Mapping the Growth of Transdisciplinary Partnerships over Time in a Large Scientific Initiative

Bobbi J. Carothers, Douglas A. Luke, Amar Dhand, Sarah Moreland-Russell, Cathy C. Sarli, Bradley A. Evanoff

Washington University Institute of Clinical and Translational Sciences Tracking and Evaluation Team

International Network for Social Network Analysis

2/22/2014

Why team science?

- Increasing trend of team science
- Modern scientific challenges likely to require approaches that cross disciplinary boundaries [1,2,3]
  - Obesity
  - Smoking
  - Alzheimer's
  - etc.
- Focus of *science* of team science is to study large-scale collaborations

1. Borner et al., 2010
2. Falk-Krzesinski et al., 2011
3. Stokols et al., 2008

Project Goal

- Clinical and Translational Science Award (CTSA)

- CTSA at Washington University in St. Louis: Institute of Clinical and Translational Sciences

- CTSA Goal: "To promote the translation of the results of clinical and translational research into practice and public policy" [1]

    - CTSAs should:

        - "Emphasize interdisciplinary team-based approaches in training, education, and research"

        - "Strengthen collaborations across the schools and disciplines in their home institutions" [2]

- Evaluation goal: are grant and publication collaborations becoming more cross-disciplinary over time?

- Network analysis is the appropriate tool to examine relationships

1. https://www.ctsacentral.org
2. IOM, 2013

Institute of Clinical and Translational Sciences

- Began in late 2007
- Goal: to promote & facilitate collaborative research
- Provides access to 24 core units
  - Human Imaging
  - Research Design & Biostatistics
  - Clinical Trials
  - etc.

METHODS

Participants

- ICTS members
- Formal membership required to gain access to services
- Online application → member database
  - Membership date
  - Discipline (from NIH Field of Study)

Join ICTS Today!
Benefits for eligible researchers and their collaborators include:

- funding opportunities
- research services
- education programs

Register Now »

Data Collection

- Grant submissions
  - University grants & contracts offices
  - ICTS member key personnel
  - New submissions from 2007-2010
  - Federal, state, local, & foundation sources
  - Grants, contracts, programs, & sub-agreements
- Publication co-authorships
  - Scopus search on ICTS members
  - 2007-2011

Analysis

- Longitudinal designs
  - Cohort model: compare original cohort (members in 2008) over time
  - Growth model: include entire membership as individuals are added
- Standard network descriptive statistics
  - Density
  - Average degree
- Modularity [1]
  - Community detection
  - Community ←→ scientific discipline
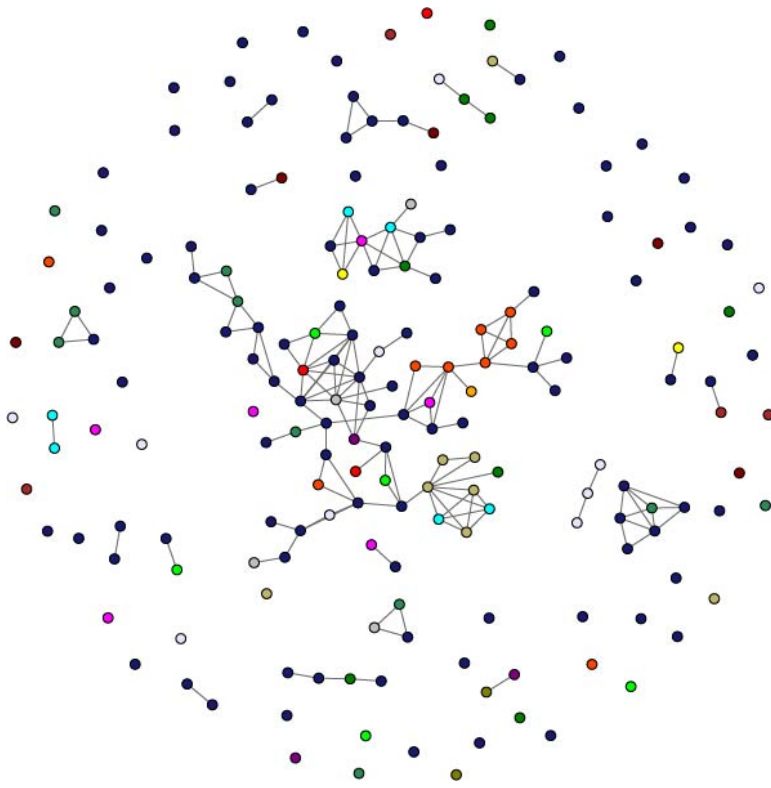 - Expect to see *decreased* levels over time

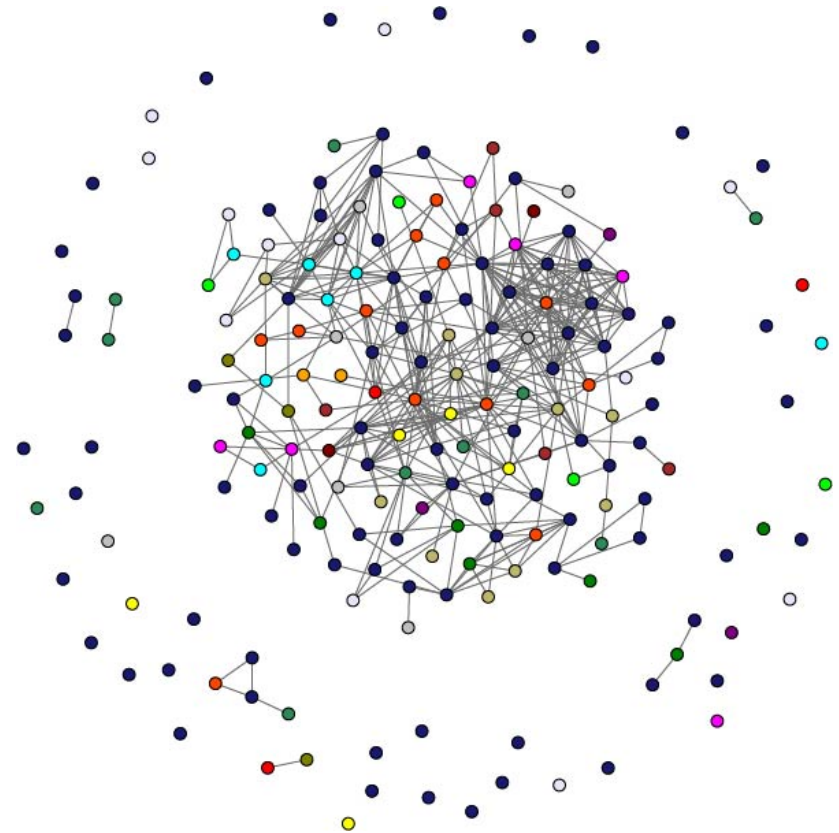1. Newman & Girvan, 2004

RESULTS

Grant Submissions

2007

2010

Grant Submissions

Year	Size	Density	Ave. Degree	Modularity	Δ Modularity
Cohort Model					
2007	186	.009	1.65	.140	
2010	193	.023	4.41	.054	- 61%
Growth Model					
2007	186	.009	1.65	.140	
2010	493	.011	5.51	.071	- 49%

Publication Co-authorships

2007
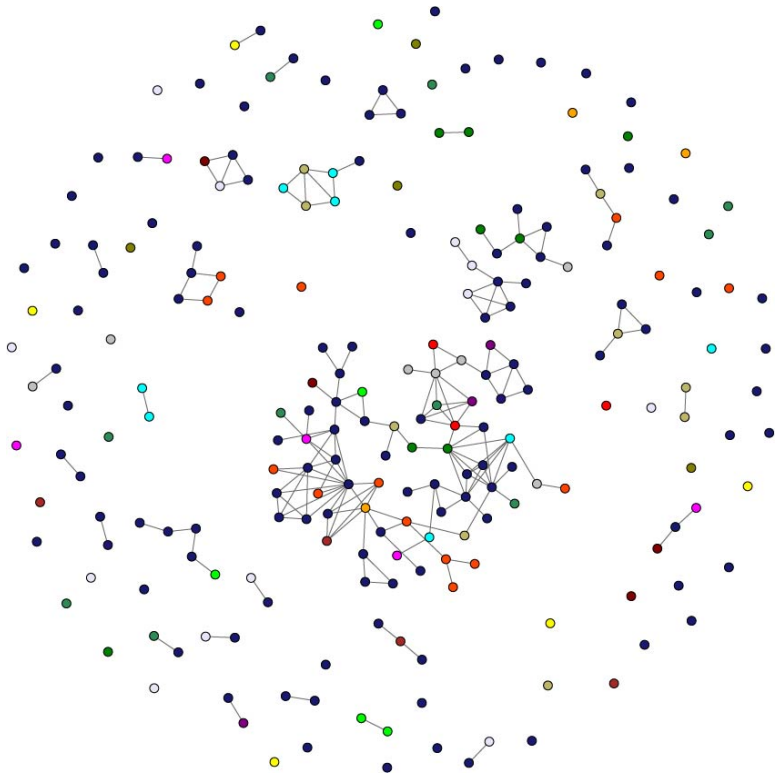
2011
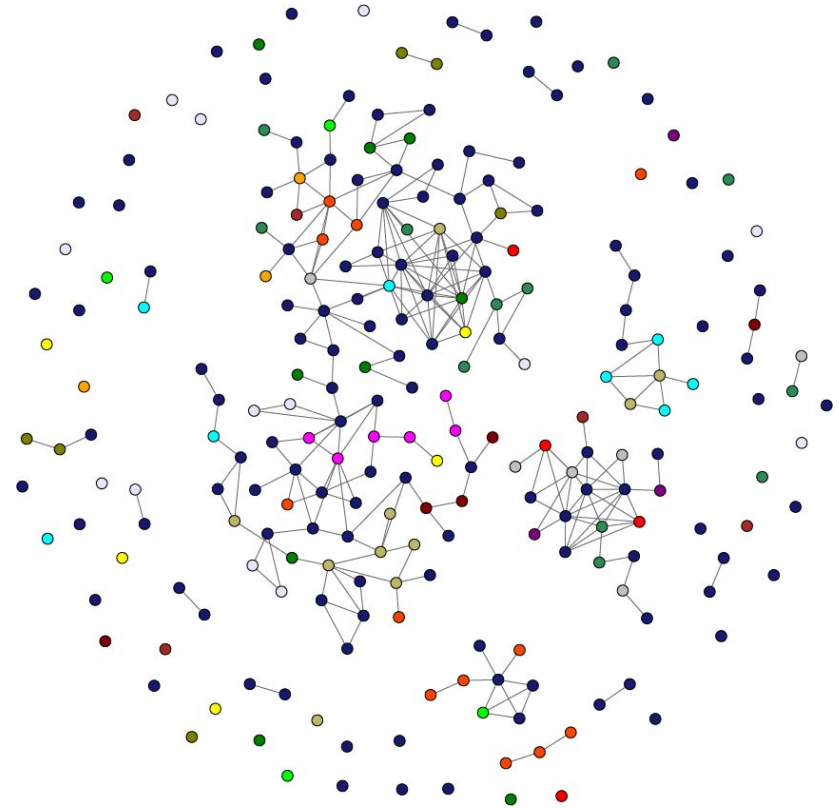
Publication Co-authorships

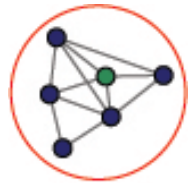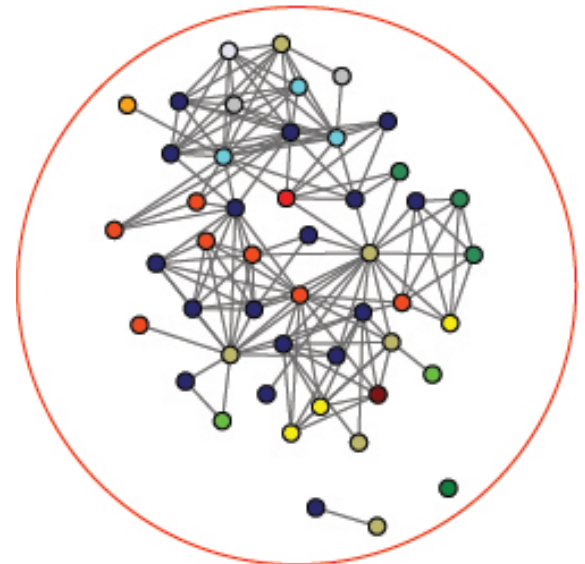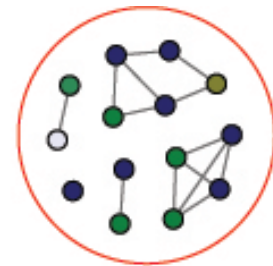| Year	Size	Density	Ave. Degree	Modularity	Δ Modularity
Cohort Model					
2007	224	0.007	1.61	0.093	
2011	234	0.009	2.14	0.071	-23%
Growth Model					
2007	224	0.007	1.61	0.093	
2011	833	0.004	3.57	0.125	35%

2007 Grants

2007 Grants

Evolution of Collaboration

2007

2010

DISCUSSION

Network Development

- Generally speaking, collaboration became more cross-disciplinary over time
- Pattern was stronger for grants than publications
    - Publications can take many years
    - Any change after 4 years is encouraging
- Pattern was stronger for Cohort model than Growth model
    - More recent cohorts tend to be younger
    - Greater pressure for them to publish in their own field until obtaining tenure

Network Analysis and Evaluation

- Use of standard network statistics (average degree) good for examining general increase in collaborations

- Use of modularity measure was crucial in examining the success of the ICTS goal of increasing rates of *cross-disciplinary* collaboration

- Next steps
  - Collect more current data
  - Longitudinal SIENA models: significance testing

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Acknowledgements

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Questions?

Bobbi Carothers

bcarothers@wustl.edu