Harald Katzmair

Networks, Complexity and Innovation

6 Rules for Managing Innovation in the Networked Economy Area

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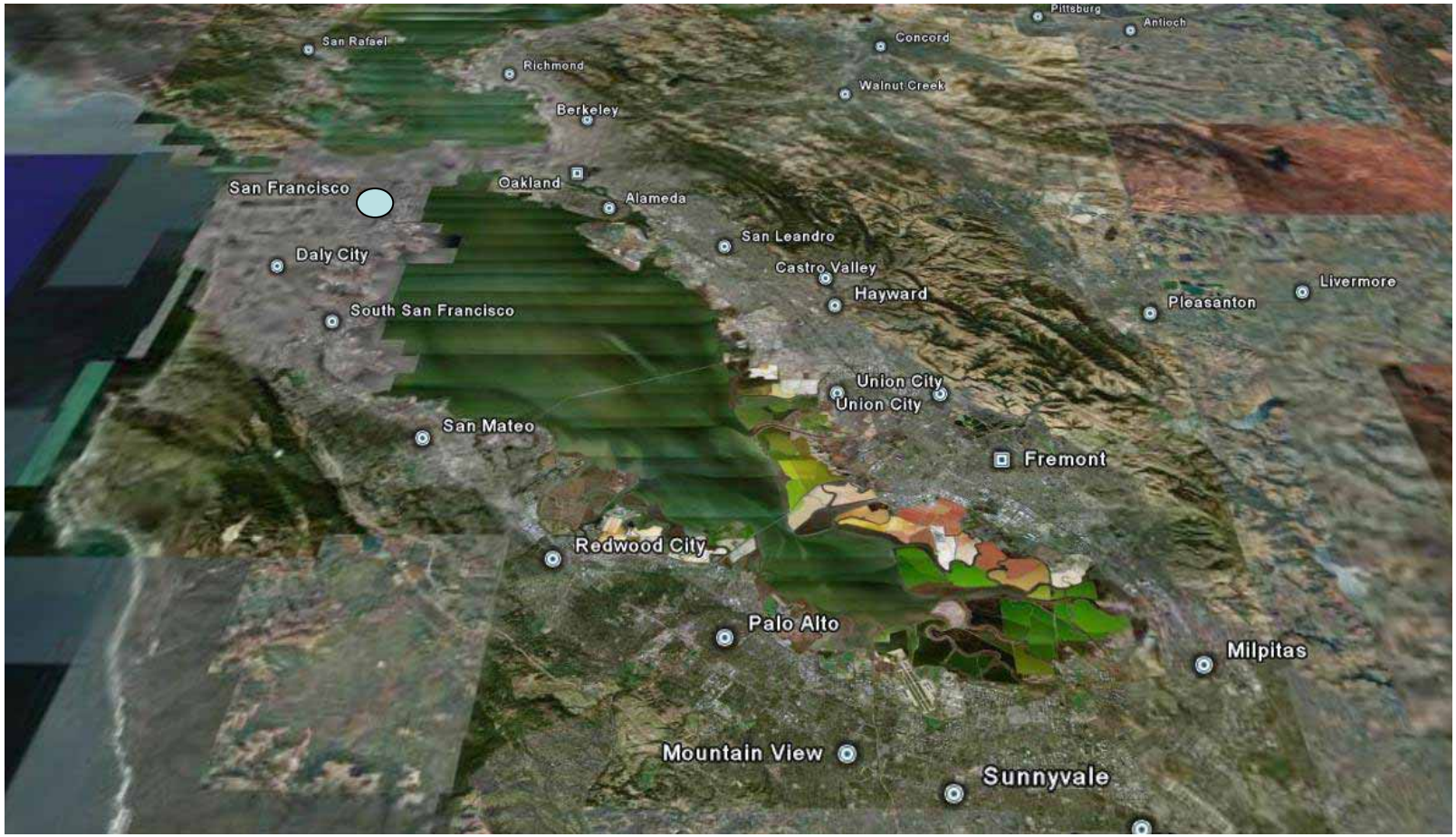
Network Analysis for Science and Business

Cities and towns…



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… are linked through railways

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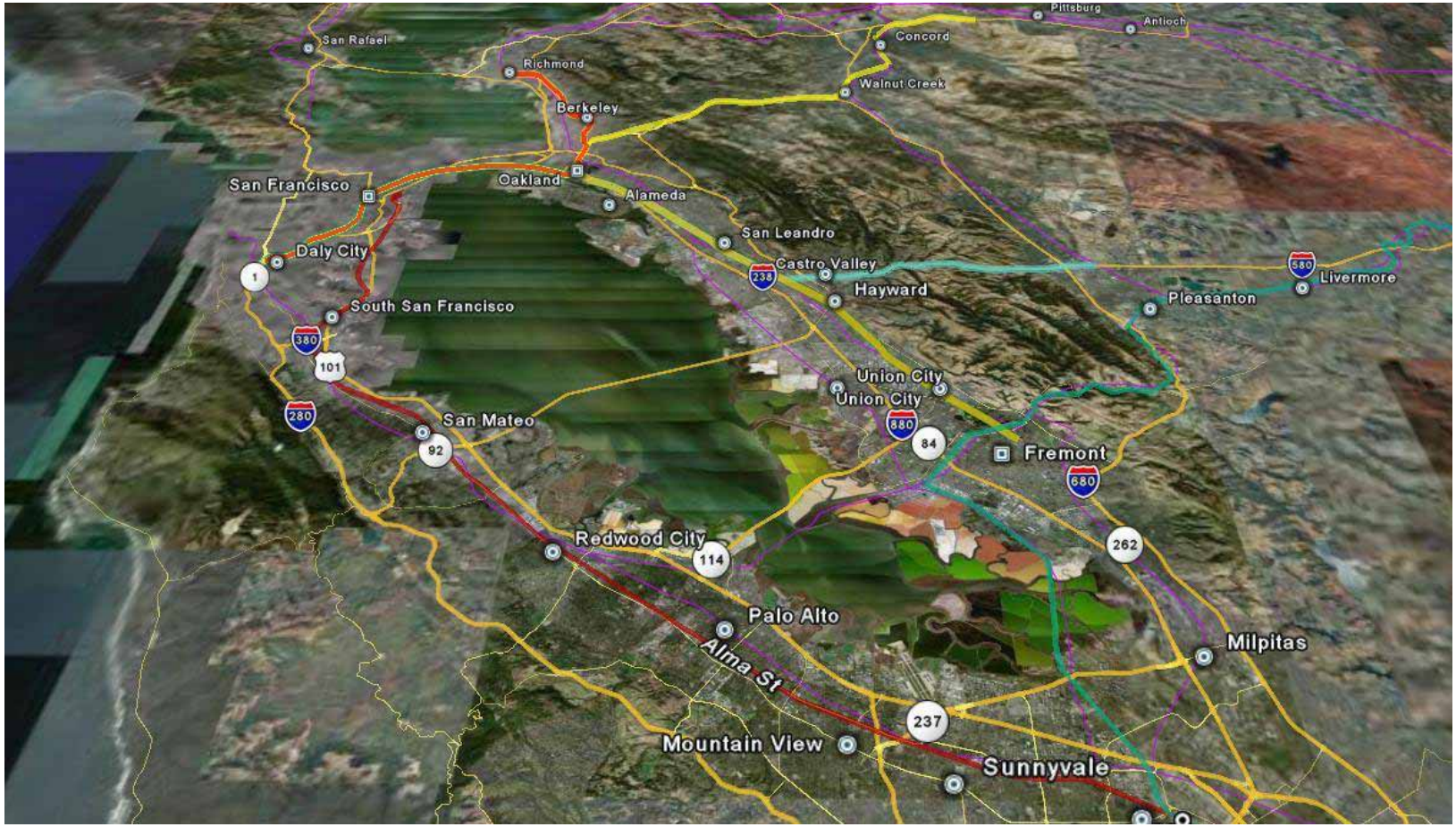
…bridges and roads



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Economic infrastructure

- Bridges, roads, railroads, pipelines etc. are the material infrastructure of an economy for creating value

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People, firms, organizations …

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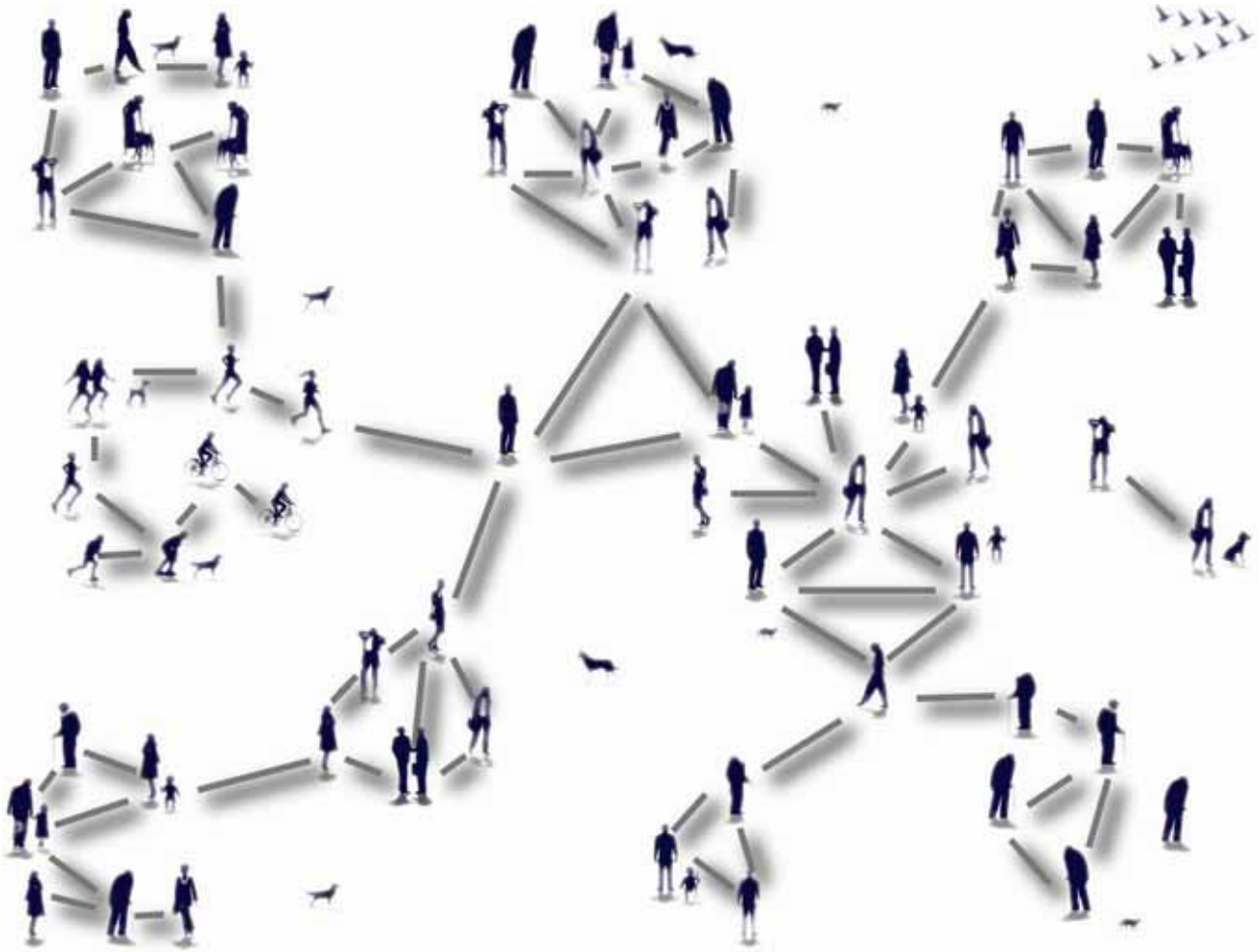
…are linked through relationships



- Working relations
- Common projects
- Friendship
- Kinship
- Common interests
- etc.

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Social infrastructure

- Networks between people, communities, and organizations are the intangible infrastructure for learning, adapting, creating value and being economically successful.

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Excellent networks…

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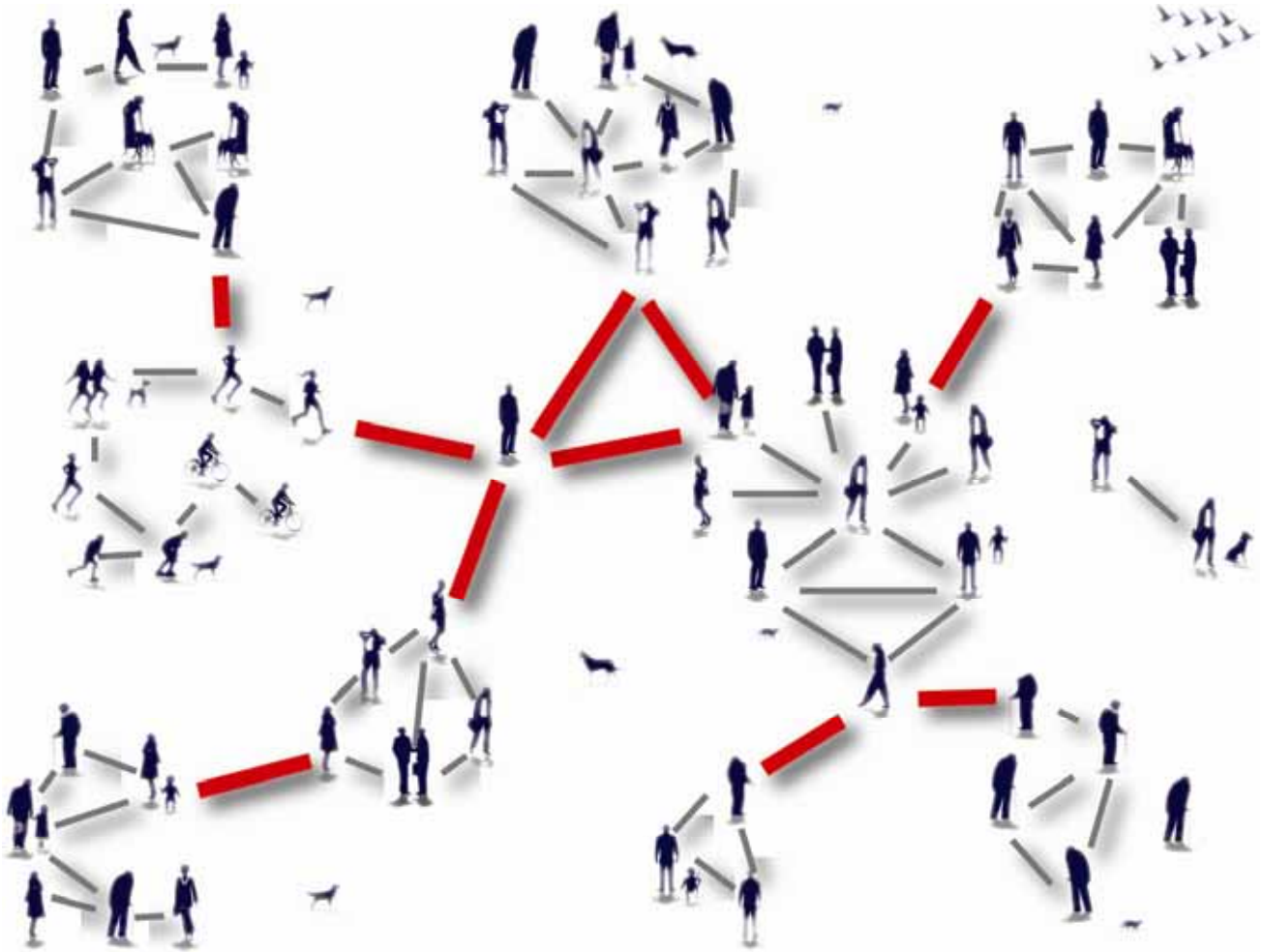
Excellent networks bridge clusters…



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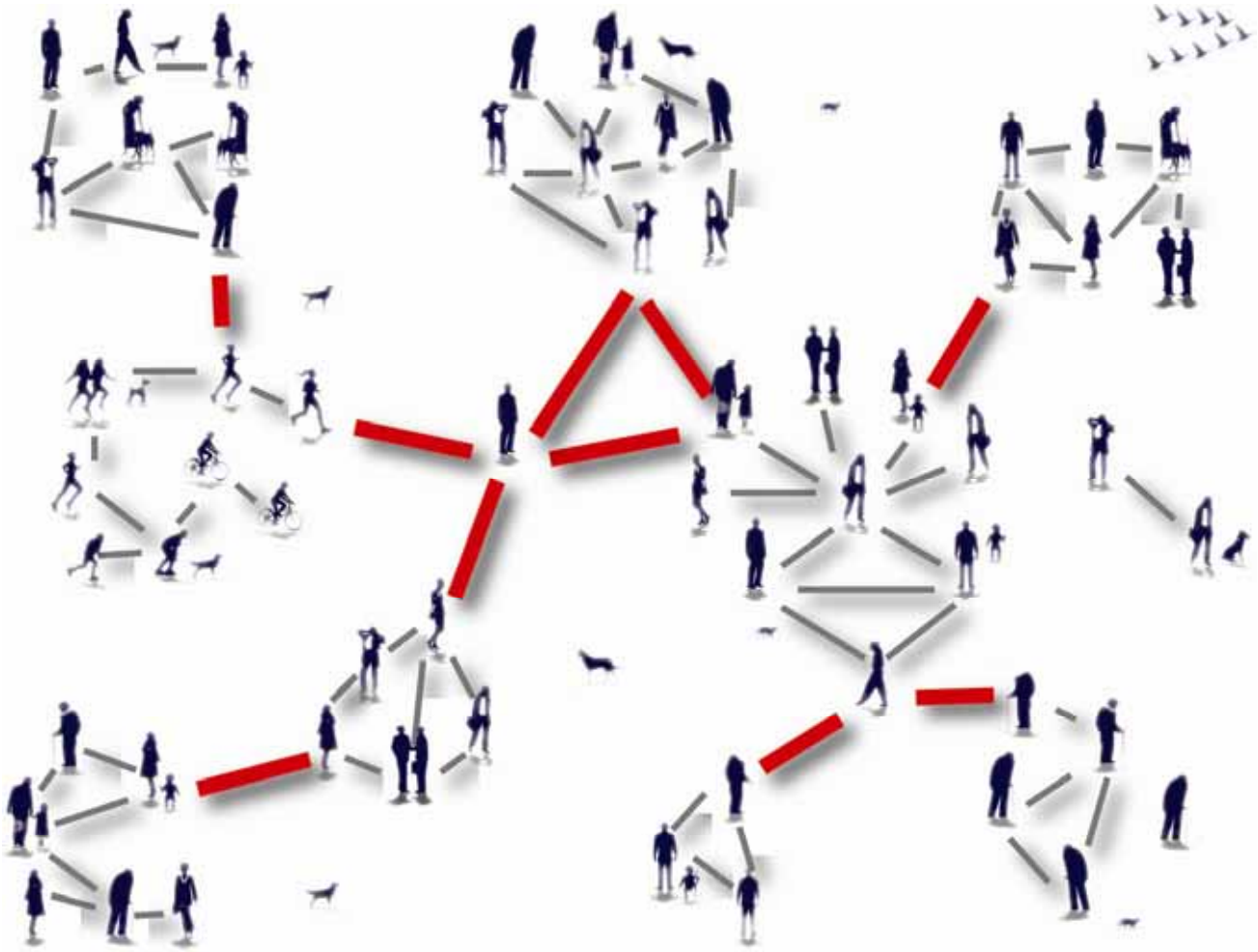
Excellent networks bridge clusters…



- Flow of resources and information
- Access to ideas, resources
- Exchange of solutions and experiences

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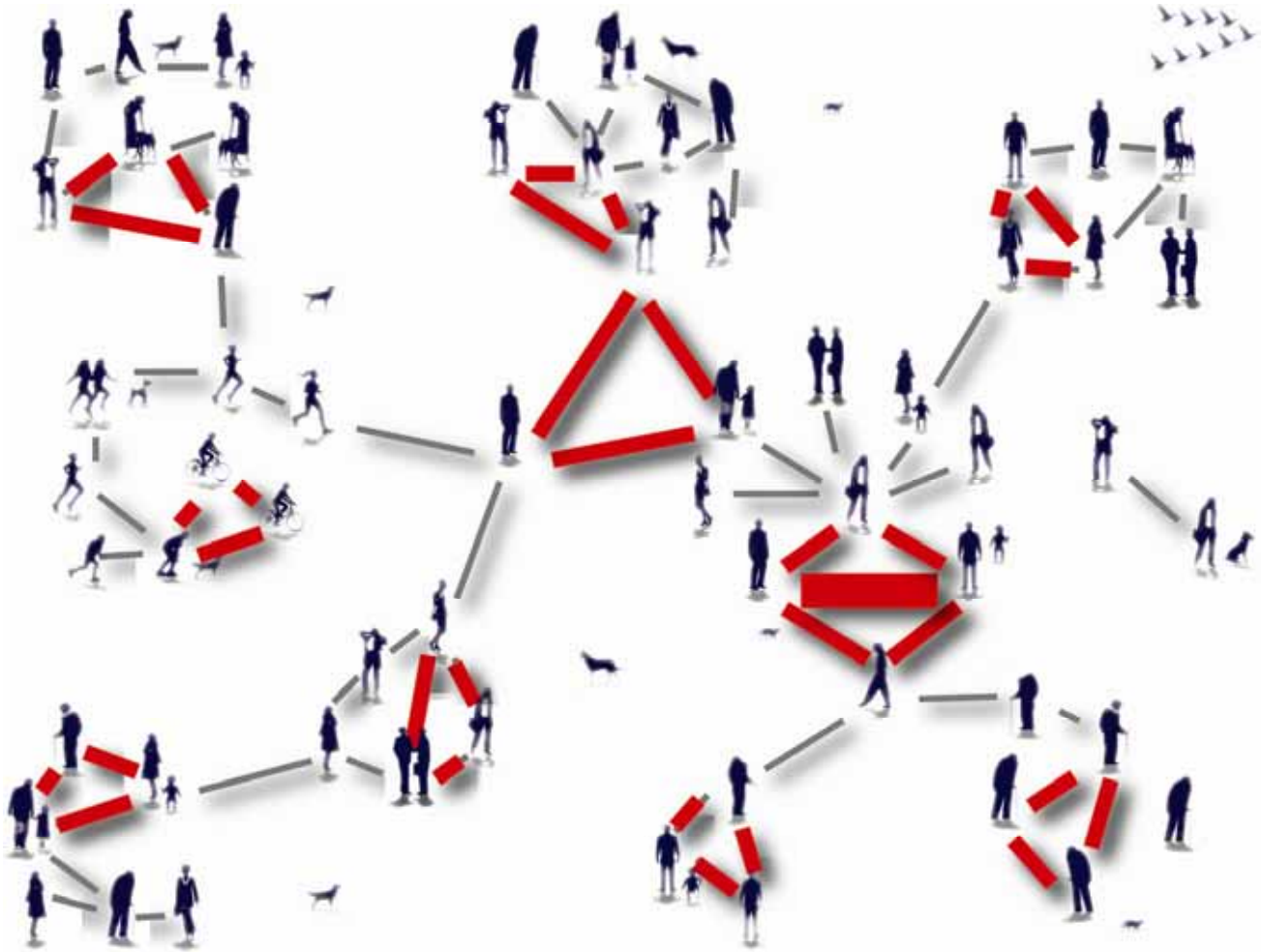
...are robust



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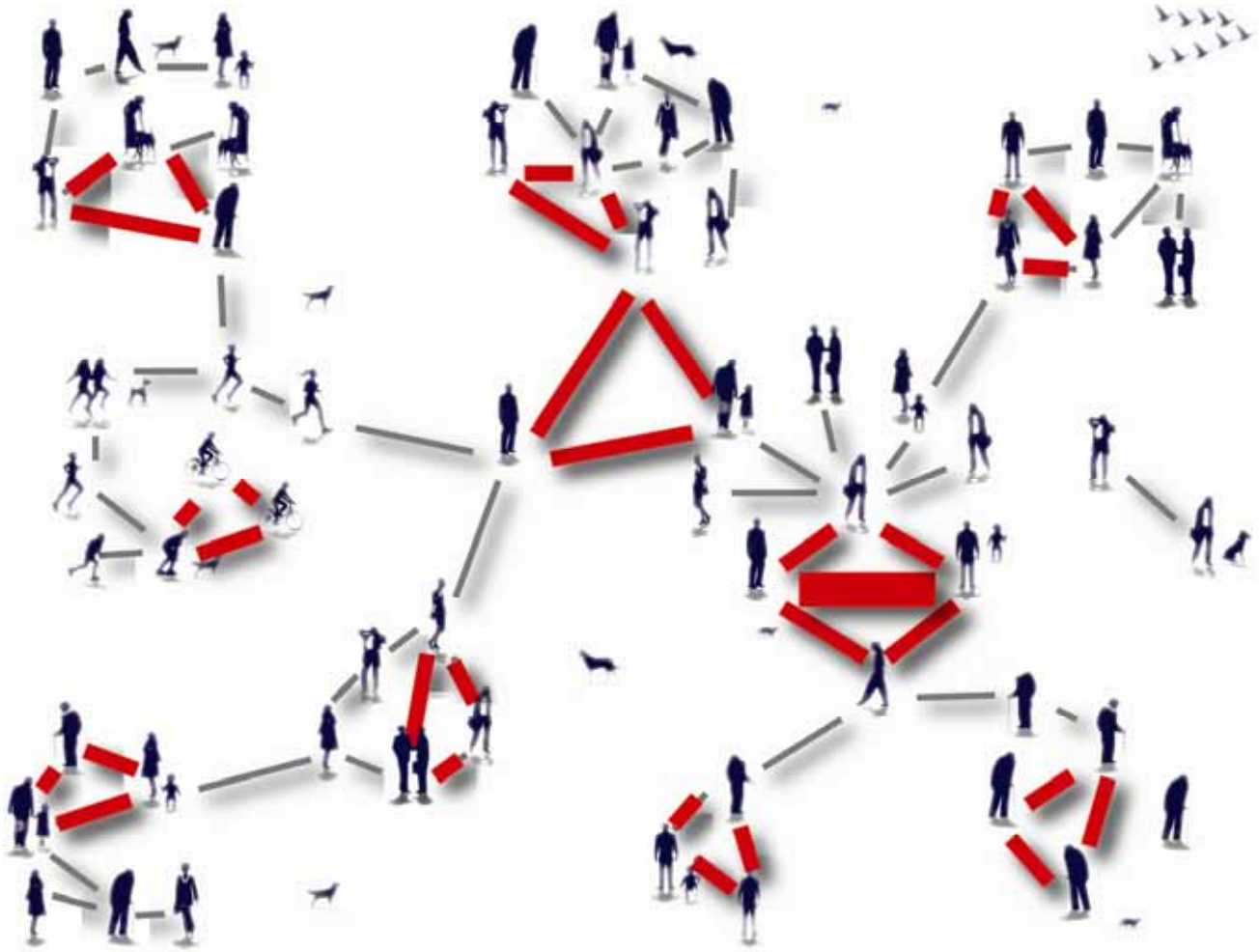
...are robust



- Triangles = stability
- Critical masses of knowledge and technologies
- Home bases for the spread of new influence

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Competitive variables

❶ Capital — "Economies who do better provide more capital for in R & D"

❷ Knowledge — "Economies who do better educate and attract better human capital."

❸ Networks — "Economies who do better have better innovation networks."

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Competitive variables

1. Financial (Venture) Capital
2. Human Capital
3. Social Capital

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6 rules for managing (regional) innovation

(developed for the Austrian Council)

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1. Know your innovation network!

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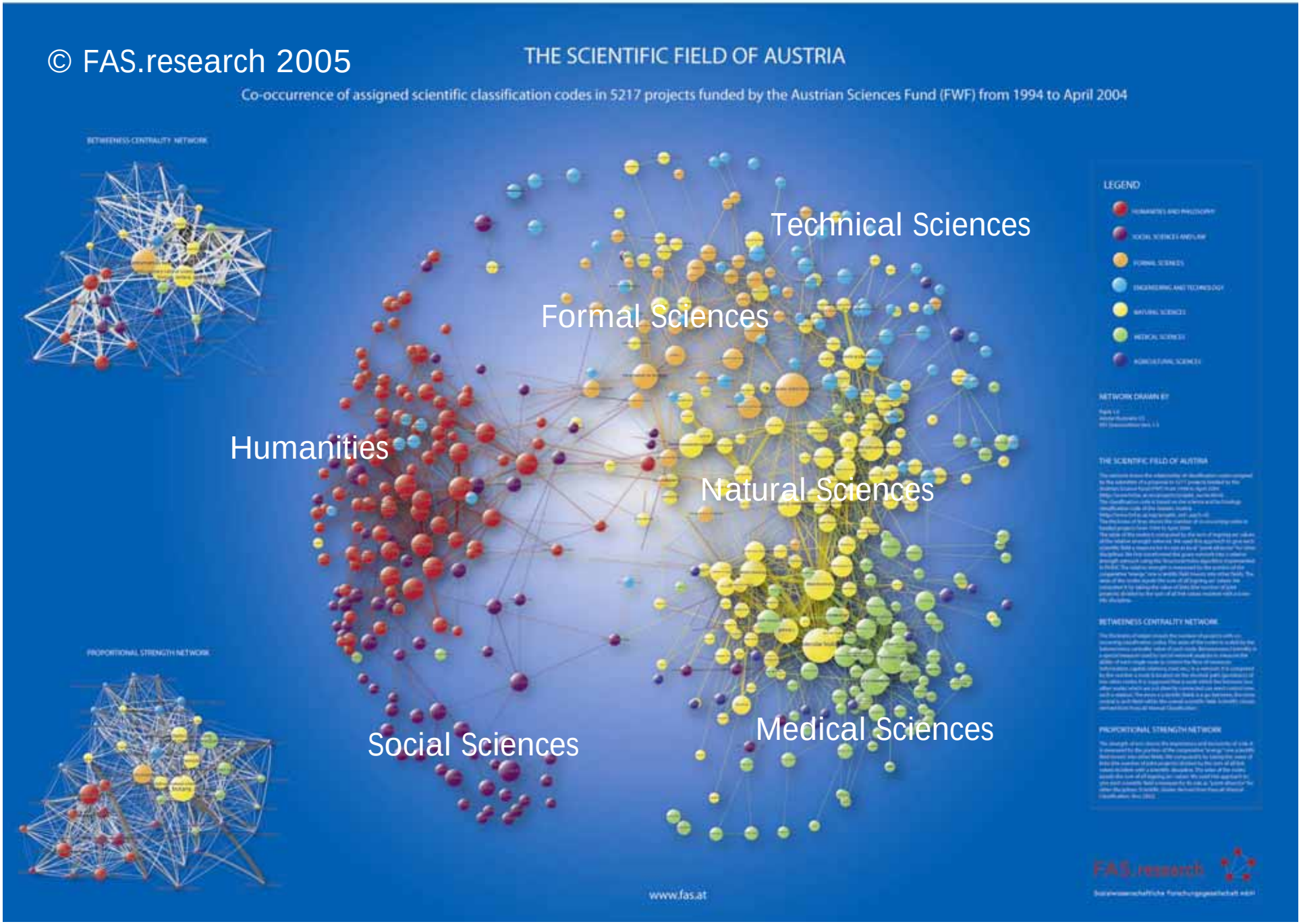
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THE SCIENTIFIC FIELD OF AUSTRIA
Co-occurrence of assigned scientific classification codes in 5217 projects funded by the Austrian Sciences Fund (FWF) from 1994 to April 2004
BETWEENESS CENTRALITY NETWORK
PROPORTIONAL STRENGTH NETWORK
Technical Sciences
Formal Sciences
Humanities
Natural Sciences
Social Sciences
Medical Sciences
LEGEND
NETWORK DRAWN BY
THE SCIENTIFIC FIELD OF AUSTRIA
BETWEENESS CENTRALITY NETWORK
PROPORTIONAL STRENGTH NETWORK
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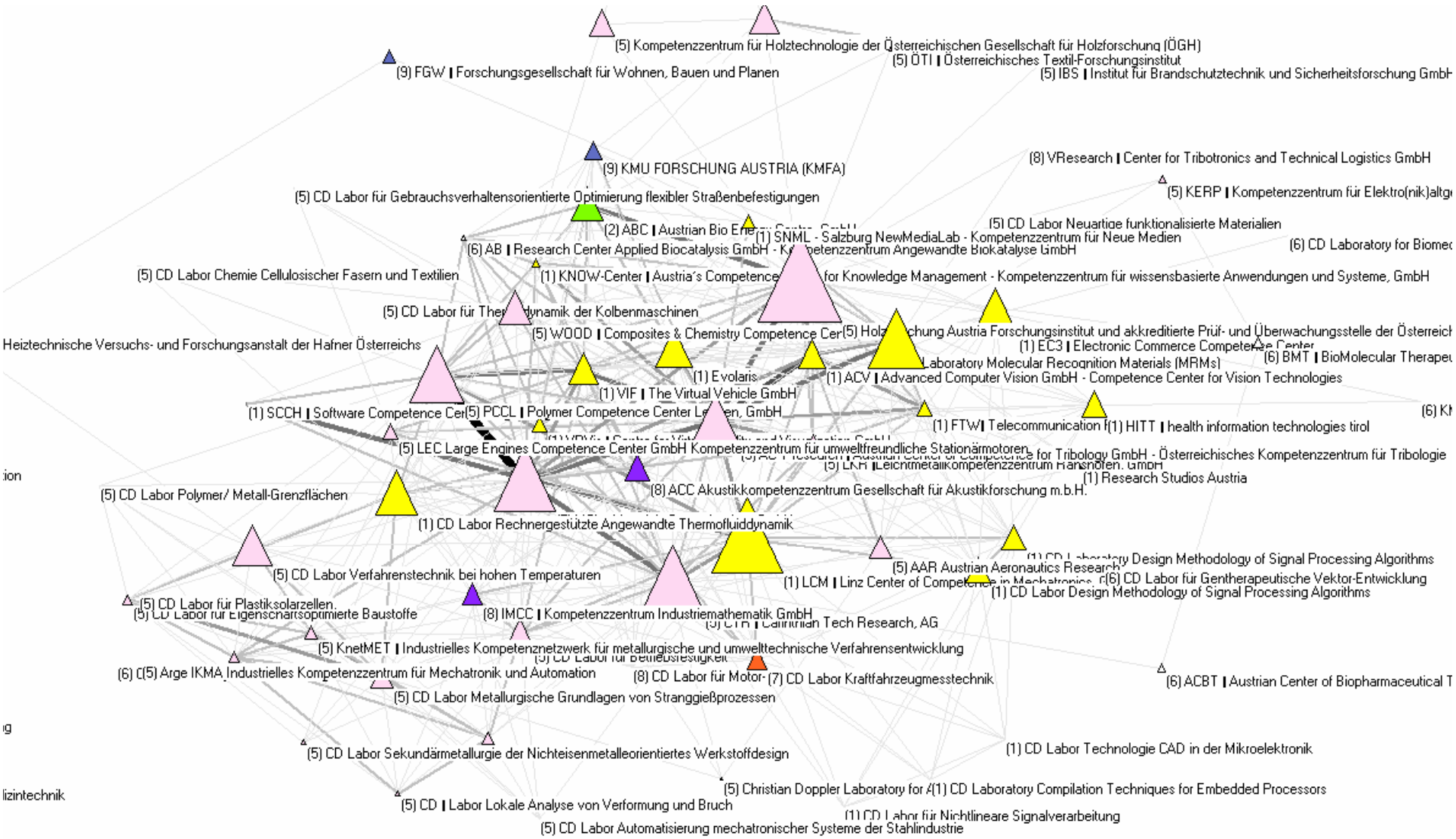
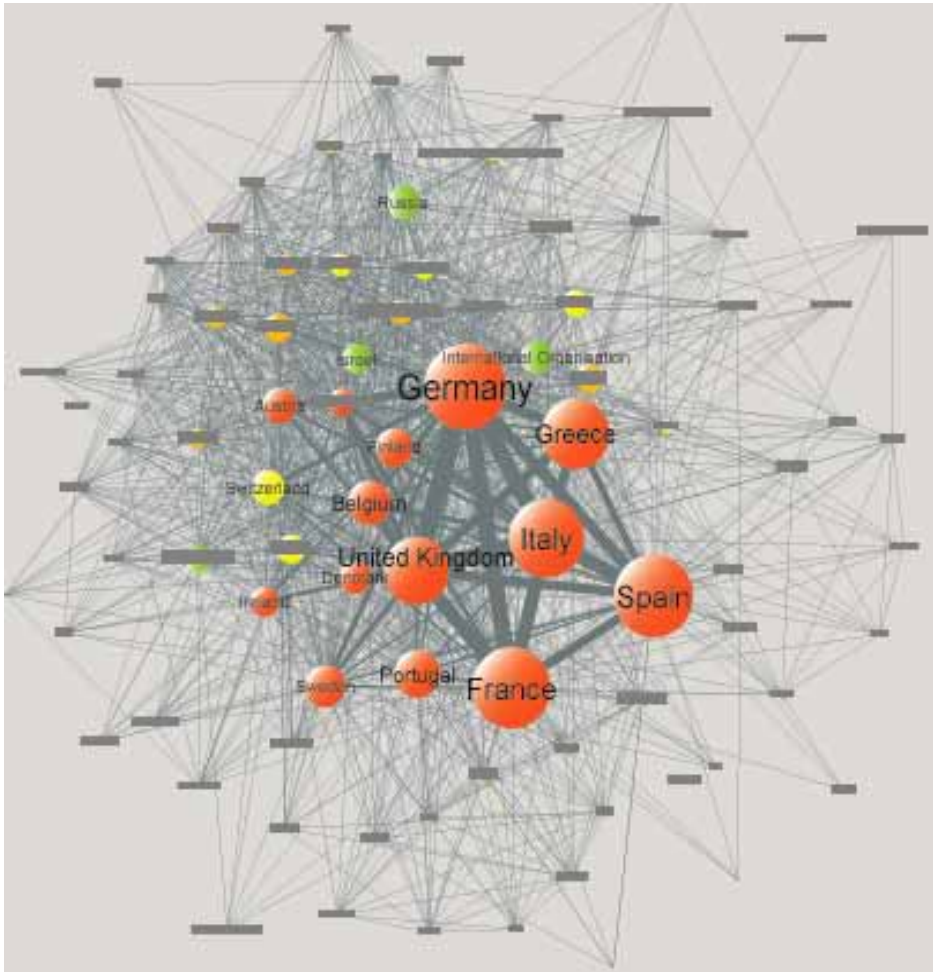



```
1=ELECTRONICS, INFORMATION TECHNOLOGIES AND TELECOMMUNICATION
2=ENERGY
3=ENVIRONMENT AND SAFETY
4=FOOD
5=INDUSTRIAL PRODUCTION AND TECHNOLOGIES, MATERIAL TECHNOLOGIES
6=LIFE SCIENCES
7=MEASUREMENTS AND STANDARDS
8=PHYSICAL AND EXACT SCIENCES
9=SOCIO-ECONOMY AND CULTURAL SCIENCES
```

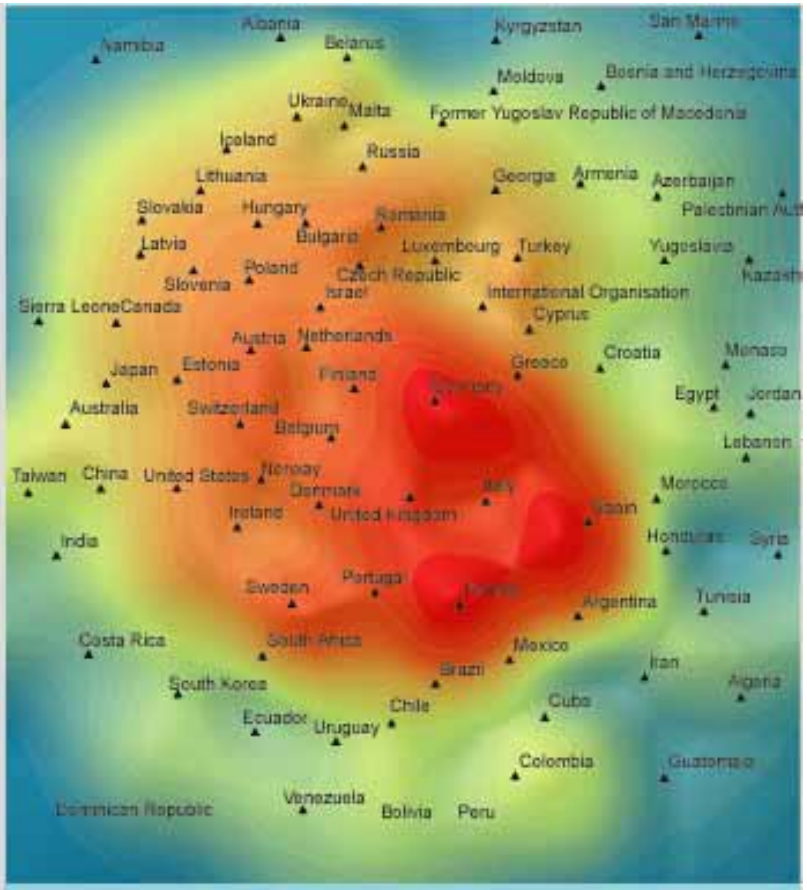


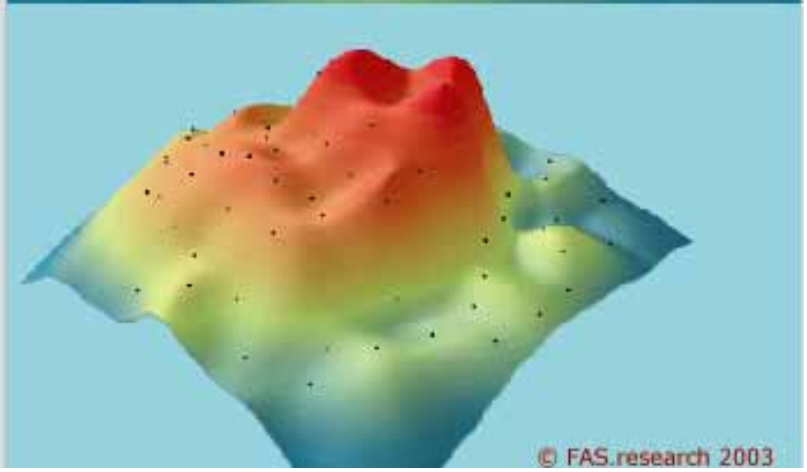
IST Projects 1999-2001

The graph above illustrates the interconnection of countries as a result of collaboration in the same IST Projects and their level of activity. The bigger the circle, the higher the level of activity of a certain country in IST Projects. Strong lines connecting two countries indicate an intense research liason.

- European Union member states
- Other European Countries
- New member states
- Rest of the world

The same data was conveyed to the illustration on the upper left. Mountains (red) account for a high level of activity in IST Projects. Neighbourhood indicates an intense research liason.





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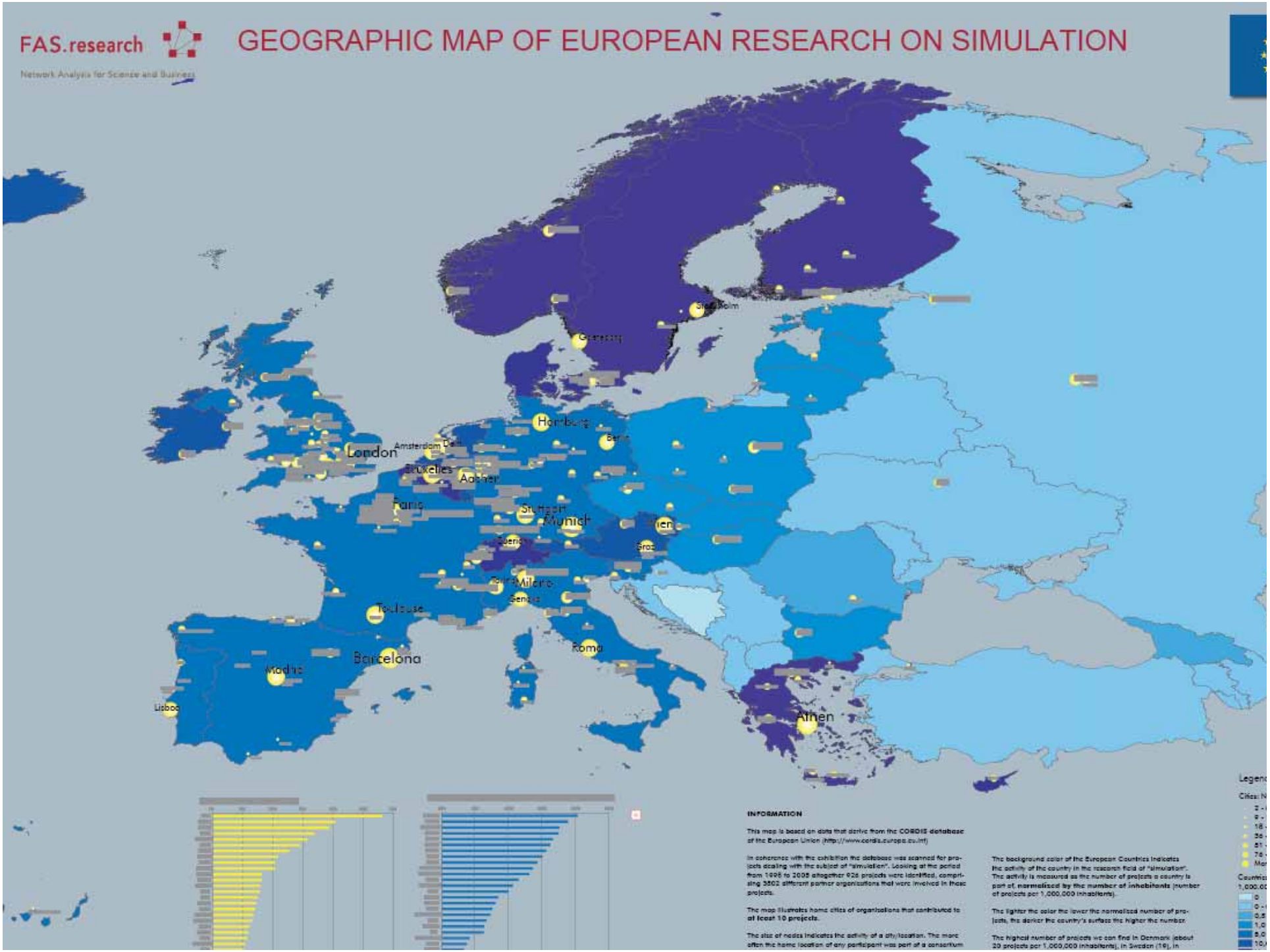
Network Analysis for Science and Business

GEOGRAPHIC MAP OF EUROPEAN RESEARCH ON SIMULATION



INFORMATION

This map is based on data that derive from the CORDIS database of the European Union (http://www.cordis.europa.eu/int)

In coherence with the exhibition the database was scanned for projects dealing with the subject of "simulation". Looking at the period from 1998 to 2008 altogether 926 projects were identified, comprising 3502 different partner organizations that were involved in these projects.

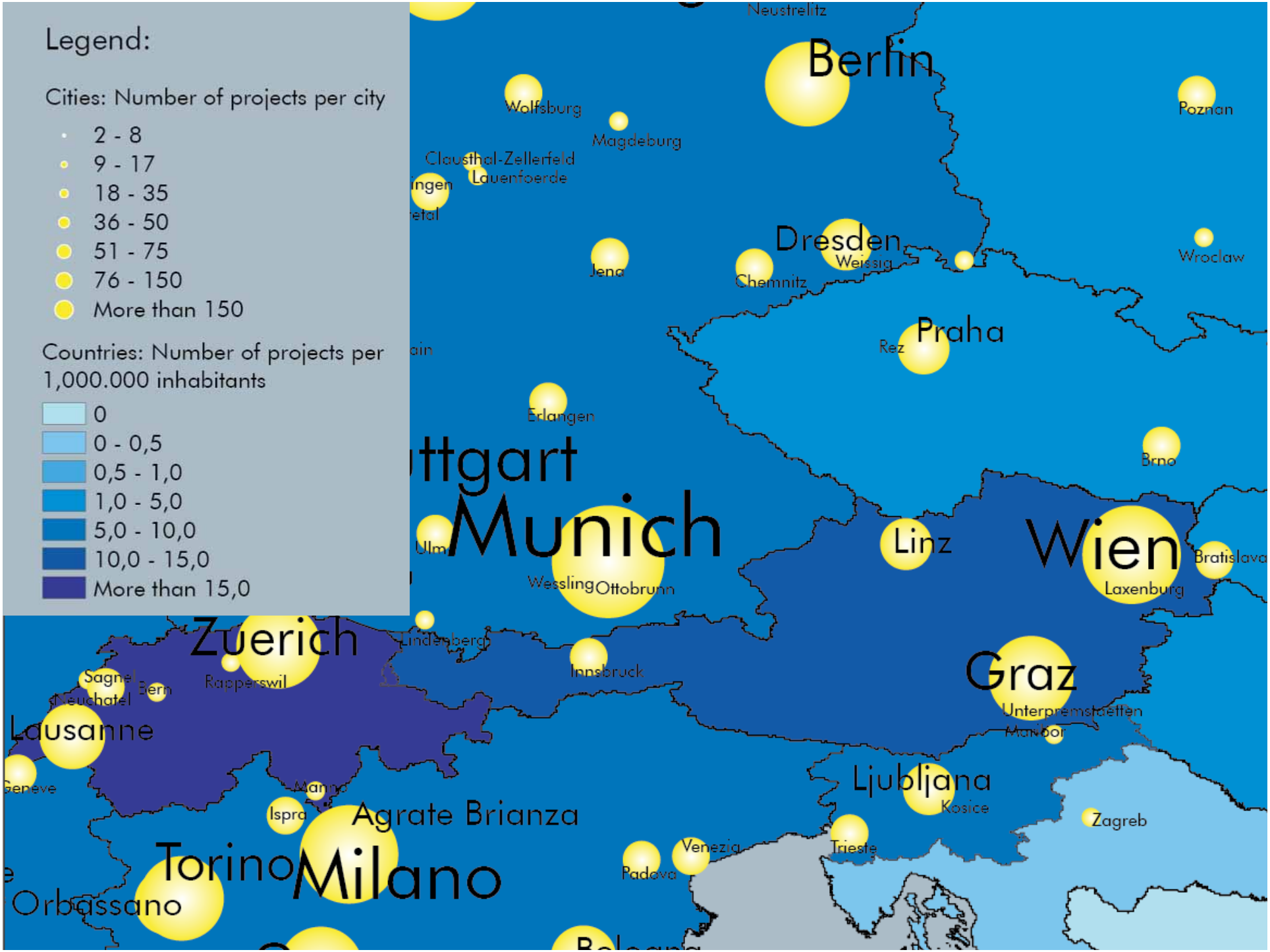
The map illustrates home cities of organisations that contributed to **at least 10 projects.**

The size of nodes indicates the activity of a city/location. The more often the home location of any participant was part of a consortium

The background color of the European Countries indicates the activity of the country in the research field of "simulation". The activity is measured as the number of projects a country is part of, **normalized by the number of inhabitants** (number of projects per 1,000,000 inhabitants).

The lighter the color the lower the normalized number of projects, the darker the country's surface the higher the number.

The highest number of projects we can find in Denmark (about 20 projects per 1,000,000 inhabitants), in Sweden (19), in


Legend:
Cities: Number of projects per city
2 - 8
9 - 17
18 - 35
36 - 50
51 - 75
76 - 150
More than 150
Countries: Number of projects per 1,000.000 inhabitants
0
0 - 0,5
0,5 - 1,0
1,0 - 5,0
5,0 - 10,0
10,0 - 15,0
More than 15,0
Neustrelitz
Berlin
Wolfsburg
Magdeburg
Poznan
Clausthal-Zellerfeld
Lauenfoerde
Dresden
Weissig
Jena
Chemnitz
Wroclaw
Praha
Rez
Erlangen
Brno
Munich
Linz
Wien
Bratislava
Wessling
Ottobrunn
Laxenburg
Zuerich
Lindenberg
Innsbruck
Graz
Sagne
Rapperswil
Bern
Neuchatel
Unterpremstaetten
Lausanne
Maribor
Geneve
Ljubljana
Kosice
Ispra
Agrate Brianza
Zagreb
Venezia
Trieste
Torino
Milano
Padova
Orbassano

2. Keep your landscape connected!

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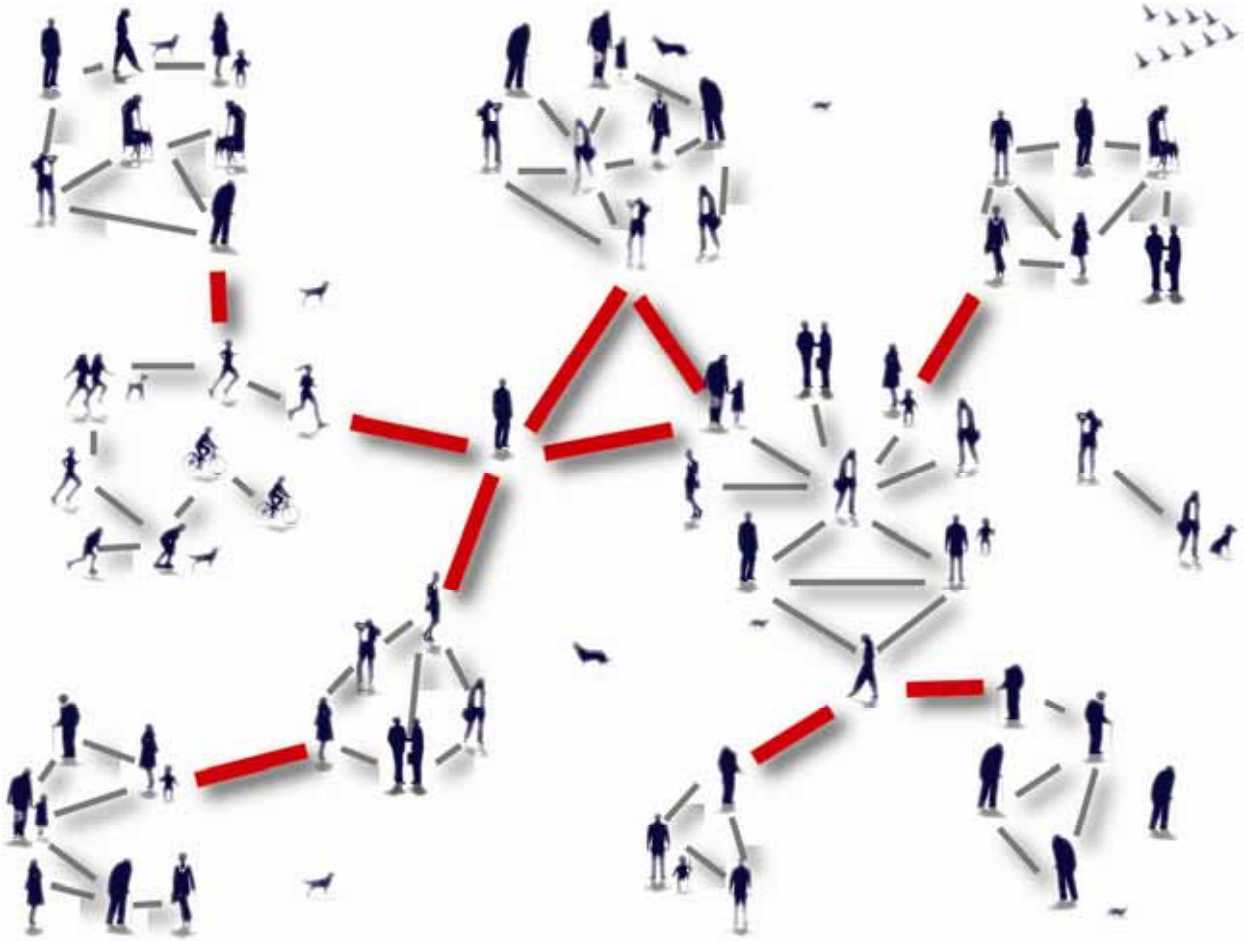
Excellent networks bridge clusters…



- Bridge disconnected communities, complementary technolgies and initiatives
- Flow of resources and information
- Exchange of solutions and experiences

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3. Facilitate cross-technology skunk works!

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Schumpeter

- Innovations are the outcome of a **new connectivity** between already existing knowledge, attitudes, codes, models or approaches

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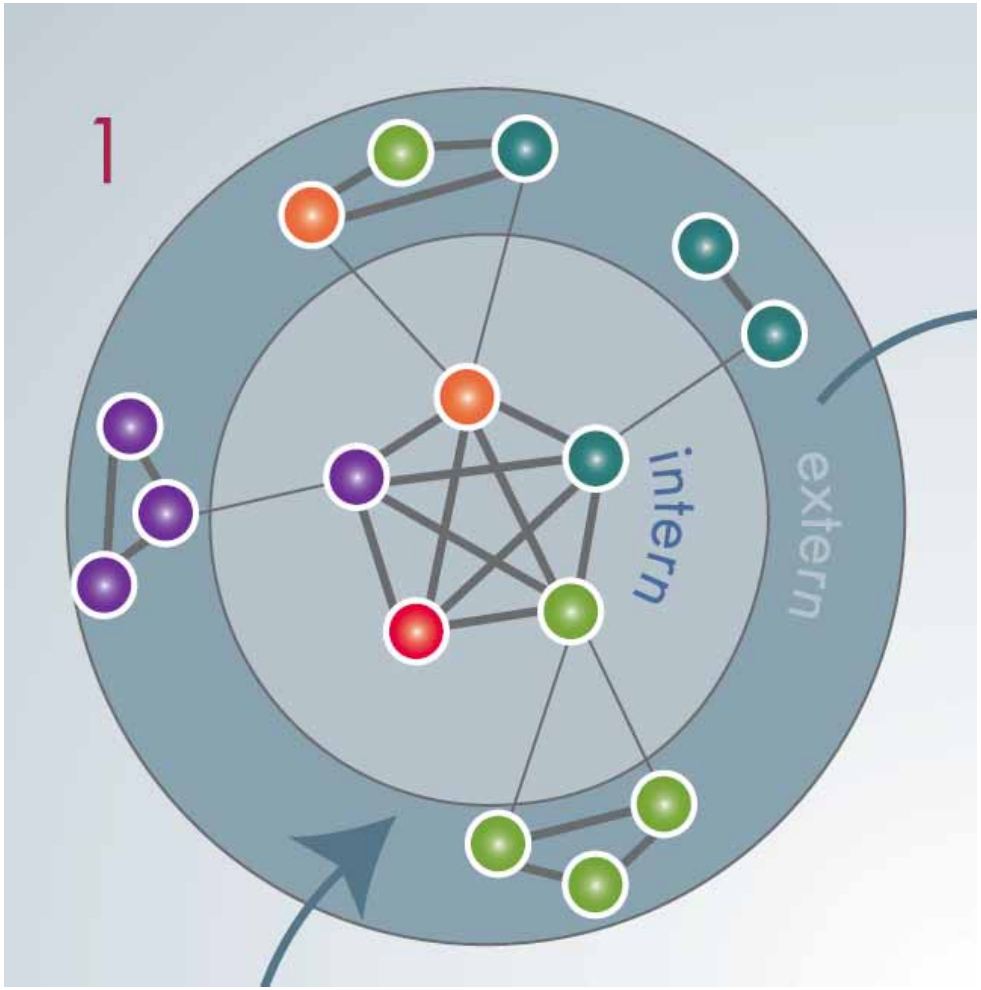
Skunk group



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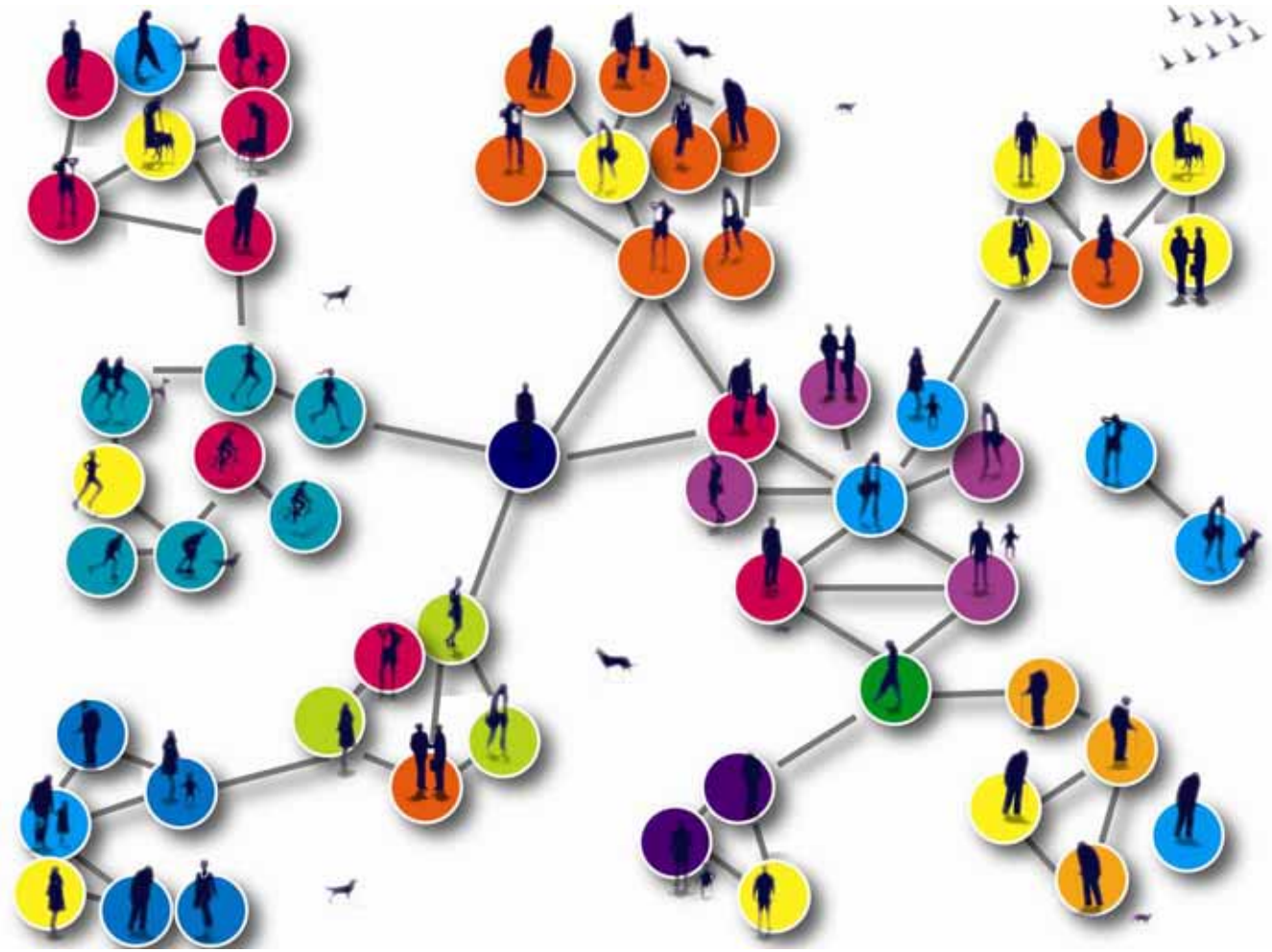
Diversity rules



- Different attributes, different thoughts
- Innovations
- Emergent, self-organizing potential (complexity theory)

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Foster excess of new ideas!

Regard the 100 : 10 : 3 rule

out of ...

100	ideas only...
10	are good ideas from wich...
3	work out in practice

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Prototype cycle of excellence

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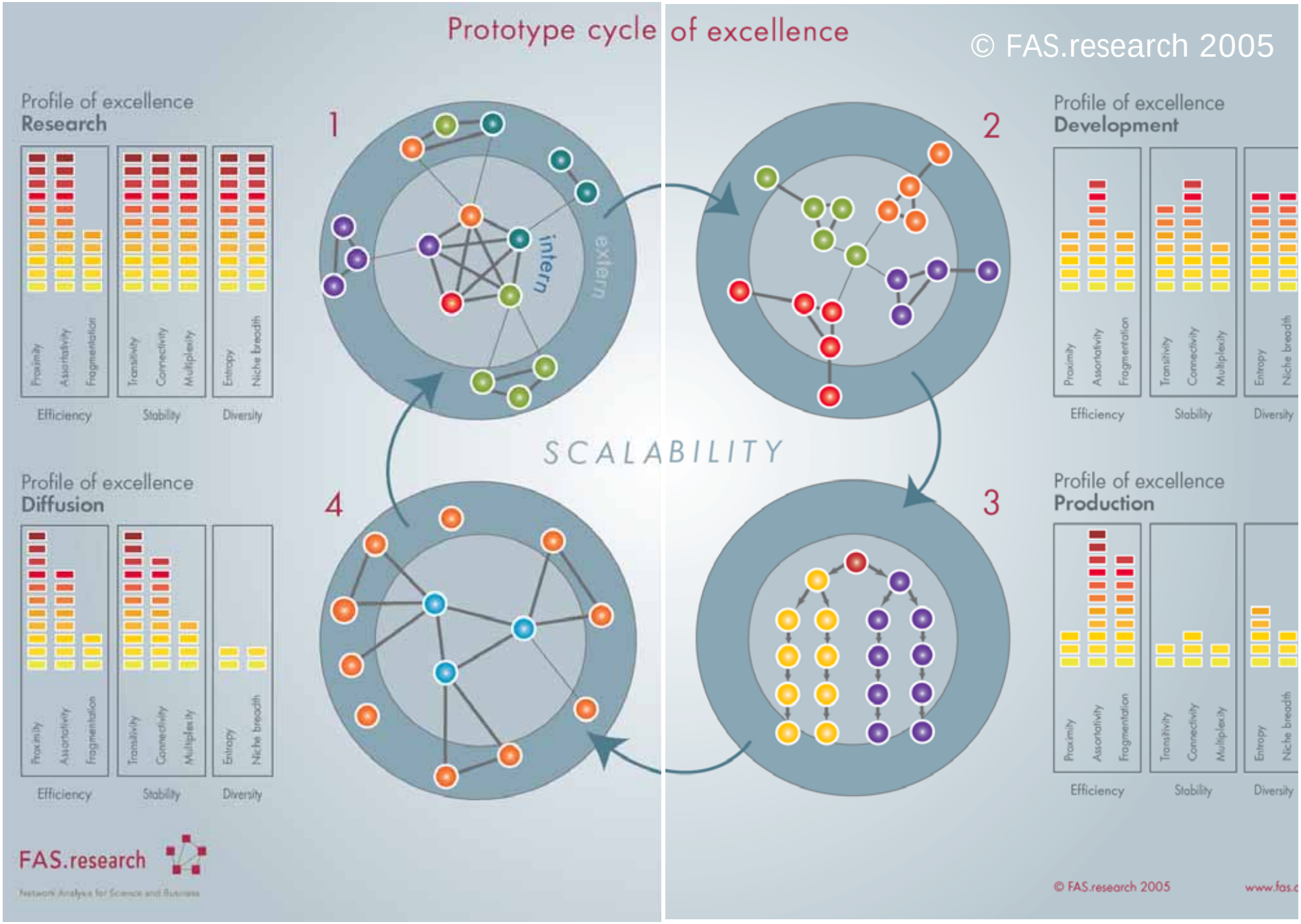
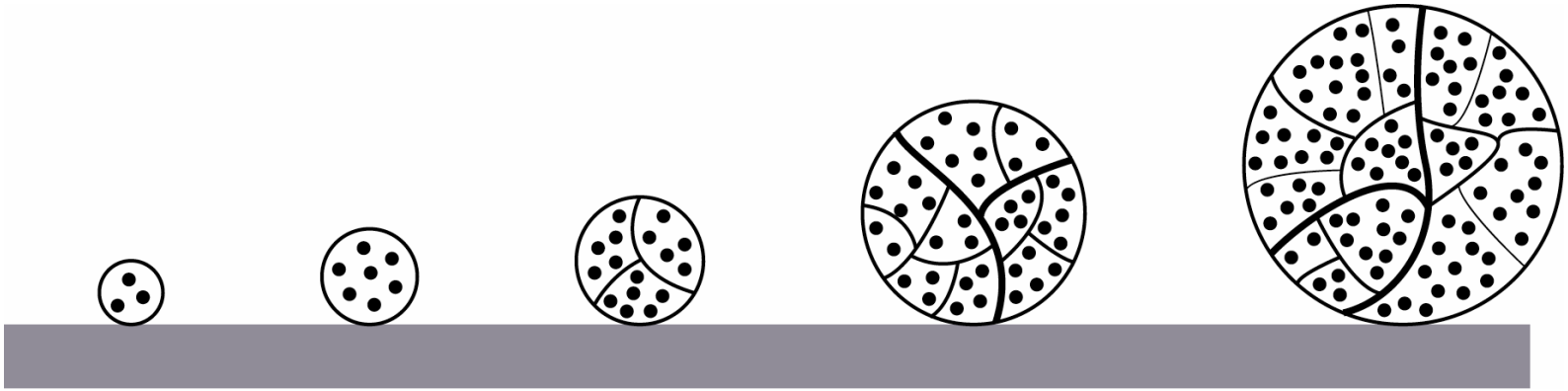


4. Create critical masses!



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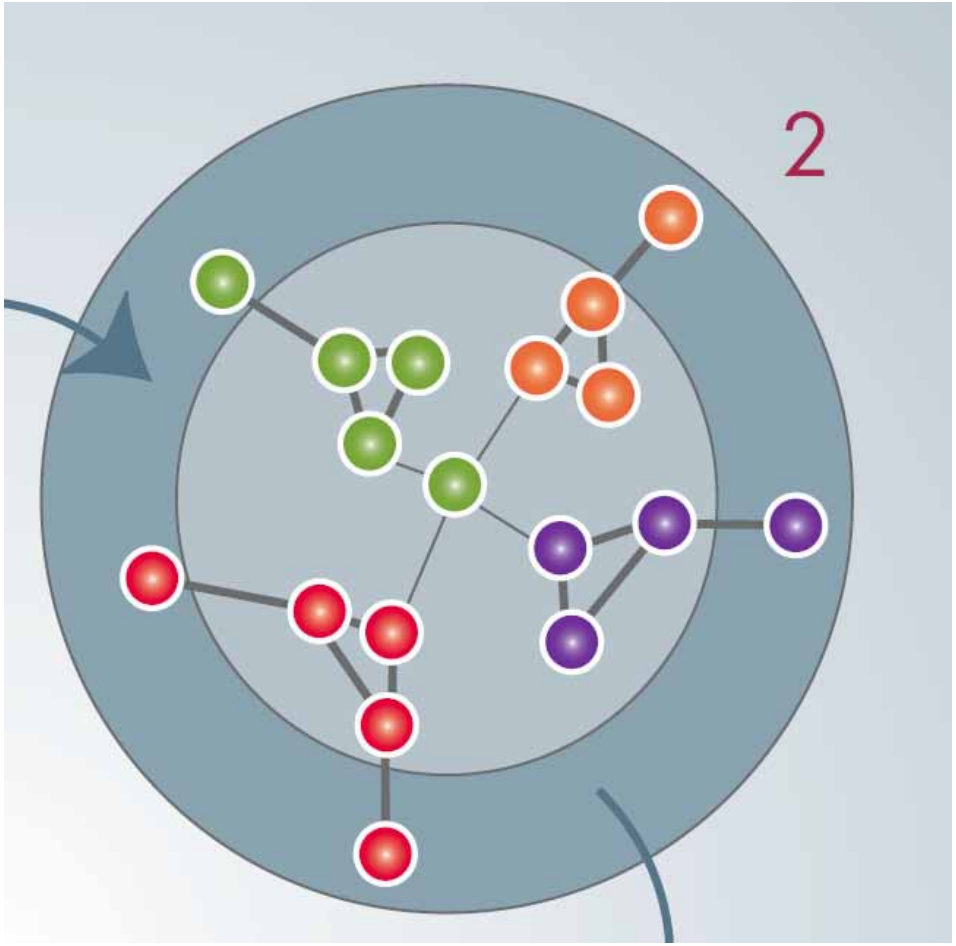

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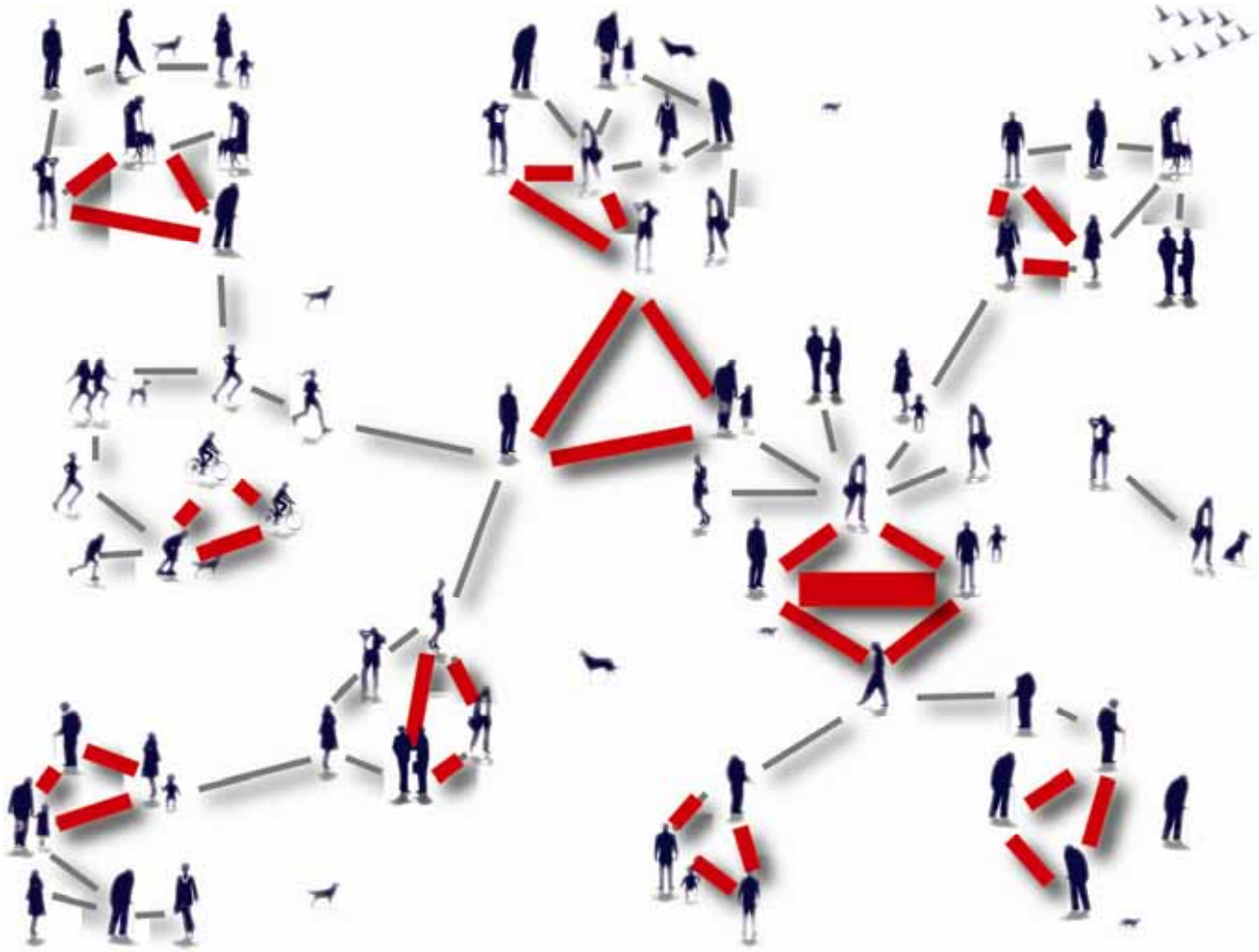
Excellent networks are robust



- Critical masses
- Homebases for the spread of new technologies
- Build communities of technologies

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5. Create communities of innovators and adopters

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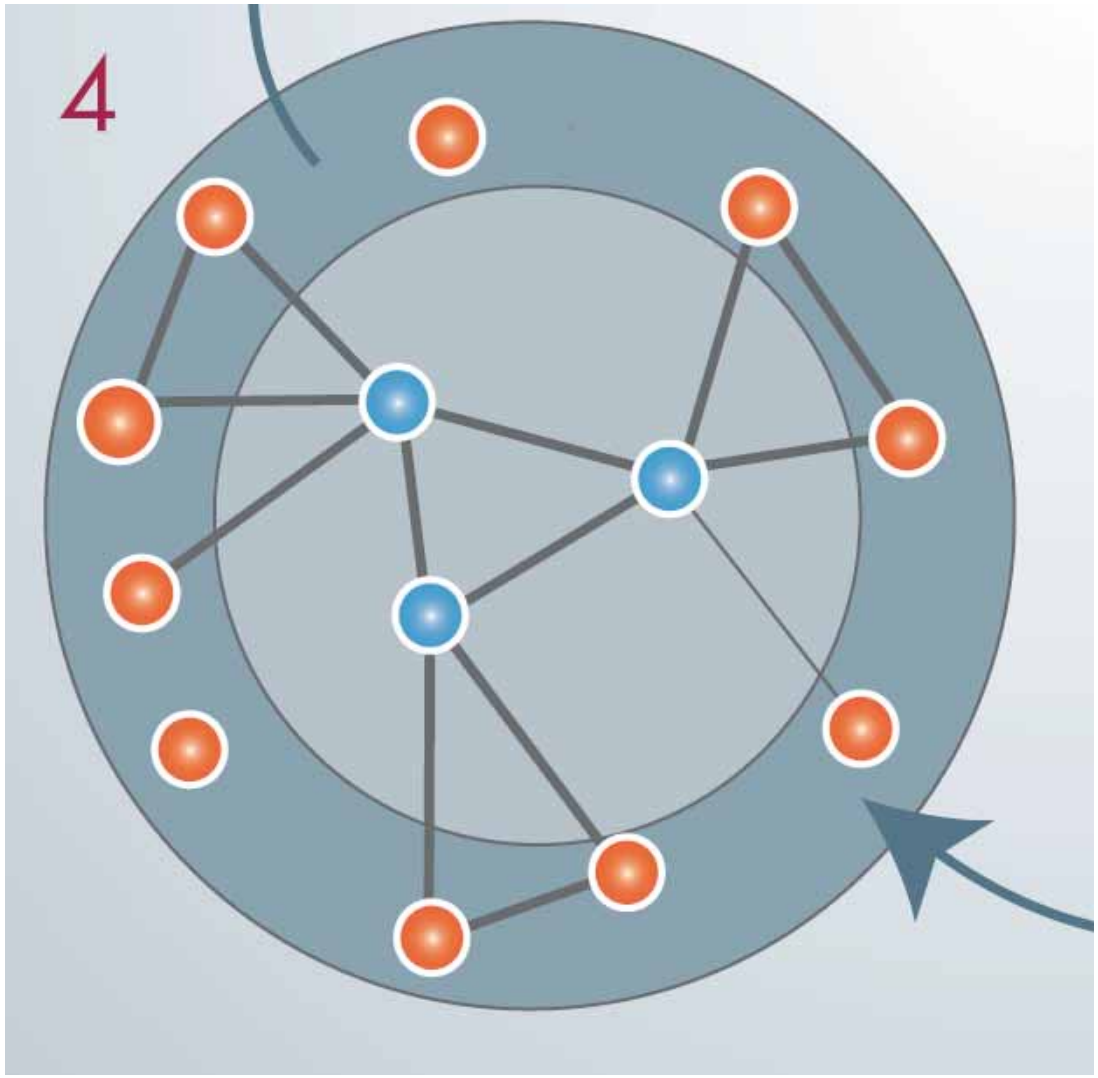

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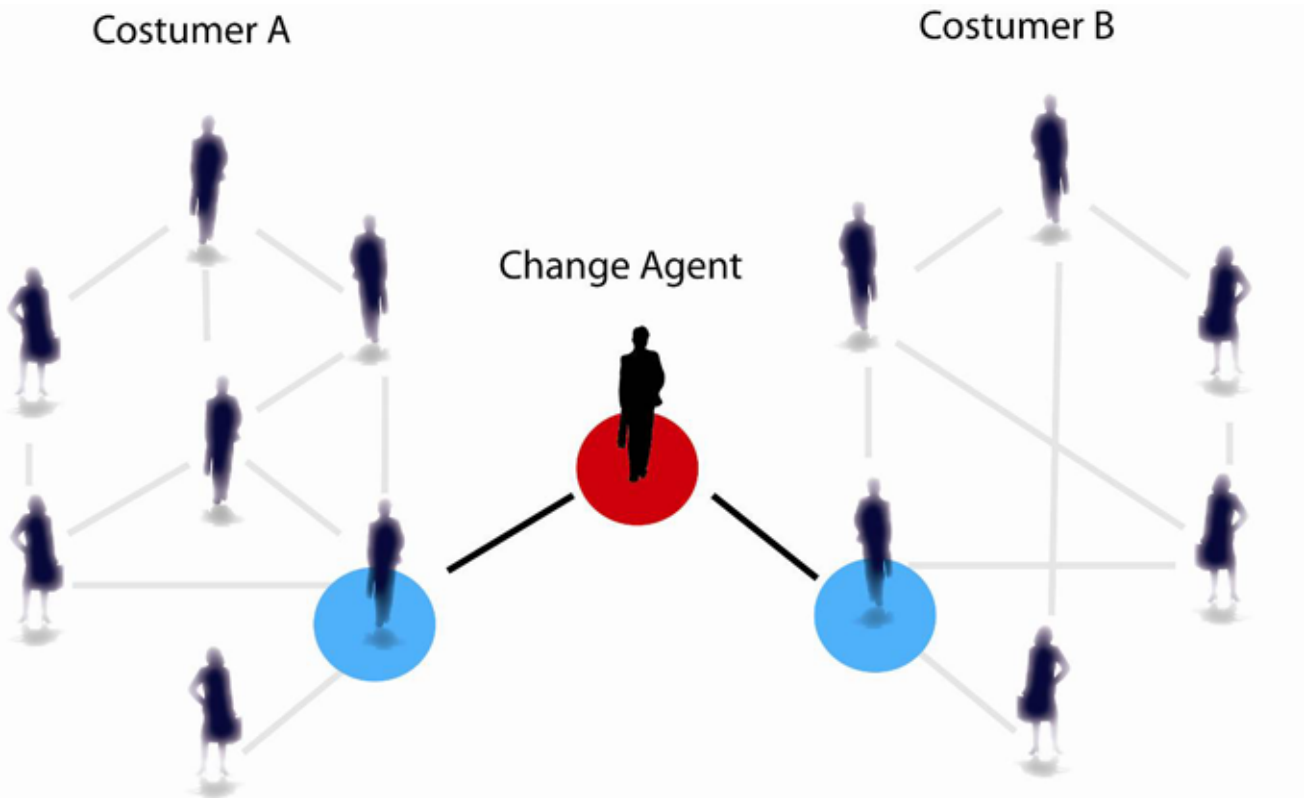

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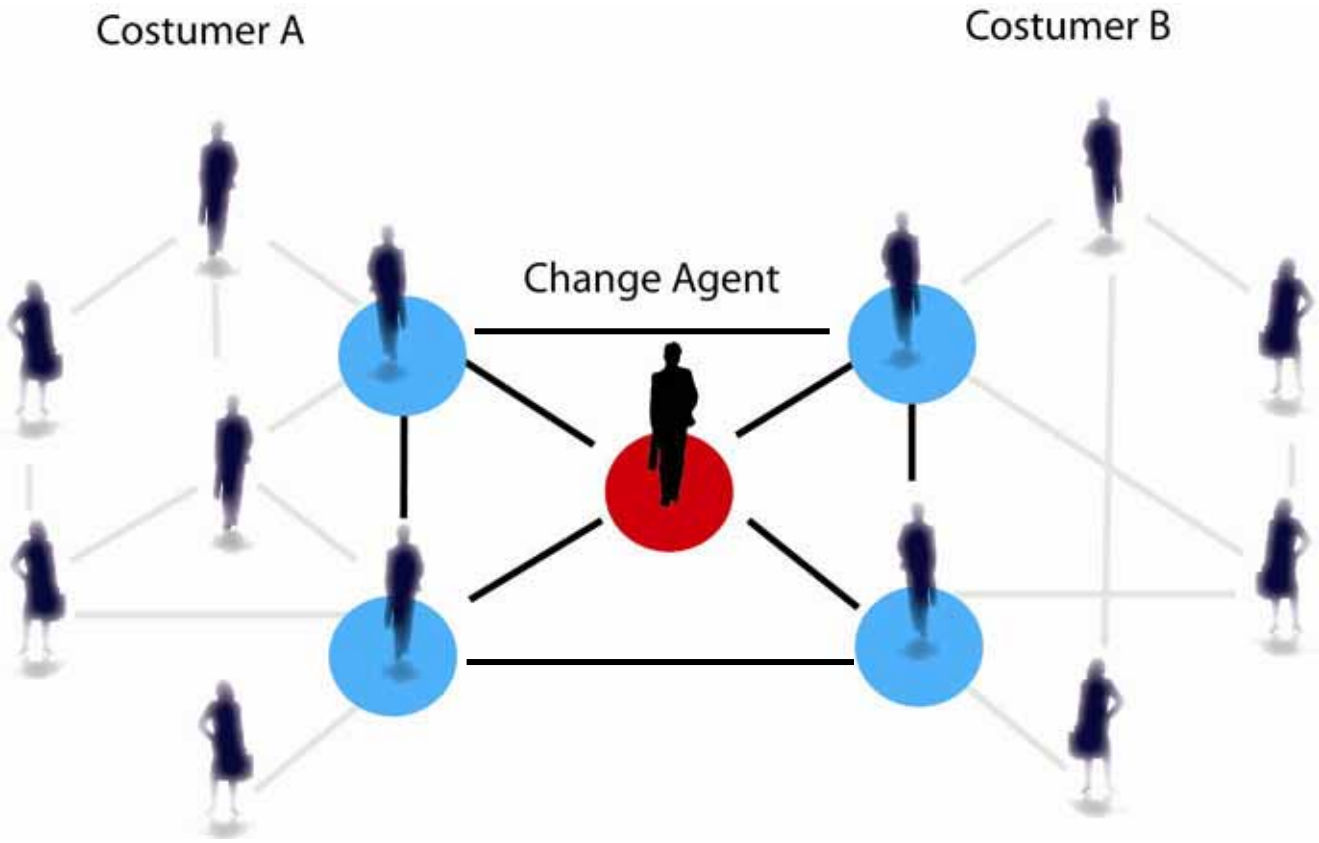

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Prototype cycle of excellence

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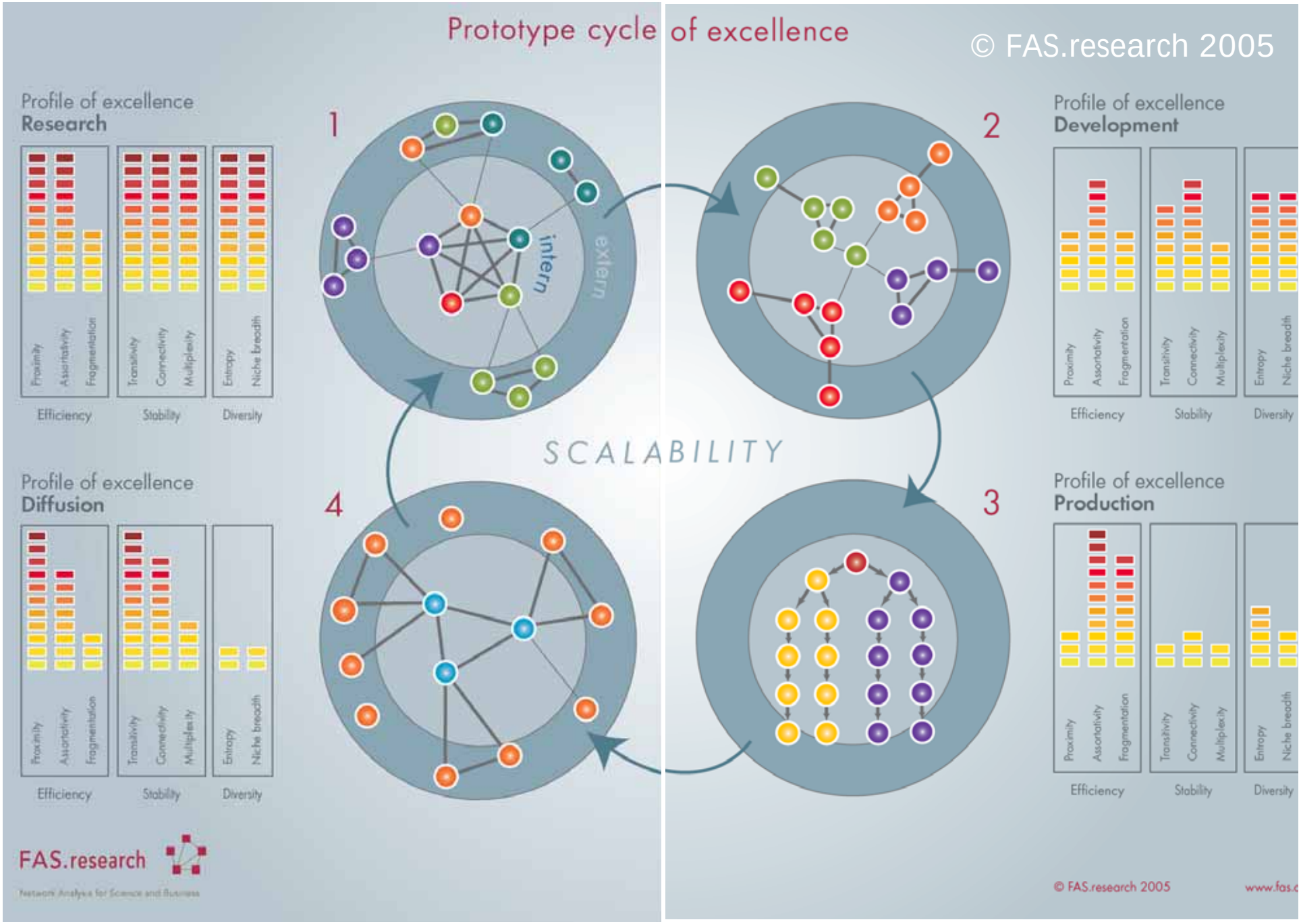

6. Change incentives and rules of evaluation!

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New indices for evaluating the outcome

- Number of inputs into other projects and value added chains (the more the better)
- Change in the institutional diversity of attributes
- Change in the connectivity of the overall landscape (old channels, or new pathways?)

Change the culture of innovation!

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Overview

1. Know your innovation network!
2. Keep your landscape connected!
3. Facilitate cross-technology skunk works!
4. Create critical masses!
5. Create communities of innovators and adopters!
6. Change incentives and rules of evaluation!

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Harald Katzmair

Networks, Complexity and Innovation

6 Rules for Managing Innovation in the Networked Economy Area

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Network Analysis for Science and Business

Thank you for your attention!