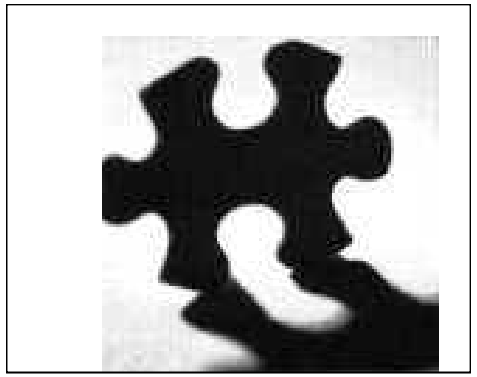


Hard measures and soft issues:

a potential model for incorporating metrics into cluster based analysis

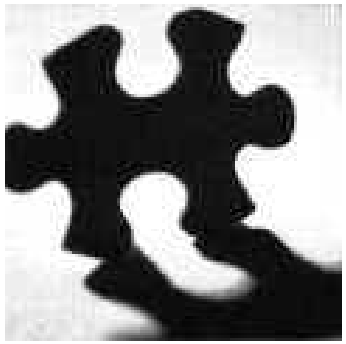
Innovation Systems Research Network

4th Annual Meeting

Ottawa, Ontario

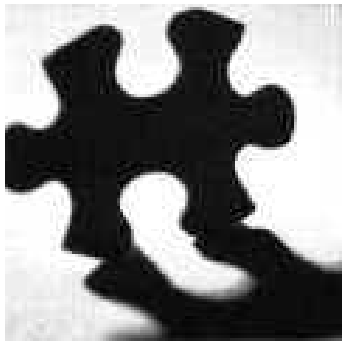
Tara Procyshyn and Cami Ryan

Narrative——Metrics



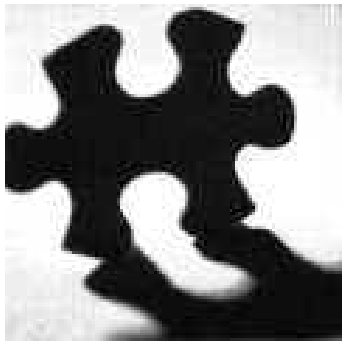
- Primarily ***soft*** data -- qualitative
- Data used mostly to support narrative stories
- Some qualitative data used to:
  - correlate firm performance
  - estimate national economic performance

Narrative——Metrics



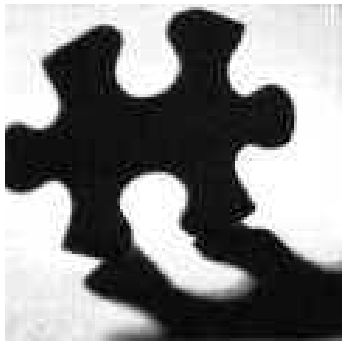
- Mainly ***institutional*** aspects have been analyzed in cluster analysis **but…**
- ***Functional*** aspects are also implicit integral parts of the cluster dynamic
- Interaction creates the regional picture, with each component a separate piece in the “cluster jig-saw” (Martin & Sunley 2002).

The Metrics “Puzzle”



- “Pieces”:
  - Theodorakopoulous & Kalaitzandonakes (2001)
    - Density and Centrality
  - Ryan & Phillips (2003)
    - Activity Based Analysis (ABA) approach

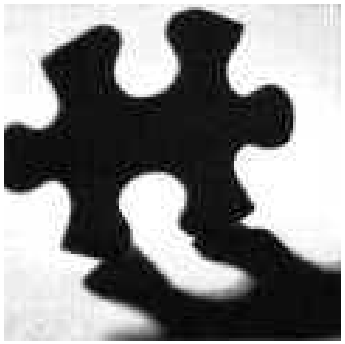
Theo & K

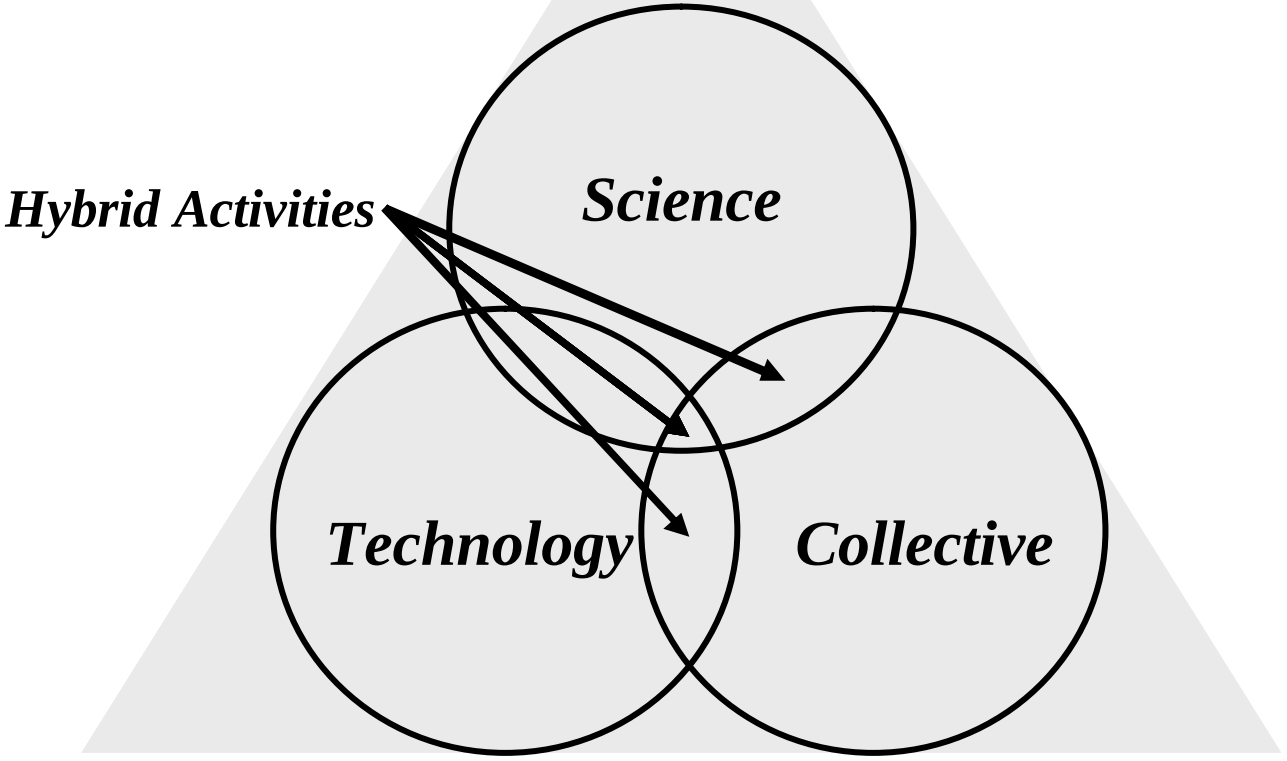


- A comparison of EU & US public-private knowledge networks in plant biotechnology
- Utilize measurements of density and centrality
- **Benefit**: strong basis for comparison!

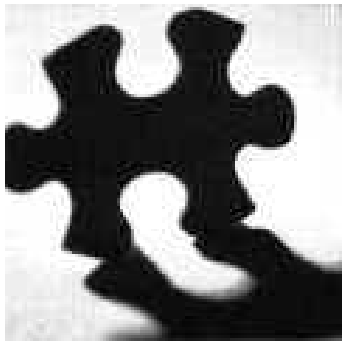
Ryan & Phillips

Activity Based Analysis



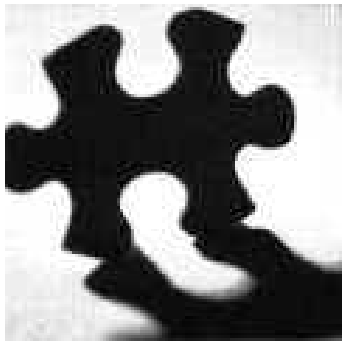


Methodology



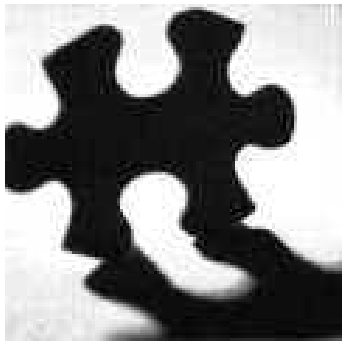
- Density and centrality measures allowed to quantify and analyze relations at the cluster level
- We expand measures to include functional parameters
  - R&D – Services – Financial Exchanges – High Quality Personnel – Networking
- N = 95
- Eight *core* actors were analyzed

Organizational Breakdown within Region



	Public	***Private***	***Collective***	***Quasi***
Whole Network (N=95)	37 (39%)	38 (40%)	10 (10.5%)	10 (10.5%)
Core Network (n=8)	5 (63%)	---	1 (12%)	2 (25%)

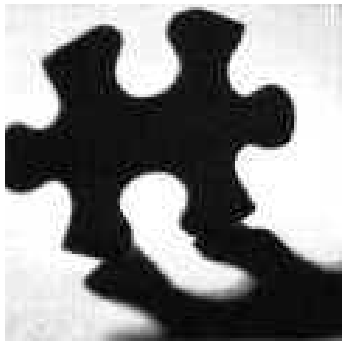
Network Density



- Density - “characteristic of the entire network, is a proportion that is calculated as the number of all ties occurring the matrix divided by the number of all possible ties.” (Knoke and Kuklinski 1982)

$$Density_{Local} \; ? \; \frac{2L}{N(N \; ? \; 1)}$$

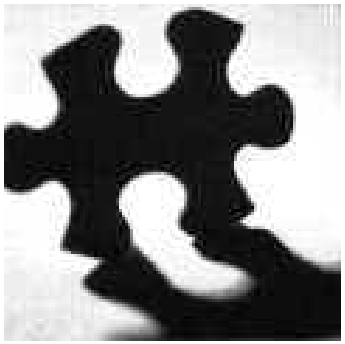
Density Results



- Across all functions, core actors (8) have an average of 85 connections
- Overall network density is 7.59% (678 of a possible 8,930)
- Compare with Theo & K (2001) results:

	# Links	***Core Network Density***
US	9	9%
EU	37	59%

Aggregate* Network Density by Function



R&D	*Services*	*Financial*	*HQP*	*Networking*
2.3%	1.9%	1.4%	1.8%	8%

* limited to core actors

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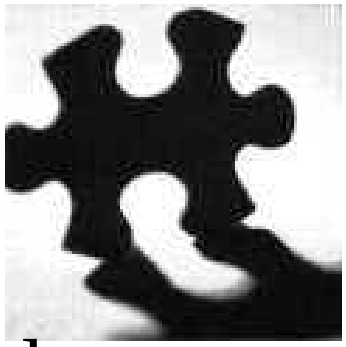
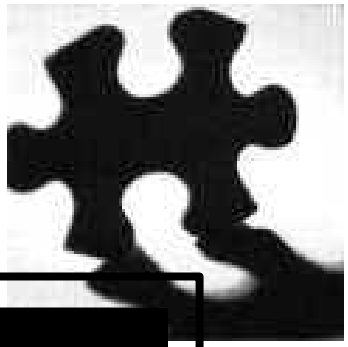
Centrality



- Refers to the importance of a particular actor and the degree of centralization of an entire network
- Measures are used to "describe and measure properties of *actor location* in a social network" (Wasserman and Faust 1994)

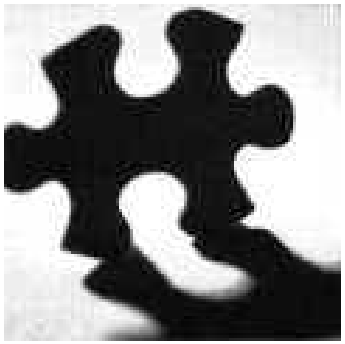
$$Centrality \; ? \; \frac{? \; x_{ij}}{N \; ? \; 1}$$

Centrality by Functional Linkage



	Ranges	***Actors***
R&D	0 – 39%	U of S NRC-PBI NRC-IRAP
Services	0 – 43%	NRC-IRAP
Financial	0 – 34%	NRC-IRAP
HQP	0 – 27%	SRC NRC-IRAP
Networking	0 – 97%	AgWest

Dilution Factors
“Noise”



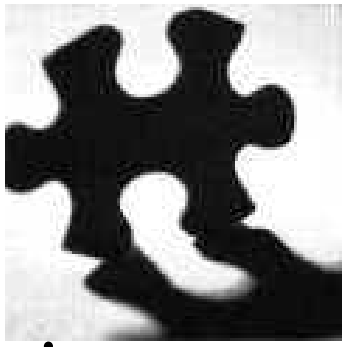
$$Dilution_{PEOPLE\ FIRM} = \frac{N}{CommFirmPop^*} = \frac{95}{12{,}000} = 0.0079$$

$$Dilution_{INSTITUTION} = \frac{N}{CommInstPop^*} = \frac{3000}{213{,}000} = 0.014$$

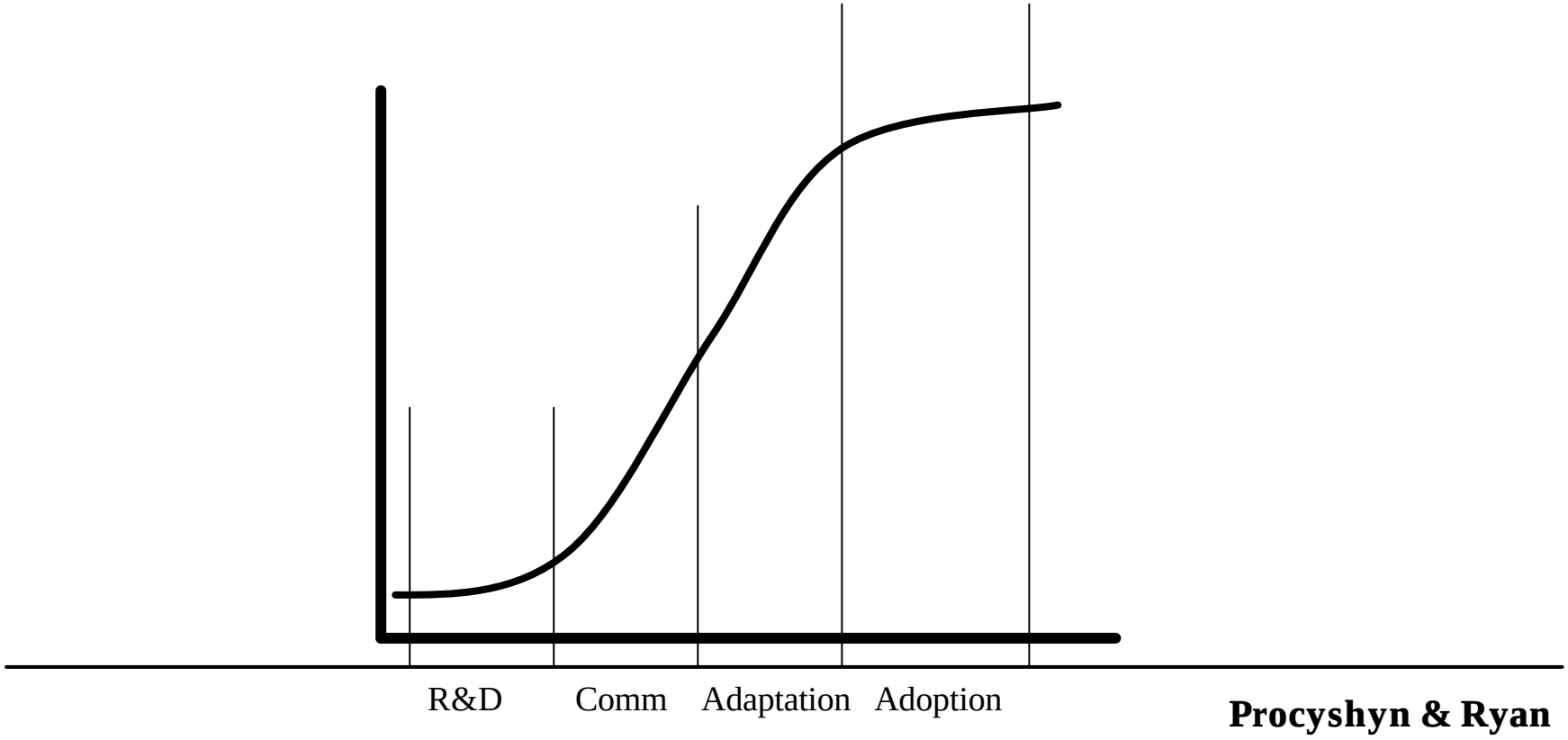
$$Boffins'\ Factor = \frac{\#ofEmployeesInCluster}{WorkingPopulation} = \frac{3000^*}{80{,}000} = 0.0375$$

*Beggs 2003 and authors

Clusters & the Industry Life Cycle

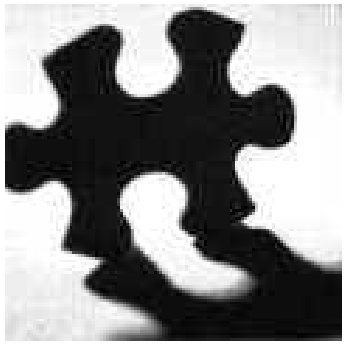


- R&D – Commercialization – Adaptation – Adoption

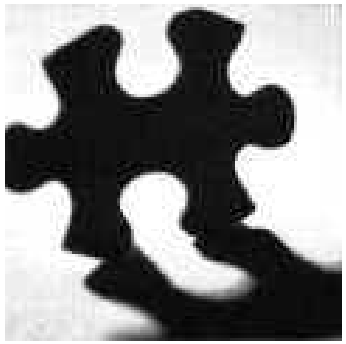


Procyshyn & Ryan

Applications



- Dependent variable against which we can evaluate answers to the survey
- Apply across multiple clusters or innovation systems



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