Critique of Current Network Studies: Not Measuring Complex Nodes, Project Integration and Gaps in the Idea Innovation Network

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Mapping Networks, Detecting Problems

➢Relevance to crisis of innovation

  ➢Help identify gaps in the (network)connections between scientific breakthroughs and industrial innovation

➢Relevance to evaluation

  ➢Checklists of what to map and what to measure for networks

➢Relevance to theory

  ➢Builds on idea innovation theory and tries to understand causes of gaps in the network

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Why Should We Care About Networks?

- Advantages of networks are considerable (Brass et al, 2004)
  - Enhanced learning
  - More efficient use of resources
  - Increase capacity to plan for and address complex problems
  - Greater competitiveness
  - Better services
- Key structures for linking macro and micro and transfer of tacit knowledge
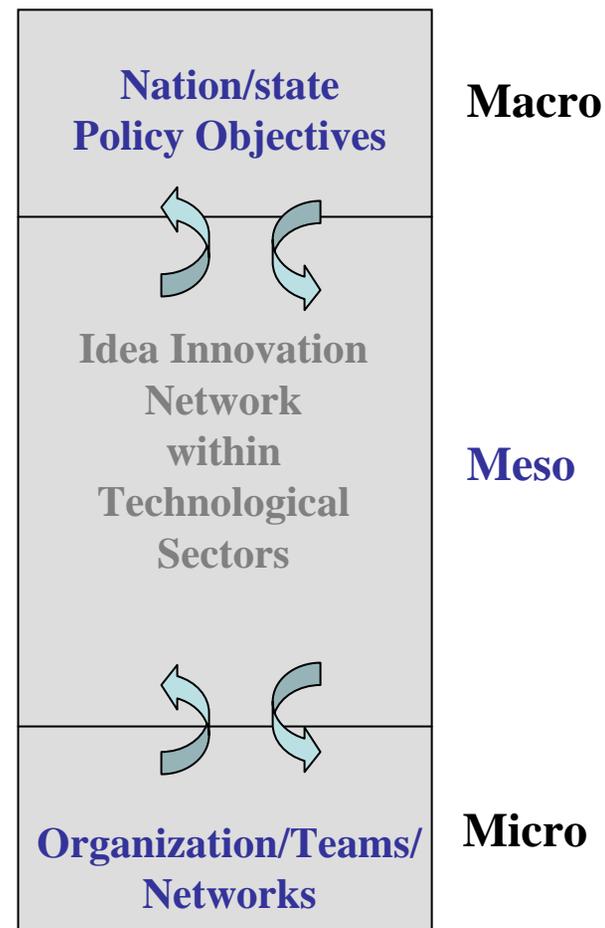
How Much Do We Know?

- Still relatively little known about overall functioning of networks (Provan and Kenis, 2008, Mote et al, 2007)

- Network functioning – process by which certain network conditions lead to network-level outcomes
  - Need to distinguish between the network and network outcomes.

- In RTD evaluation, need for a theory that encompasses networks in the national innovation system
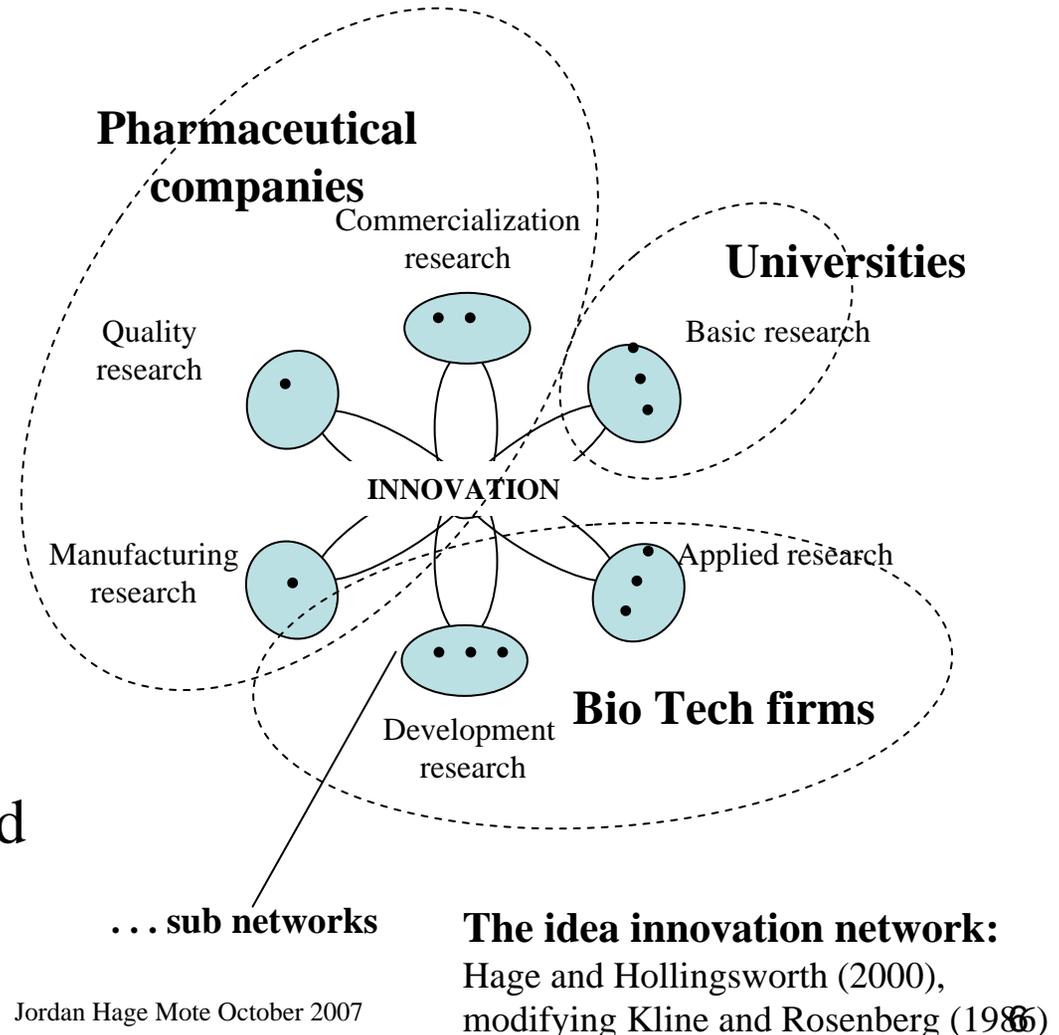
Where do networks fit in?

Focus on the technology sector

- Mission and policy decisions are often sector specific (e.g. semiconductors)

- Policy impacts differ by sectors because sectors differ in:
  - Amount of investment by RTD arena
  - Rates of technical change

- Meso level connects macro with micro

- Bottlenecks can be spotted more easily here

Nation/state Policy Objectives — Macro

Idea Innovation Network within Technological Sectors — Meso

Organization/Teams/ Networks — Micro

Idea Innovation Network Theory

- Six arenas of RTD

- For successful introduction of new product/ mission RTD advance can occur in one or more arenas

- Ideas move between arenas

- As RTD funding grows, knowledge becomes more differentiated and organizationally segregated

- Intra- and Inter- organizational networks transfer tacit knowledge

Pharmaceutical companies

Commercialization research

Universities

Basic research

Quality research

INNOVATION

Manufacturing research

Applied research

Development research

Bio Tech firms

. . . **sub networks**

The idea innovation network:
Hage and Hollingsworth (2000), modifying Kline and Rosenberg (1986)

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Mapping and Measuring the Idea Innovation Network

What to map and measure?

➢ Amount of money in each arena

➢ Number of researchers in each arena

➢ Number of linkages between researchers/research organizations within each arena

➢ Strength (and type) of linkages

What are the gaps in social network theory?

- Measurement

  - What are the appropriate ties for knowledge networks?
    - Collaboration, communication, project, etc?

  - Tends to overlook the strength of network ties
    - For example, collaboration, but how much and how measured?

  - Multiplexity
    - People exist in multiple networks, some times in conflict with each other, i.e. research networks and resource networks

What are the gaps in social network theory?

- Network Structure

    - Typically focus on egocentric networks, rather than overall network.
        - What is the overall network? Idea Innovation Network.

    - Not clear what optimal network structure might be
        - Do we need to know as long as linkages to all six arenas?

Meso level (network) questions – Performance and connectedness

Questions

- Technical achievement in real time in each arena (connected to sector performance)

- Overall sector socio-economic performance (new sales in product mix, speed to develop, how radical/broad)

- Strength of networks between differentiated arenas, among small organizations within arena

Given mission and technical/market opportunities, theory suggests

- Reasons for poor performance at 3 levels

- Where to increase transfer of tacit knowledge

Evaluation implications

- Build on existing output measures and peer review

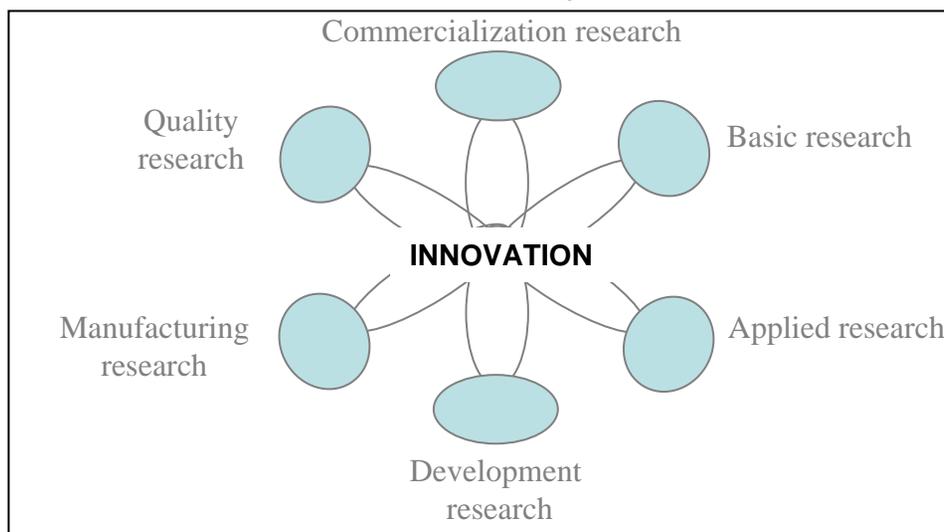– Gather comparative sector data to establish knowledge transfer with forms of connectedness

All these work together…Meso level (networks) is critical for achieving policy objectives and effectiveness

High risk capital – available where

Capabilities – Level, mix, availability

Modes of coordination – effective?

Macro- Institutional Rules as they affect the sector

Meso - Performance by sector and arena

Commercialization research

Quality research

Basic research

INNOVATION

Socio economic outcomes

Manufacturing research

Applied research

Technical progress

Development research

Network connectedness

if not, check for bottlenecks

Micro - funds allocation by arena and profile

RTD arenas – are there sufficient funds

Portfolios - need more/ less radical, large scope?

Organizational profiles – do attributes match the profile?

Summary and Conclusions

- Strengths of our approach
  - Theories-based, using idea innovation network at meso level
    - Able to connect micro with macro levels
    - Indicators help identify network gaps and suggests how these occur
    - Raises questions, will help build theory, including effectiveness of market mechanism for transfer of tacit knowledge and ways to break path dependency
- Proposed framework indicates what might be done, and can guide further discussion and study on networks in evaluation.

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We welcome comments, suggestions

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