTD networks play an important role in creating new, innovative ICT products/processes and how?
2. What are the network characteristics of the organizations that are effective innovators?
3. Do IST-RTD networks influence ICT deployment? Do they speed up the diffusion process? Do they affect the geographical distribution of deployment? Do they have a structuring effect on ICT take-up in specific geographical areas?
4. Do IST deployment networks (eTen, eContent) play an important role in deploying new, innovative ICT products/processes and how?
5. How do IST-RTD and IST deployment networks complement each other? Where are the strong and the weak links? Is there a significant overlap between the two kinds of networks? Are there common nodes, common hubs?

## *Evaluation Questions (2)*

6. Are there opportunities for greater linkages between IST-RTD and IST deployment networks and how could they increase the impact of current and future innovation and deployment activities?
7. What are the best institutional contexts to promote ICT take-up through innovation networks?
8. Do national/regional IST networks supported by EU structural funds play an important role in introducing and in deploying new, innovative ICT products/processes and how?
9. How do the above networks (supported by structural funds) compare with networks supported only with national/regional funds in terms of both innovation and deployment?

*...these questions cannot be answered through network analysis alone, they can be answered by understanding the value of the network to the participants*

# *Analytical Steps*

The methodology involved the following steps:

- Select a **thematic area** of IST research and deployment: “Applied IST research addressing major societal and economic challenges”;
- Investigate **innovation and deployment activities** at the EU level in the selected thematic area and define **network topology** at the European level through network and data analysis;
- Select **regions** and undertake quantitative and qualitative analysis of **deployment** in selected regions;
- Conduct **interviews** with key organizations;
- Analyse **patterns** and relationships of networks;
- Derive **lessons learned** and policy recommendations.

# *Data Analysis for Selected Regions*

**Quantitative analysis:** data on the characteristics of research and deployment projects (EU, national, regional). Main analytical objectives:

1. Analyze IST **networks in terms of position and role of regional organizations**
2. Analyze RTD **networks and innovation**
3. Analyze RTD **networks and deployment**

**Qualitative analysis:** interviews with actors in deployment networks at the regional level. Main analytical objectives:

1. Complement available empirical information on the **characteristics** of research and deployment networks at the regional level
2. Seek detailed information on specific cases of regional deployment, especially on the linkage of IST-RTD networks and deployment networks
3. Identify the **additionality** of EU research and deployment networks at the regional level
4. Highlight **obstacles and costs** of EU research and deployment networks at the regional level
5. Derive **policy** recommendations

## *Data and Networks Construction*

	<b>IST RESEARCH Project</b>	<b>IST DEPLOYMENT Project</b>
Description	European network formed by organizations participating in <i>FP6 IST</i> projects	European network formed by organizations participating in <i>eTen</i> and <i>eContent</i> projects
Data source	Internal EC Database (not publicly available)	Internal EC Database (not publicly available)
Participants	4198	2008
Projects	249	287
Participants per project	17	7
Organisations	2417	1634
Projects per organisation	1.7	1.2

## *Question 2: What are the Network Characteristics?*

### *Network Structure*

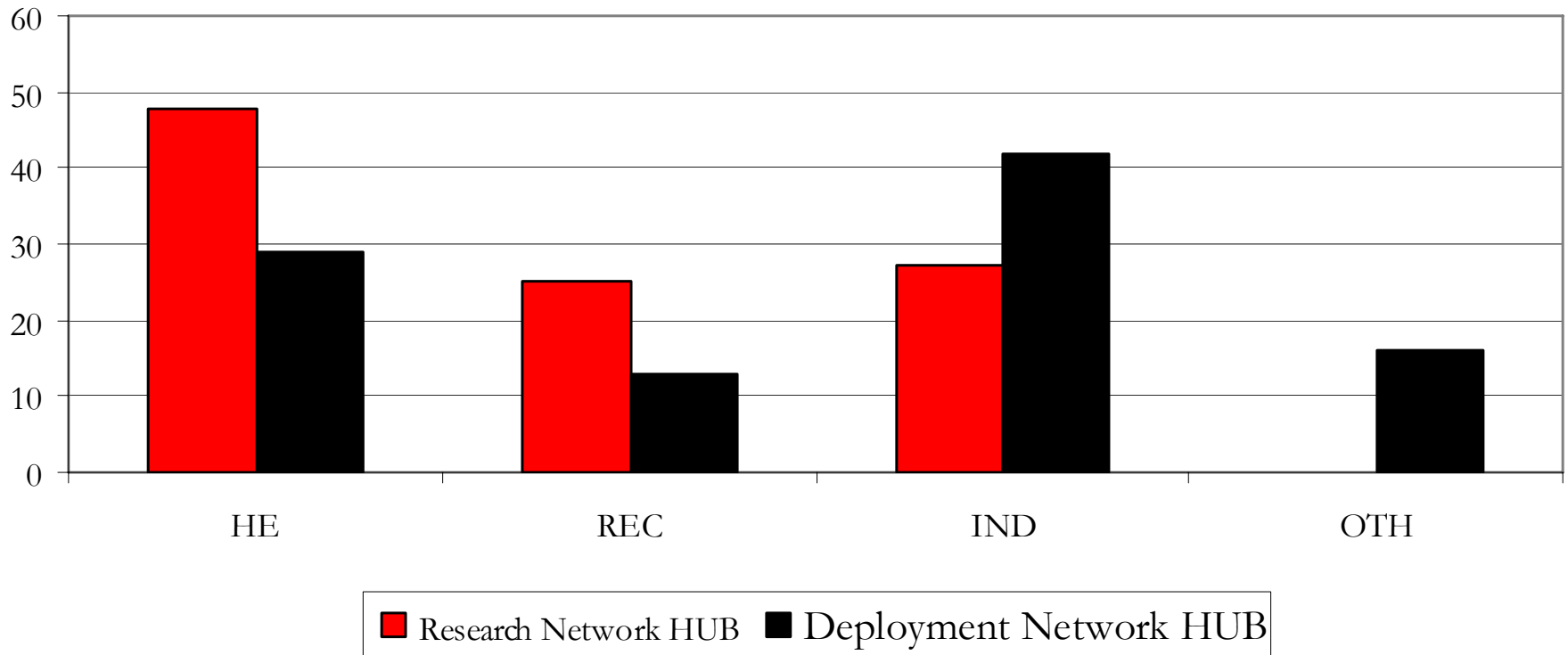
	<b>IST RESEARCH Network</b>	<b>IST DEPLOYMENT Network</b>
number of nodes (organisations)	2417	1634
number of edges (links)	61686	7422
network density	0.020	0.006
size largest component	2373 (98.18%)	1153 (70.56%)
average degree	51.04	9.08
average distance	2.5	5.08
max distance	5	11
clustering coefficient	0.0377	0.1292

Both networks are highly connected and display *Small World* properties: low average distance and high clustering coefficient as compared to a random network.



## *Question 2: What are the Network Characteristics?*

### *Network hubs*

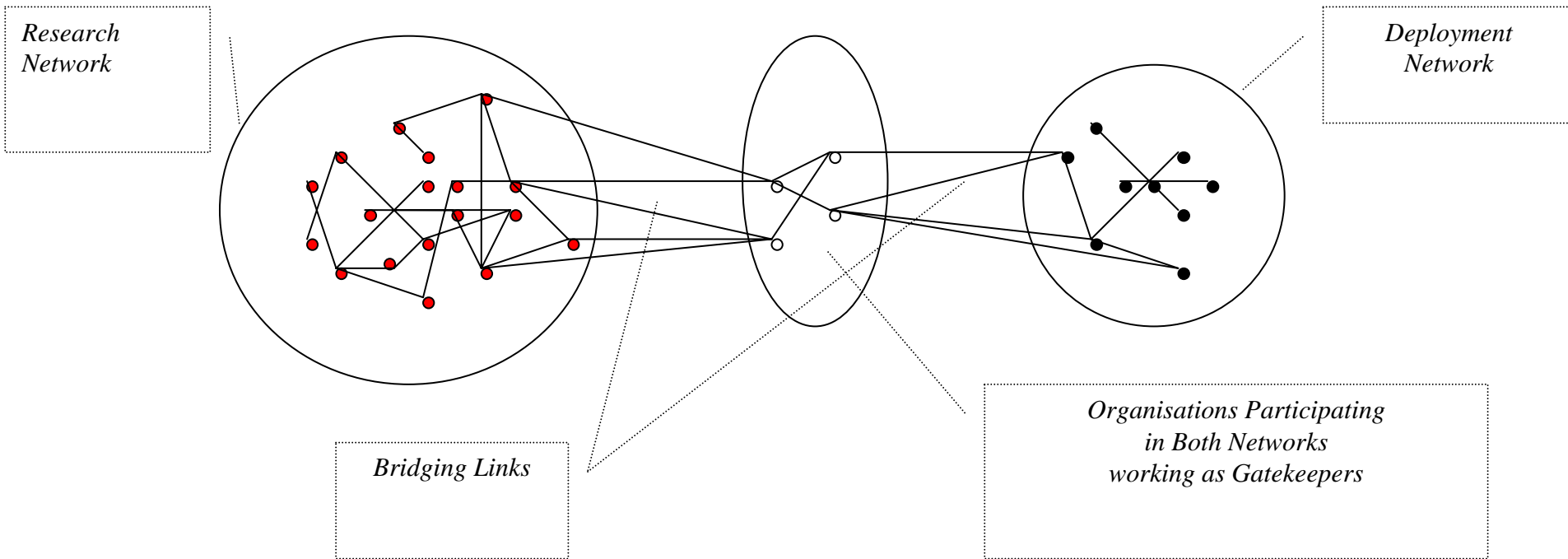


As compared to the Research network, in the Deployment network:

- Other organizations (e.g. City Council) play a role
- Private companies have a more important role

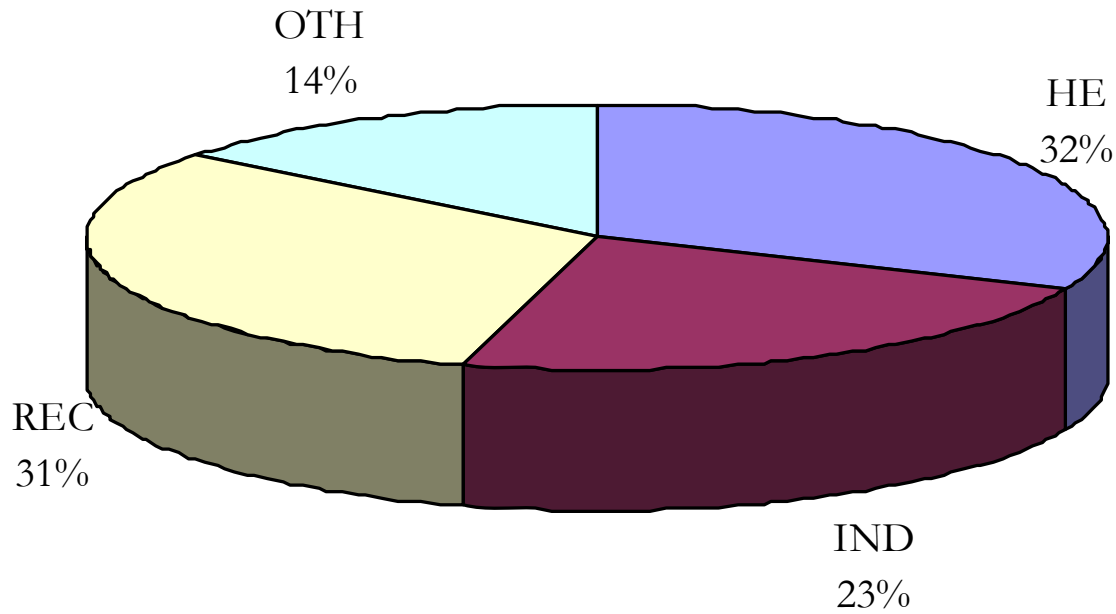
# *Question 2: What are the Network Characteristics?*

## *Gatekeepers: Bridging Research and Deployment Networks*



- There are 277 *gatekeeper* organizations
- 1/3 of the links in each of the two networks are *bridging links*

*Question 2: What are the Network Characteristics?  
Gatekeepers by organisational type*



**SMEs** seem to play a relevant role: 45 gatekeepers are SMEs (16.7% of the total).

*Question 2: What are the network characteristics?  
Regional Networks*

REGION	Location	STE Strength	IST network Organizations	RESEARCH		DEPLOYMENT	
				Organizations	Density	Organizations	Density
UK - East Wales	C	HIGH	2	1	-	1	-
FR - Rhône-Alpes	C	HIGH	20	12	0,15	9	0,11
DE - Bremen	C	HIGH	16	10	0,53	9	0,27
DK- N. Jutland	N	HIGH	3	3	0,66	0	-
FI - Lansu Suomi	N	HIGH	11	10	0,53	1	-
PT- Norte	S	VERY LOW	22	13	0,35	9	0,11
GR - Attiki	S	LOW	116	56	0,14	84	0,04
IT -Emilia Romagna	S	LOW	54	25	0,14	38	0,11

**Question 2: What are the network characteristics?  
Regional Networks (2)**

REGION	Location	RESEARCH			DEPLOYMENT		
		Organizations	HUBS	Connection to external HUBS	Organisations	HUBS	Connection to external HUBS
UK - East Wales	C	1	0	-	1	0	-
FR - Rhône-Alpes	C	12	2	0,110	9	0	0
DE - Bremen	C	10	0	0,060	9	0	0,021
DK- N. Jutland	N	3	0	0,090	0	-	-
FI - Lansu Suomi	N	10	0	0,075	1	0	-
PT- Norte	S	13	0	0,089	9	0	0,003
GR - Attiki	S	56	2	0,110	84	2	0,017
IT -Emilia Romagna	S	25	0	0,060	38	4	0,026

***Question 2: What are the Network Characteristics?  
Regional Network (3)***

<b>REGION</b>	<b>Location</b>	<b>STE Strength</b>	<b>OVERLAP between RESEARCH and DEPLOYMENT network</b>		<b>OVERLAP between IST and STRUCTURAL FUNDS</b>	
			<b>Organizations</b>	<b>Links</b>	<b>Research</b>	<b>Deployment</b>
<b>UK</b> - East Wales	C	HIGH	0	-	-	-
<b>FR</b> - Rhône-Alpes	C	HIGH	1	0	1	2
<b>DE</b> - Bremen	C	HIGH	3	0	1	2
<b>DK</b> - N. Jutland	N	HIGH	0	-	0	-
<b>FI</b> - Lansu Suomi	N	HIGH	0	-	3	0
<b>PT</b> - Norte	S	VERY LOW	0	-	6	3
<b>GR</b> - Attiki	S	LOW	24	8	17	16
<b>IT</b> -Emilia Romagna	S	LOW	7	0	5	8

*Question 2: What are the network characteristics?  
Regional Networks (4)*

Each region has a higher density than the density of the overall network: being co-localized makes the probability to be connected higher.

Attiki and Emilia-Romagna, the regions with a *low* (but not very low!) capacity in science, technology and economy have the highest number of organizations participating in IST Research and Deployment networks.

A large number of organizations does not translate into a higher number of connections to external Hubs: it is the presence of Hubs in a region which increases the connectivity of the region to other external Hubs.

## *Lessons Learned*

- IST RTD networks have an integrating effect across sectors
- Networks create opportunity for knowledge sharing about new product, processes, and markets
- The research networks are denser and more interconnected than the deployment networks
- Key institutions-*Gatekeepers*-integrate these two networks
- Knowledge flows bilaterally within the network, but the information shared by different nodes reflects their institutional role
- The EU requirement for geographic integration bring smaller institutions together with large multinationals in ways that would not happen otherwise



## *Policy Recommendations*

- Continue efforts to strengthen ERA. Research networks could involve more organizations that are critical local players in deployment. The latter are often different than the research intensive organizations.
- Supplement the concept of ERA with a concept that extends to deployment, and to the linkages between research and deployment, following the higher emphasis on innovation and demand side effects in Europe today.
- Develop a local/regional deployment strategy as part of IST-RTD projects, when program objectives include dissemination and application, since the deployment efforts, capabilities and skills are to a significant extent different than those relating to research.

## *Policy Recommendations (2)*

- Understand better the organizations that link knowledge “hubs” with local economies. FP knowledge “hubs” are often international universities and research institutes, traditionally weak in local economies of Europe. Programs will depend on other, often smaller players from the local private sector to deploy. The linkages between the two types of players are of critical importance.
- Create an on-line information center/directory of regional deployment assistance to help improve access to information.
- Streamline the application process to regional/national/European activities for small business and research institutes.
- Create virtual technology transfer centers that focus on creating feedback loops at the local level.