

Paris, June 2010

RUPRECHT-KARLS-  
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HEIDELBERG



# Conditions for the Formation of Knowledge Networks: A Geographical Perspective

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# Arguments



- Corporate knowledge networks are constrained by hierarchy and geography. Global knowledge networks tend to be sparsely connected and imply continuous reinventions of the wheel.
- Corporations can learn from their (knowledge) peripheries. Controversial innovation and peripheral diffusion of knowledge may be critical sources of advance for a corporation.

# The case of MILECS



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late 1970s	An experienced engineer founds MILECS as professional partnership. Early internationalization (by piggy-backing) in the 1980s Organic growth: 30 partners & 200 consultants at the end of 1990s
1997	Establishment of an international holding Launch of an electronic knowledge management system
2000	Crisis: Partners sell the firm to a publicly traded stock company that goes bankrupt soon after (new economy bubble bursts)
2001	A few partners redeem their stakes and relaunch MILECS Problem: no financial assets, several partners retire (generation shift) MILECS freezes international support in finance, knowledge transfer
2006	business consolidates (190 consultants): 11 offices in 9 countries Reassessment of potential international advantage

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- Business driven by expertise, project work and client orientation
- High degree of geographical distribution of expertise
- Firm-specific crisis disrupts international communication

# Technical vs. social networks: the MILECS case



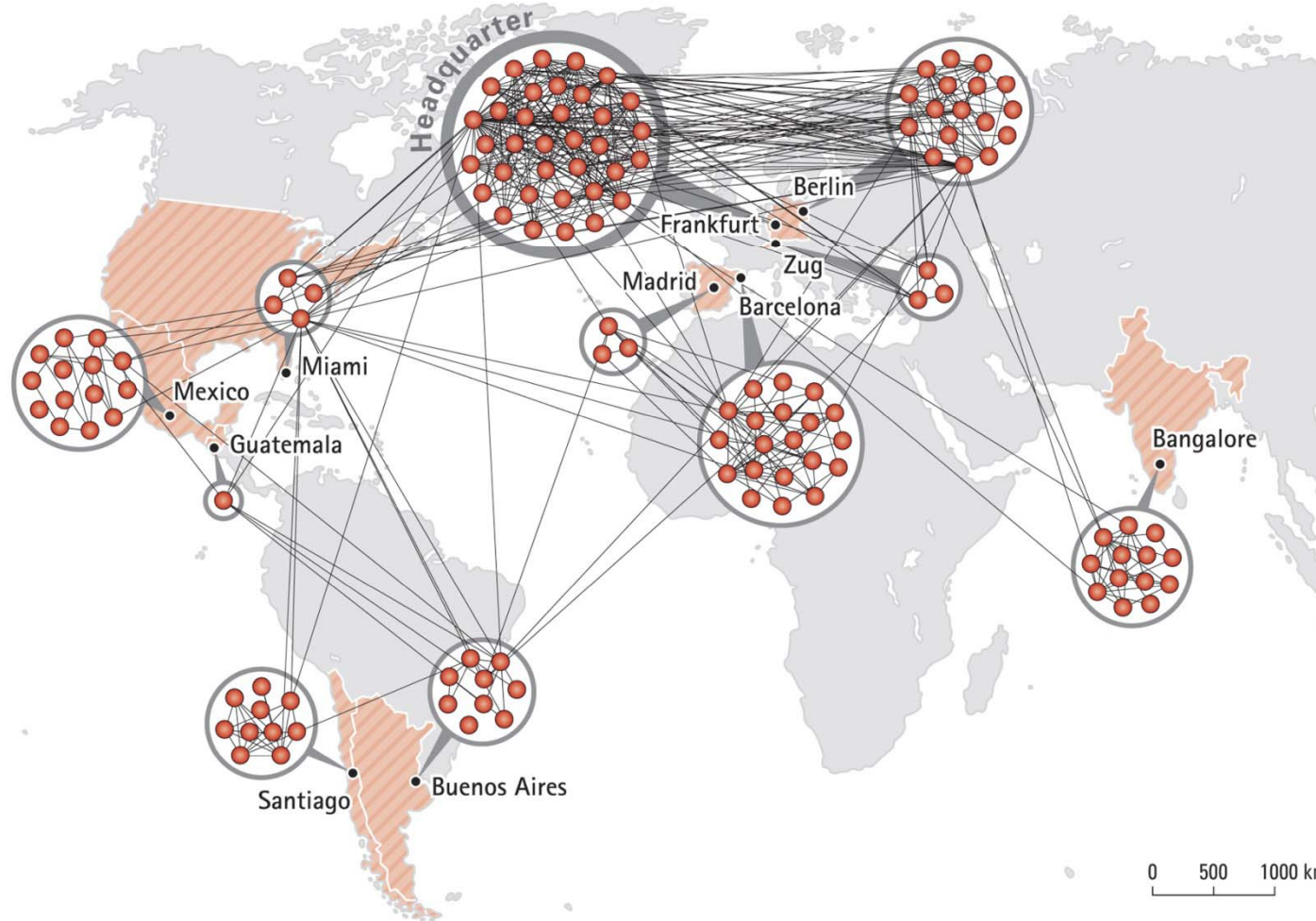
How important are the following sources of information for your work?

Source of information	Not important			important		
	1	2	3	4	5	6
Colleagues at MILECS	2	5	5	10	30	76
Clients	7	7	12	16	29	57
Internet	4	14	23	48	13	26
Professional colleagues in other firms	10	32	20	32	14	20
Literature (Books, Journals etc.)	8	22	32	39	17	10
KM-System of MILECS	12	26	38	23	18	11

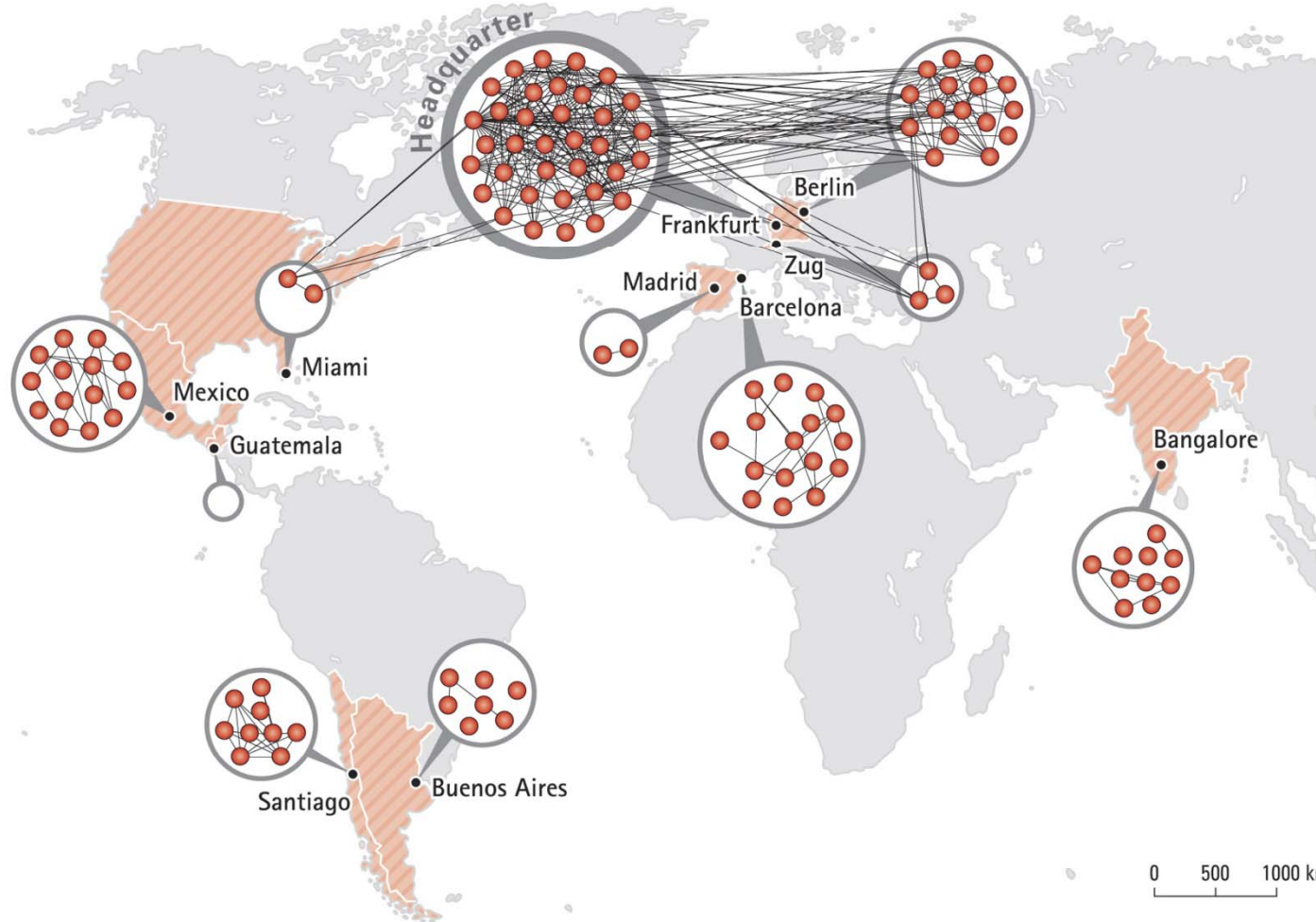
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- Personal contacts are the most important source of new information
- The intranet is even less important than the internet and print literature

# Vulnerability to knowledge flows: the MILECS case



# MILECS Knowledge network without 15 individuals



# The reinvented wheel – Example of the cold store



- Wolfram, director in Berlin (Interview 13.9.2006)
  - „I believe that we mostly export knowledge and that there is little import of new knowledge from abroad.“



- Chema, senior consultant in Barcelona (Interview 29.5.2006)
  - When he had to design a cold store for a beverage producer, there were no solutions or references on the intranet. A local solution was developed and received a national logistics award in Spain
  - Do you think the solution is known within the rest of the firm?  
„Maybe not“.



- Gustavo, project manager in Buenos Aires (Interview 15.3.2007)
  - When he looked for references on cold stores, he didn't find anything in the intranet. He then asked his director who connected him with Chile: there was a solution.

„We keep reinventing the wheel, we research again, although the solution is there. It is just not accessible“ (Frank, director in Frankfurt)

# Constraints on personal knowledge transfer



## MRQAP-Regression for information transfer

	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	.018**	.004**	.013**	-.045	-.063
Co-location	.277**			.260**	.261**
Status level		.007**		.007**	.007**
Status equality					.027**
Native language equality			.119**	.027**	.026**
Language overlap					.004
Tenure difference					-.002
Age difference					.003
Competence overlap					.006
Qualification equality					-.004
<hr/>					
Statistics					
Adjusted $R^2$	.172	.027	.061	.204	.215
( $p$ )	.0001	.0001	.0001	.0001	.0001

\*  $p < 0.01$ , \*\*  $p < 0.001$ , N = 16,512 observations



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# Four dimensions of periphery



## Development (the economic dimension)

- an underdeveloped periphery of economies depends on a global centre
- Theories of imperialism, dependency, world system theory etc.
- Periphery = low GDP, low levels of technology, high inequality, feudal trade patterns.

## Remoteness (the geographical dimension)

- Knowledge transfer decays with geographical distance (e.g. Hansen and Lovas 2004)
- Trade gravity model: underdevelopment comes with remoteness
- Periphery = geographical remoteness with respect to a developed centre

## Subsidiarity (the organizational dimension)

- Hierarchical subordination, low status, dependence on central authority.
- organizations often ignore or resist bottom-up innovation (Yanow 2004)
- Periphery = subordination as well as a low level of influence on the hierarchical core of an organization

## Farness (the topological dimension)

- Core-periphery models in network theory
- Knowledge transfer and innovativeness increase with centrality and decrease with farness (e.g. Tsai 2001)
- Periphery = sparse connectivity and high farness to the rest of the network

Hansen, M. T., Lovas, B. (2004) How do multinational companies leverage technological competencies? Moving from single to interdependent explanations. *Strategic Management Journal* 25: 801-21.; Yanow, D. (2004) Translating local knowledge at organizational peripheries. *British Journal of Management*, 15: 9-525.; Tsai, W. (2001) Knowledge transfer in intra-organizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal*, 44: 996-1004.

# Methodology



Table: CHEMICAL AG global and in Argentina

Measure	<i>N</i> (share)
Employees, global	100,000
Employees, ARG	700 (0.7%)
Revenues, global (mEUR)	60,000
Revenues, ARG (mEUR)	300 (0.5%)

Table: Survey and interview data

Sample	<i>N</i> (share)
Study group	449
Network Survey response	224 (50%)
Qualitative interviews	29

- *Research design*: multi-method corporate case study of a peripheral unit of a global firm in a peripheral market
- *Peripheral market*: Argentina as ‘emerging or developing economy’ (IMF) remote to the global economy (market share: 0.5%)
- *Peripheral subsidiary*: CHEMICAL Argentina, a small subsidiary of CHEMICAL AG, Germany (employment share: 0.7%)
- *Mixed-methods*: qualitative interviews with managers (*N* = 29) and network survey (*N*= 224).

# Peripheral innovation: successful but unacknowledged



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- 1988 • CHEMICAL acquires an Argentinean SME specialized in automotive coatings
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- 1995 • The local managers propose a new business model. Instead of selling the paints they consider operating the entire paint finishing system onsite.
- Innovation: a cost-per-unit invoicing system whereby customers pay for each perfectly coated auto body, rather than for the amount of paint they use.
  - The headquarter in Germany rejects the proposal. Yet the subsidiary goes on to develop the concept with the client. German delegates arrive and turn down the proposal. The subsidiary renegotiates a reduced offering and begins operation: *“the chassis came in raw through the front door and left the back door painted”*
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- 1997 • CHEMICAL Germany launches a prestigious system partnership with a premium OEM in Germany based on the CPU business model and receives media attention numerous automotive awards at global scale in subsequent years.
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- 2004 • CHEMICAL Argentina increases market share in OEM coatings from 10% to 75%
- The system partnership proves successful and is now advertised aggressively:
  - *“CHEMICAL is now the leading system supplier for automotive coatings. Twenty production plants operated by eight automotive manufacturers in Europe, the Americas and Japan work with CHEMICAL according to this principle” (p. 27).*
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# Controversial innovation and peripheral dominance



*“changes at the periphery raise fewer fundamental questions about the nature of the organization itself than changes at the core.”*

(Thomke and Kuemmerle, p. 631)

*“if the innovators are located on the periphery, with some limited contact and exposure to the rest of the organization, they can safely establish the change, demonstrate its effectiveness, and then spread the word to one neighboring subunit at a time”*

(McGrath and Krackhardt, p.330)

## Creation of peripheral innovation

- Theory of structural inertia (Hannan and Freeman 1984)
- Organizations survive selection because they are reliable and accountable. To be reliable and accountable they need to ensure reproductivity.
- Periphery alleviates inertia because it faces less moral and political opposition.

## Diffusion of controversial innovation

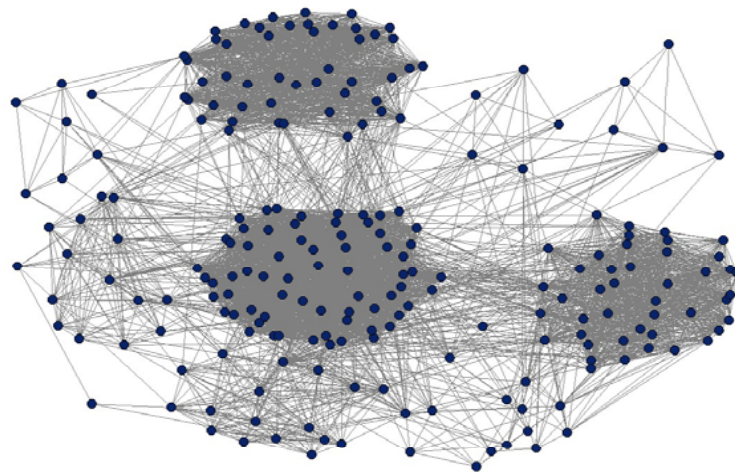
- Controversial innovation = the superiority of the innovation is ambiguous and (partially) resisted.
- Principle of peripheral dominance = change is more likely if innovation is seeded in peripheral cluster
- Viscosity = rate of interaction between clusters or groups in a network
- Principle of optimal viscosity = sparse or moderate connectivity with other clusters is most likely to gradually turn non-adopters in adopters.

# Structural advantage of the periphery



## Local inter-unit knowledge transfer

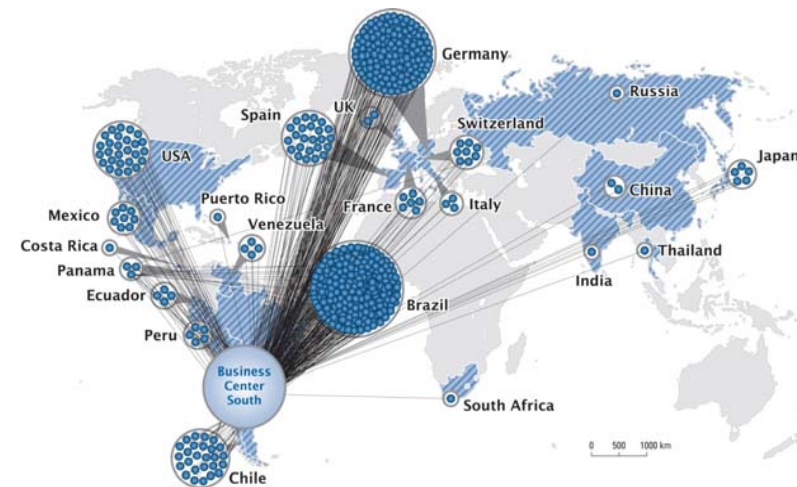
*Who of your colleagues has been an important source of knowledge for you and has helped you solve work-related problems in the past?*



- Dense inter-unit knowledge transfer (EI-Index = .094)
- Closeness to other competences in the firm because Knowledge transfer transcends organizational units  $R^2(\text{unit*Knowledge exchange}) = 0.03$

## International knowledge transfer

*Please, think of other colleagues within the global corporation who have been a source of new knowledge and expertise to improve your work. Please indicate their names.'*



- Moderate international knowledge transfer (EI-Index = -0.450)
- 60% of people with at least one contact, 9% predominantly international.
- People with high local prestige (*indegree*) were more innovative and better connected to international colleagues

# Conclusion



- Personal knowledge transfer is the single most important source of know-how development and knowledge circulation in firms.
- The formation of personal relations of knowledge transfer is considerably constrained by organizational aspects: location and hierarchy
- Because of sparse global interconnection expertise-based firms may leave large part of their knowledge potential unleveraged, existing knowledge is invented here (again)
- What's worth a peripheral subsidiary other than a dispensable pecuniary contribution to global revenues?
- Peripheral units of an organization may enjoy three advantages: proximity to a specific local market, closeness to (un)related competences in co-located functions and divisions, and limited visibility from the center.
- The periphery may thus be a repository of experimentation and entrepreneurial venture as well as a seedbed for the diffusion of controversial and challenging innovations.