Understanding Impacts of Social Network Interventions on Engineering Project Outcomes

NSF-EDSE PROGRAM / CMMI 1825678

Project Timeline: September 1, 2018 - August 31, 2021

Grant Amount Including REU Supplement: $433,839

2019 NSF Workshop for Engineering Design and Systems Engineering (EDSE)

Positioning EDSE Research for Sustained Societal Impact

Purdue University

West Lafayette, Indiana

October 7-8, 2019

MICHIGAN STATE UNIVERSITY

PROJECT TEAM

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Construction Engineering

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Professor
Measurement and Quantitative Methods
Department of Counseling, Educational Psychology and Special Education

Social Networks & Quant. Methods

Can manipulating interactions across disciplinary and organizational boundaries in complex engineering projects improve outcomes?

Central Hypothesis

Social network interventions provided within critical episodes of complex engineering projects will improve performance

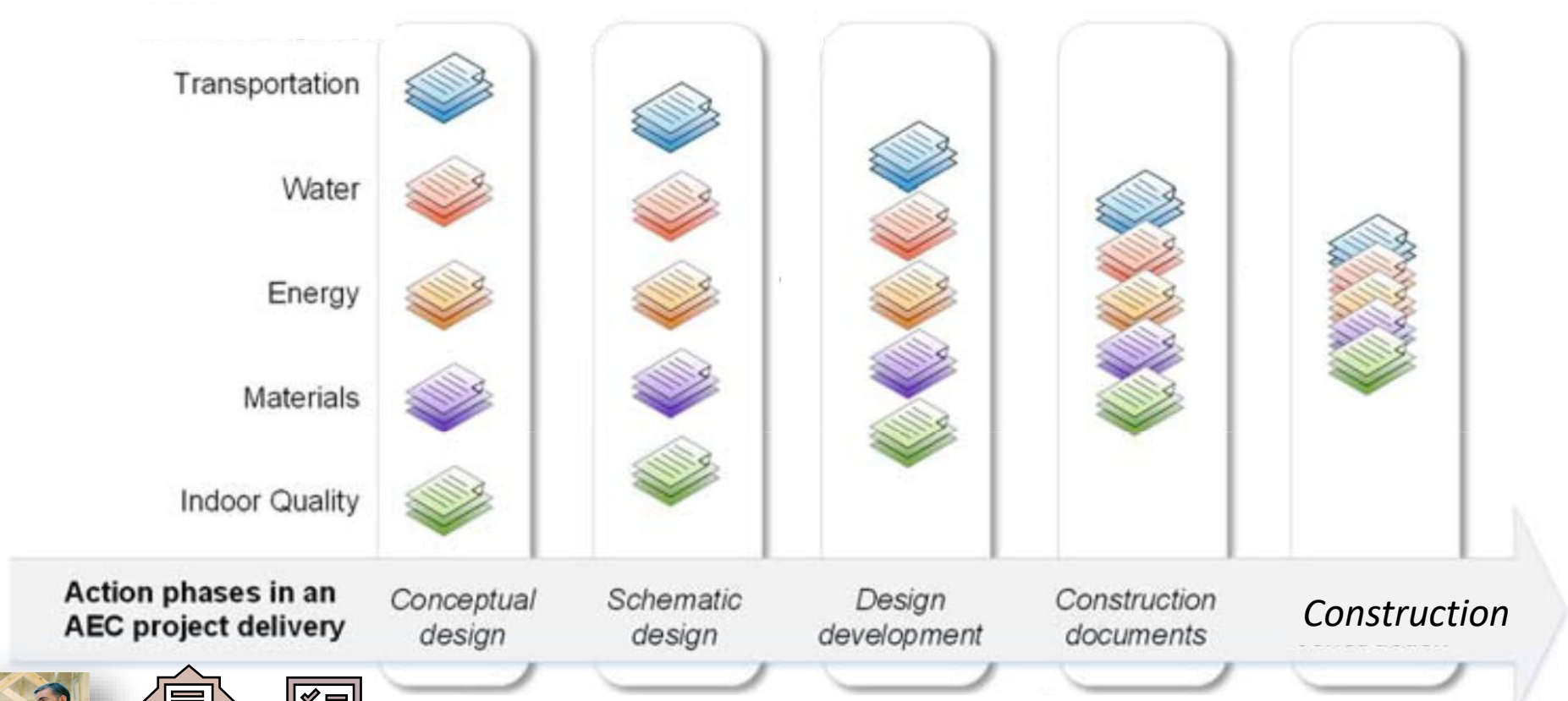
2 Architecture, Engineering, and Construction (AEC) projects:

- Timeline: 2 years
- Budget: About $20 M
- Teams: Over 150 individuals from 10-20 organizations at any given time
- LEED certifiable – Sustainable Built Environments

Control Group

Treatment Group

Methods and Work to Date



Observational Data

Emails

Archival Data

Documents analyzed (meeting minutes): **450 pages**
Project meetings attended: **78 meetings**
Team Research Meetings Held: **35 work sessions**
# of people we surveyed: **120**
# of individuals in these project teams: **750**
# of emails analyzed: **250,000**

Research team involved since December 2018

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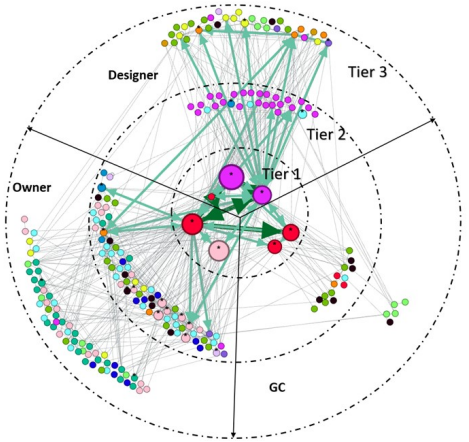
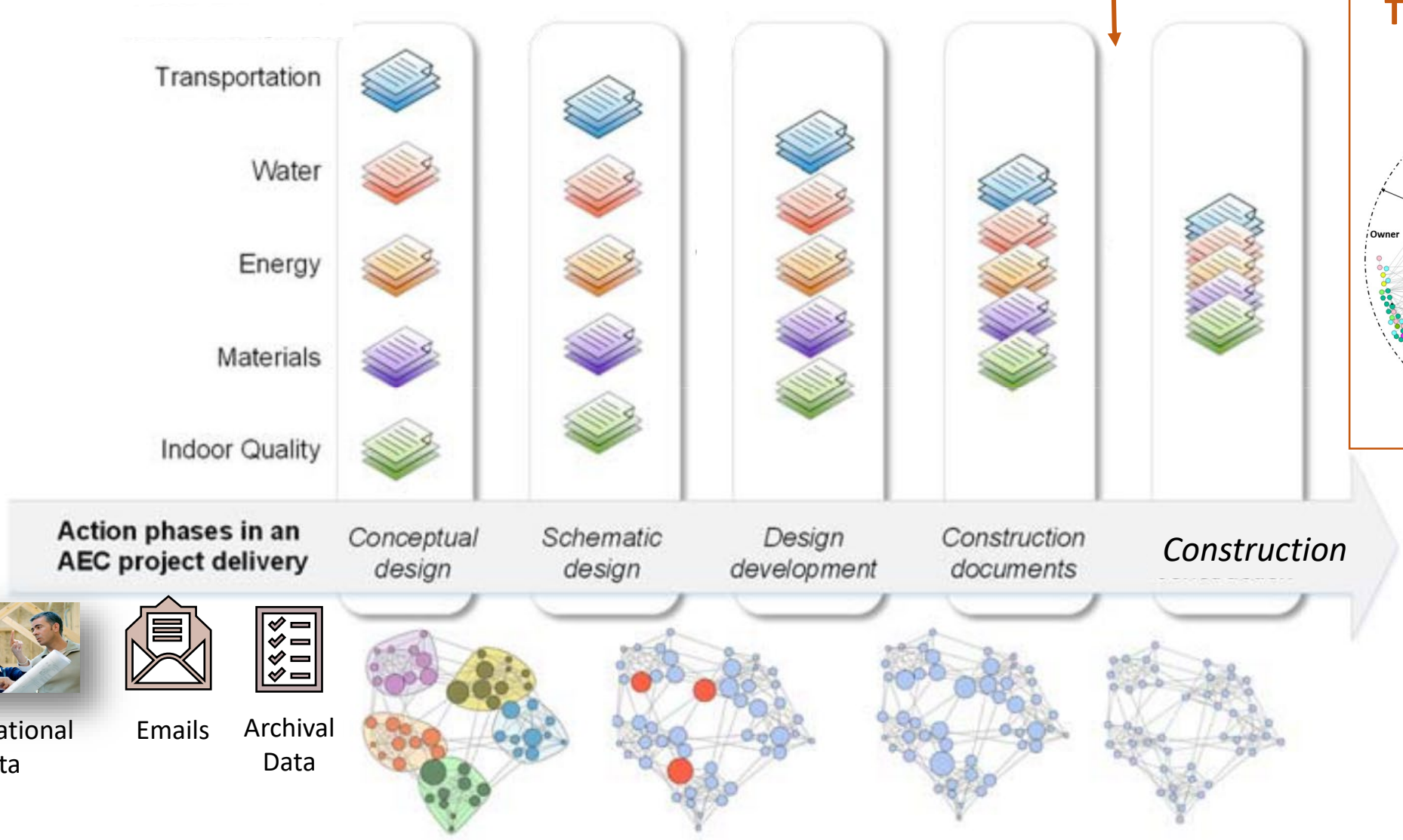
Methods and Work to Date

Social Network Interventions for the Treatment Project





Observational Data

Emails

Archival Data

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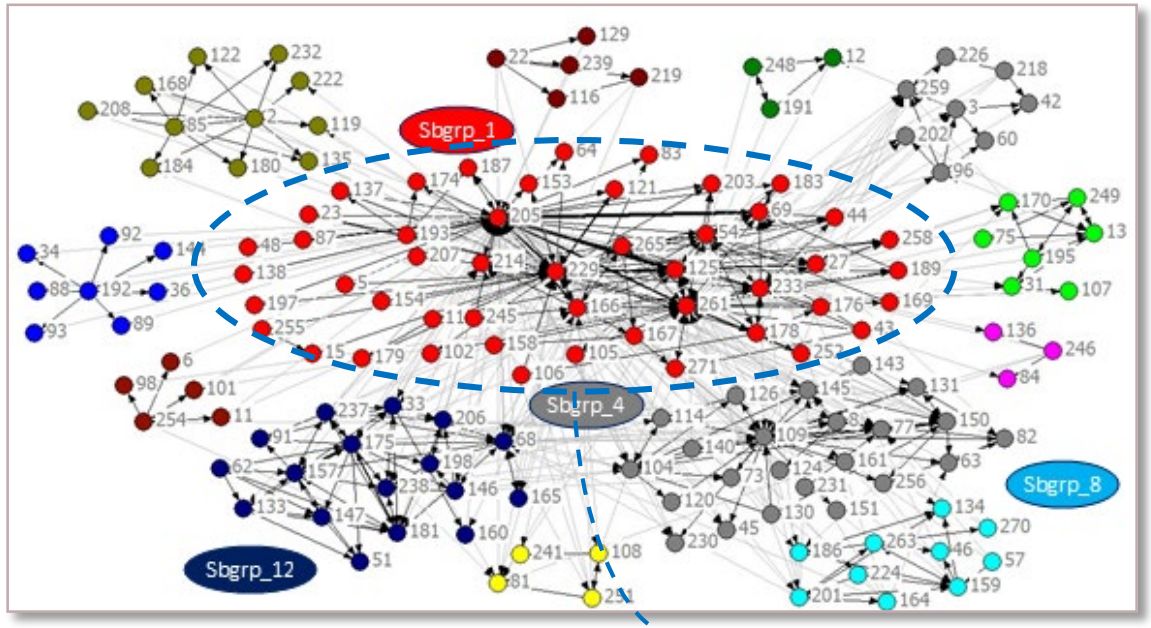
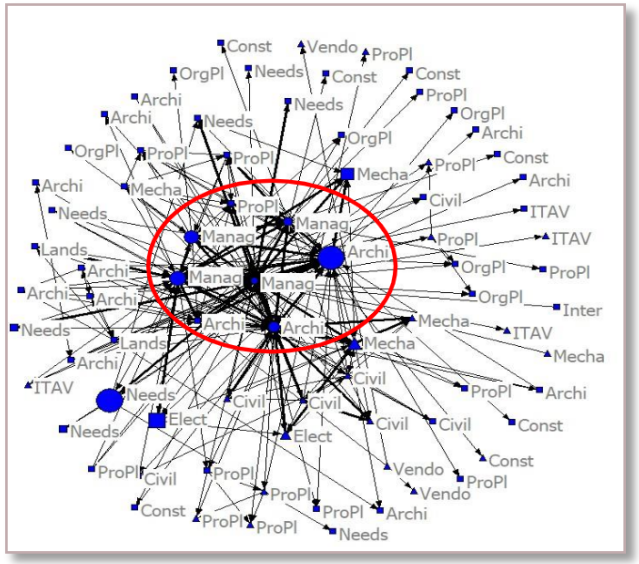
Significant Results to Date

- Project X - 6 month of construction
  - hybrid network composed of:
    - subgroups(KliqueFinder)
    - a number of core-periphery structures (UCINET) nested in those

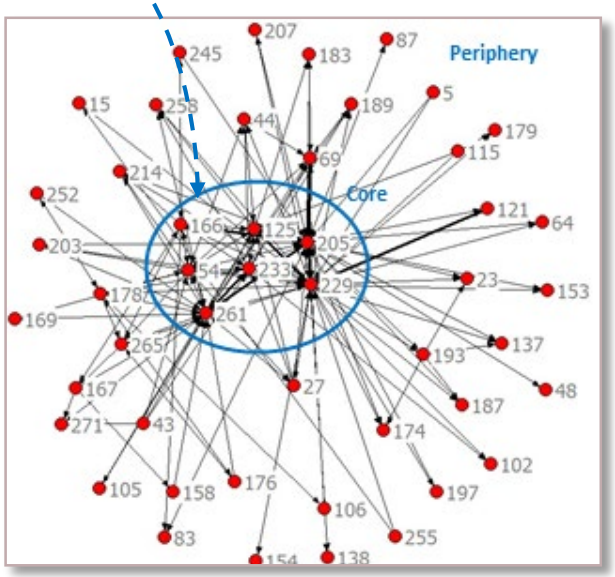


PROJECT X (Subgroups showing Core-Periphery structure)

- Project Y - 3 months of schematic design
  - core periphery network



PROJECT Y (Core-Periphery)



PROJECT X (Core-Periphery)

Evidence for **dynamic networks**

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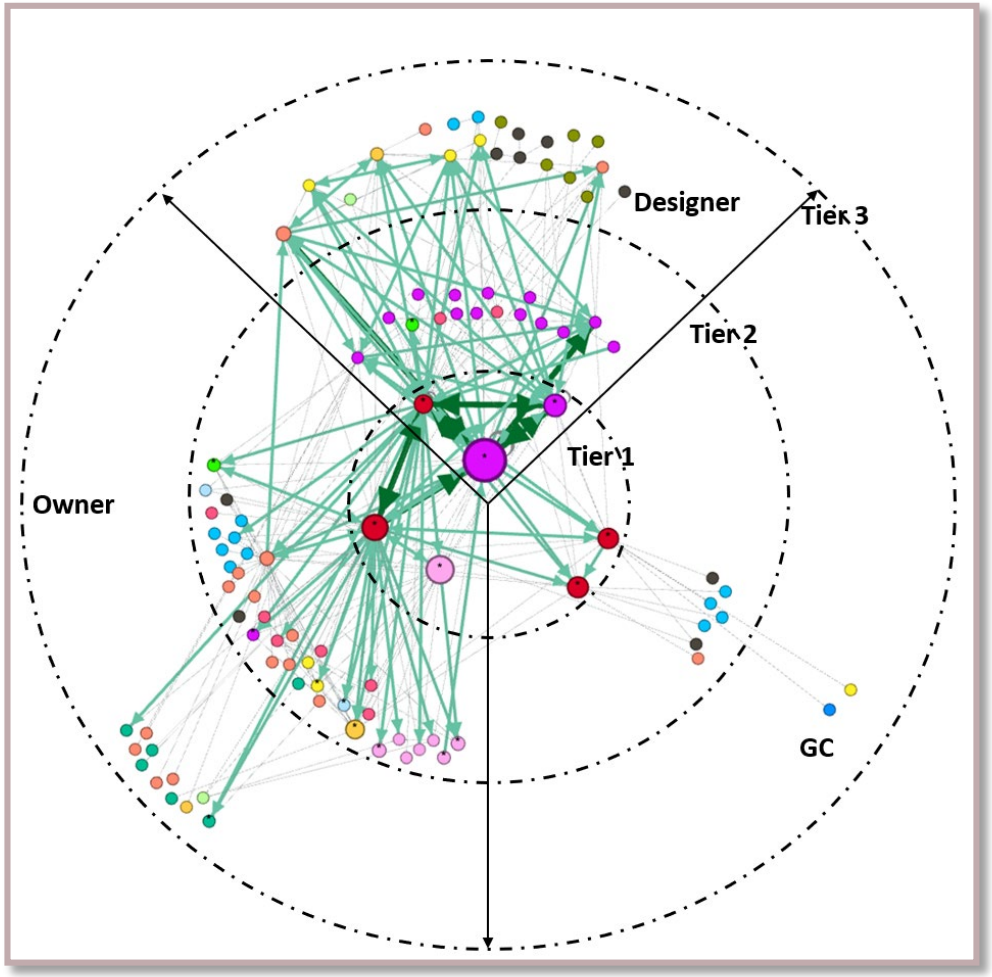
Significant Results to Date

- Intensified communications across tiers
- High number of triadic patterns
  - involved three members from at least two different tiers
- Fastest time to resolve issues when dynamic communicators are in lead.

Evidence for useful **communication network features** for complex engineering projects



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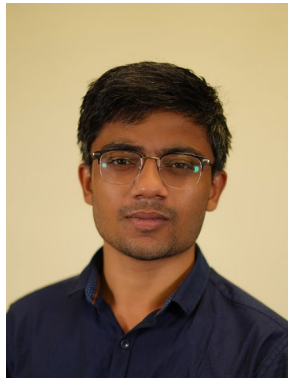

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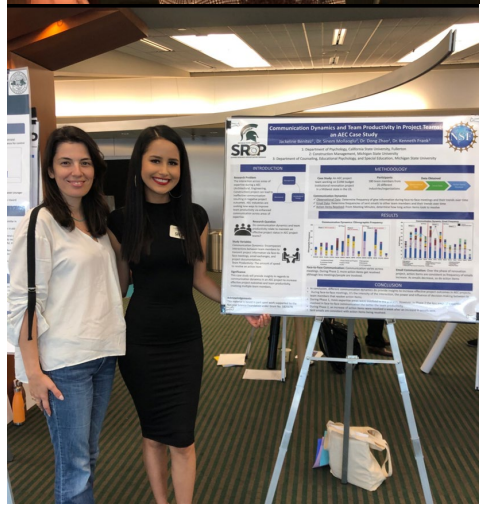

SROP Student at MID-SURE, Summer 2020

Undergraduate Students at University Research Forum, Spring 2020

Products

Papers

Garcia-Cortes, A. J., Duva, M., Mollaoglu, S., Zhao, D., Frank, K., Benitez, J. (2020). "**Expertise Flows and Network Structures in AEC Project Teams**." ASCE Construction Research Congress, March 8-10 2020, Tempe, AZ. Accepted.

Impacts

- 1 Research Associate, 1 PhD , 1 Masters, 10 UGs.
- 7 minority UGs (5 - gender ; 2 - gender & ethnic background), 3 from outside of CM discipline.
- AEC & Other Industries

Other Products

- Learning Modules
- Web-based Game

https://iopt4.msu.edu/index.html

Questions? **sinemm@msu.edu**