

Resilient International Teams: Diversity and Inclusiveness

G.A. Kiker¹ , I. Linkov^{1,5}, B. Trump^{2,5}, E. Odera³ and O. Walther⁴

¹ Dept of Agricultural & Biological Engineering , University of Florida

² School of Public Health, University of Michigan

³ Feed The Future Innovation Lab For Livestock Systems, University of Florida

⁴ Dept of Geography, University of Florida

⁵ Engineer Research & Development Center, US Army Corps of Engineers

International Teams and COVID-19

- SARS-CoV-2 has impacted ... everything...
- Even “post-COVID”, there are questions about teams and interactions
- COVID significantly disrupted many international teams, especially those focused on basic and applied research in developing countries.
- Collaborative groups at all stages of development are impacted, including long-standing teams and recently established teams
- COVID exposed significant gaps in the **formation**, **functioning** and **sustainability** of international teams
 - Teams are often constructed on an *ad hoc*, *discipline-compelled* basis to compete for funding opportunities.
 - Successful international research teams are built on the basis of **efficiency** in satisfying funding priorities, past successful alliances, ease of communication and similarity of institutional culture.
 - Such teams may not be **inclusive and diverse** beyond a superficial level required by funding priorities.
- Efficiency vs resilience? How much of each?

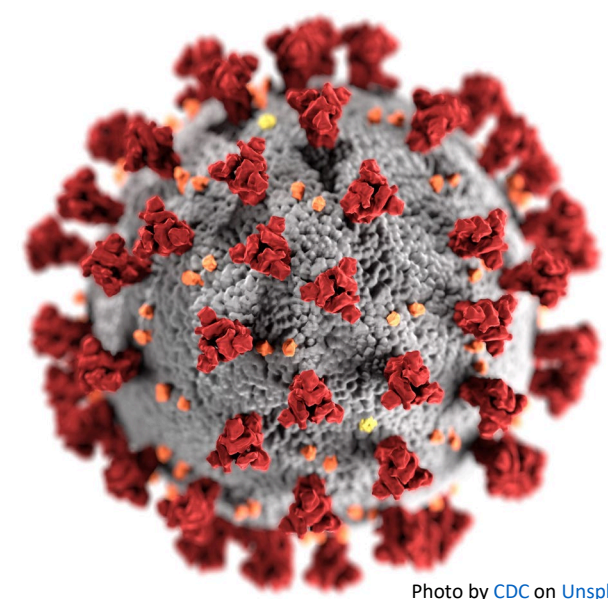


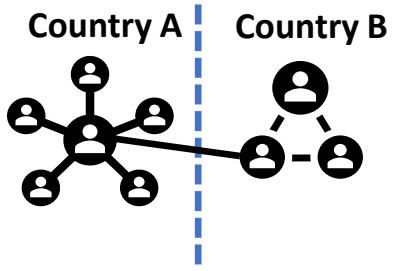
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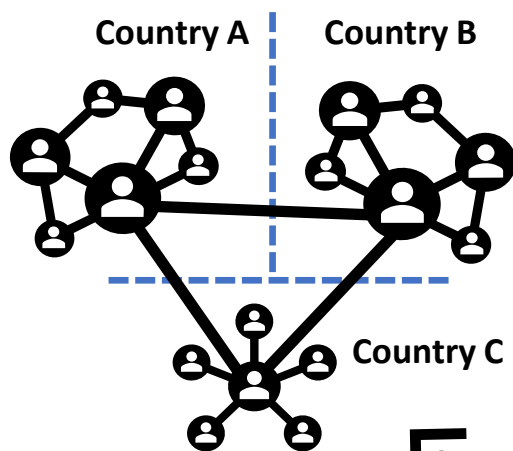
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Our NSF-EAGER project focuses on the role that diversity and inclusion can play in conferring resilient qualities to international teams.

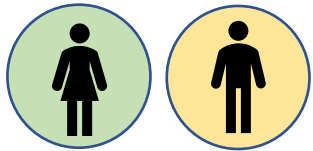
Smaller, efficient team



Larger, comprehensive team

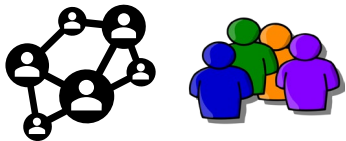


Individual Metrics



Worldviews, beliefs, values, personality, skills/training/discipline, productivity

Team Metrics



Diversity, inclusion, synergy, communications, productivity, budget

Institutional Metrics



Rules, procedures, Risk aversion, productivity, budget

Resilience Challenges



Volatility



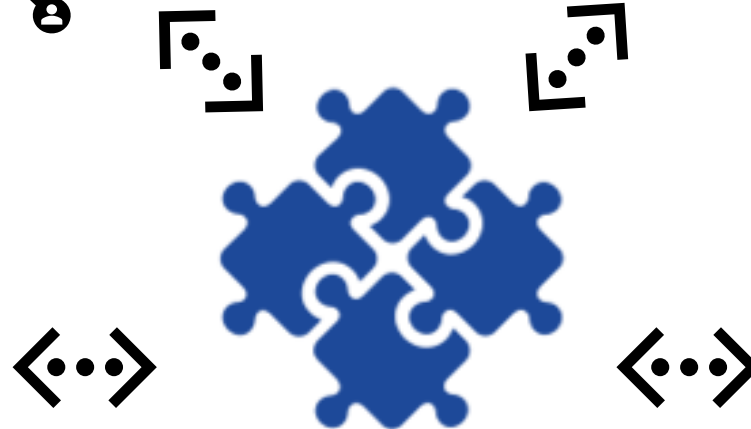
Uncertainty



Complexity



Ambiguity



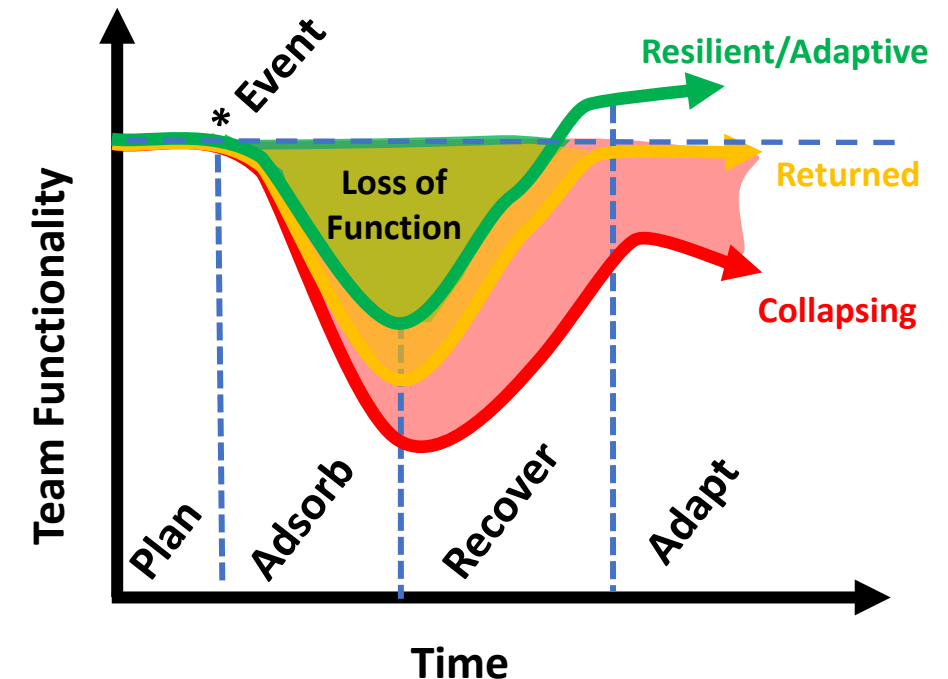
Integration Tools

Team Surveys

Social Network Analysis

Multi-Criteria Decision Analysis

Adaptive, Co-Evolutionary Network Simulation



Linkov, I., Trump, B. and Kiker, G., 2022. Nature Palgrave Humanities and Social Sciences Communications, 9(1), pp.1-5.

Methodology

- Analyze three international research teams at UF
 - **Small, new research team** (7-22) Ghana Land Use Planning (GALUP) Nasa/USAID-funded (<http://galup.cersgis.org/>) (3 yr, 600k)
 - **Medium, regionally established team** (10-15) Sahel Research Group (<https://sahelresearch.africa.ufl.edu/>) (ongoing, DoD, OECD...)
 - **Large global team** – USAID Feed the Future Livestock Systems Innovation Laboratory (<https://livestocklab.ifas.ufl.edu/>) (10 years, \$49M) Mgt (10-15) with 200+ funded researchers (6 countries across Africa and Asia)
- Review performance metrics at individual, team and institutional levels
- Survey analysis of team members' response to COVID
- Social Network Analysis (surveys and publishing relationships)
- Simulation Modeling (Adaptive Networks + MCDA)



GALUP



SRG

UF | LSIL

Team Survey Example Results

Perceived Change in Team Ability to Respond to Challenges



Respondents were asked to rate on a 0-10 scale, with 0 = unprepared and 10= well-prepared, how prepared they felt their international team was to carry out activities before and after COVID-19. Negative values indicating a perceived decrease in ability while positive values indicate a perceived increase in ability.

Team Survey Example Results



Respondents were asked to indicate their level of agreement on a 4-point Likert scale (with no neutral option) to a series of statements regarding their perceptions of the team’s diversity with regards to experiences, skillsets, and appreciation of diversity as a value.

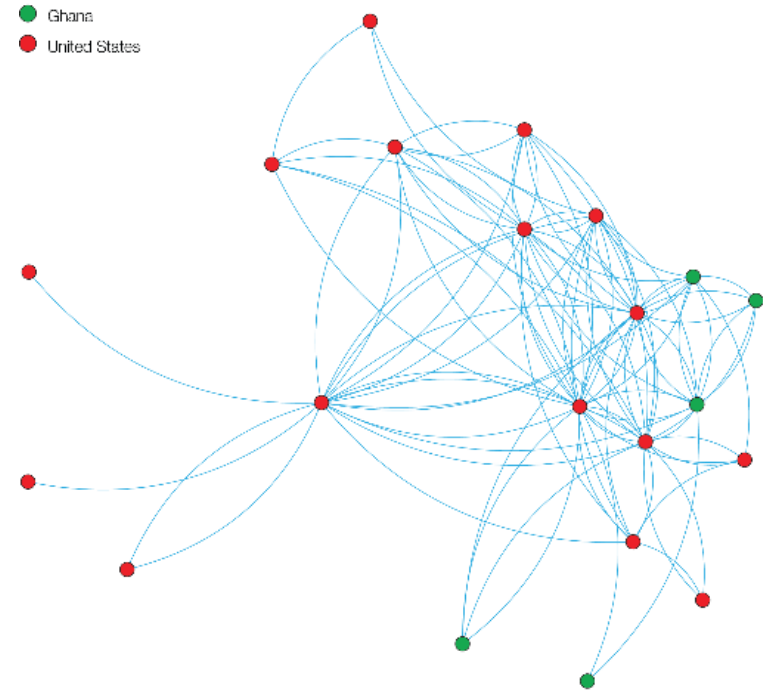
Team Survey Results Summary

- The GALUP team reported the most fluctuations in the ability to respond to challenges resulting from COVID-19, including some negative perceived changes in their ability to handle financial disruptions or senior scientists leaving the team.
- GALUP and the Sahel teams reported higher levels of team learning mindset and diversity of approaches to carrying out research than LSIL. GALUP and Sahel also reported higher levels of perceived diversity of team experiences, skillsets, and values compared to LSIL.
- The LSIL team reported higher levels of cohesion resulting from COVID-19 compared to the other two teams.

Social Network Analysis Example Results

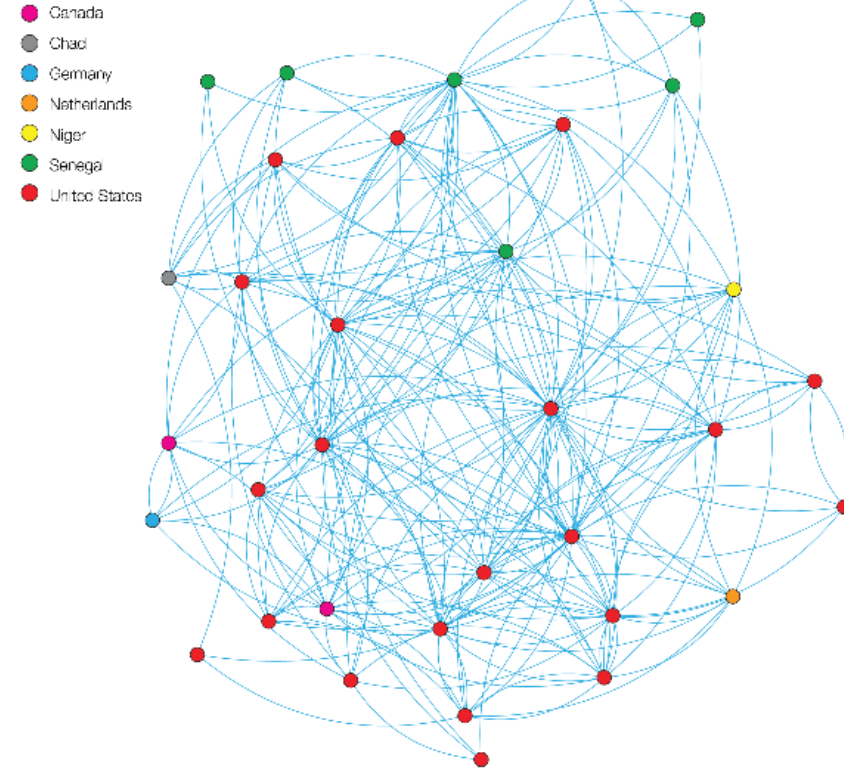
Co-Authorship Networks

Ghana Land Use Project (GALUP)

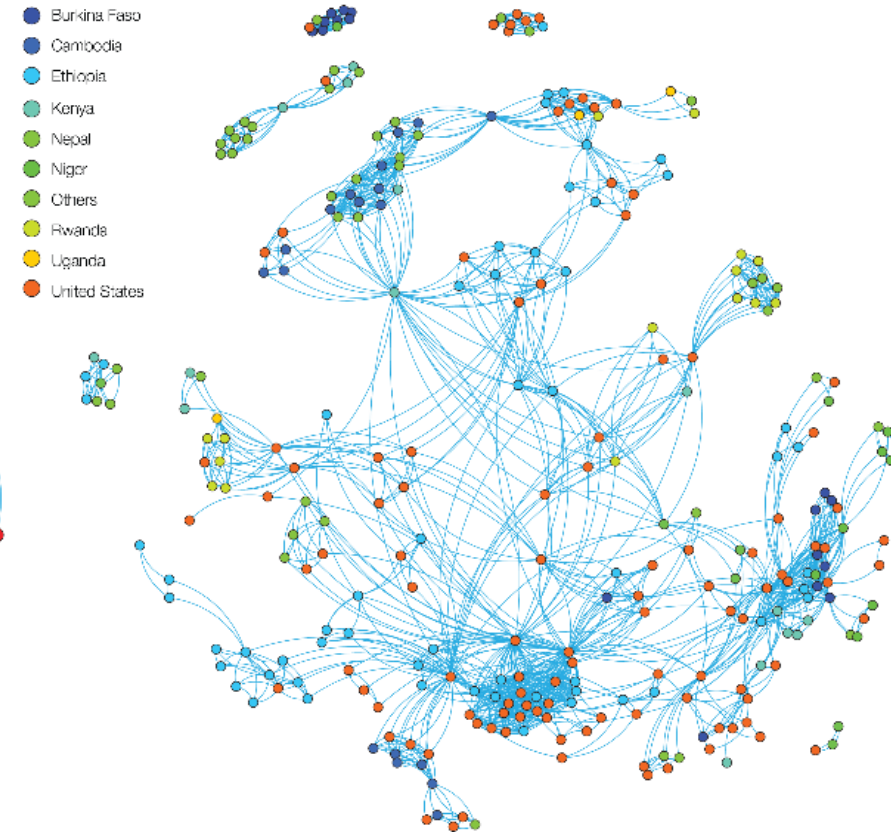


Walter et al (2022) *in final preparation*

Sahel Research Group (SRG)



Livestock Systems Innovation Lab (LSIL)

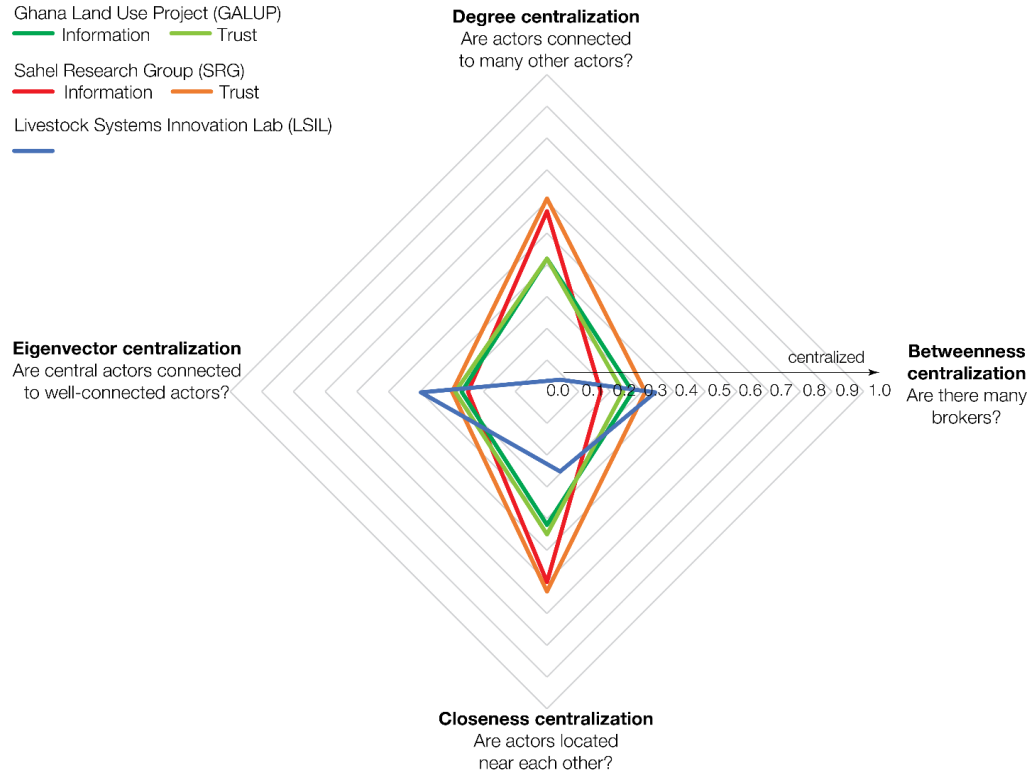


Take Home Message: International research teams rely on closely-knit communities, GALUP and SRG networks exhibit high density and numerous ties per actors (small world networks). LSIL network has a more regular structure characterized by both high path length and agglomeration coefficient.

Social Network Analysis Example Results

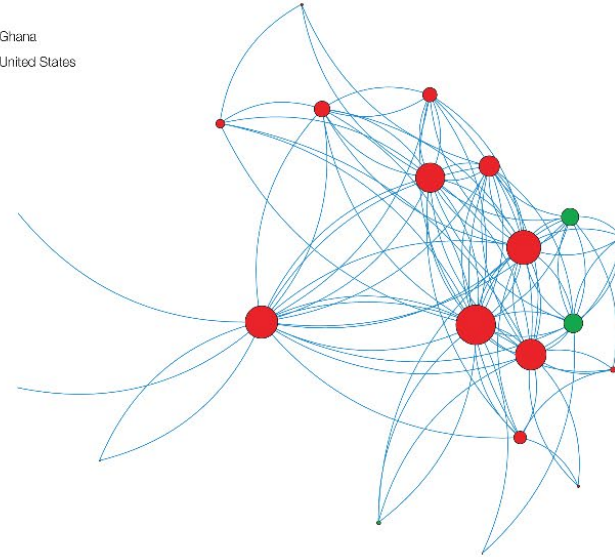
Information and Trust Networks

Ghana Land Use Project (GALUP)
— Information — Trust
Sahel Research Group (SRG)
— Information — Trust
Livestock Systems Innovation Lab (LSIL)
—



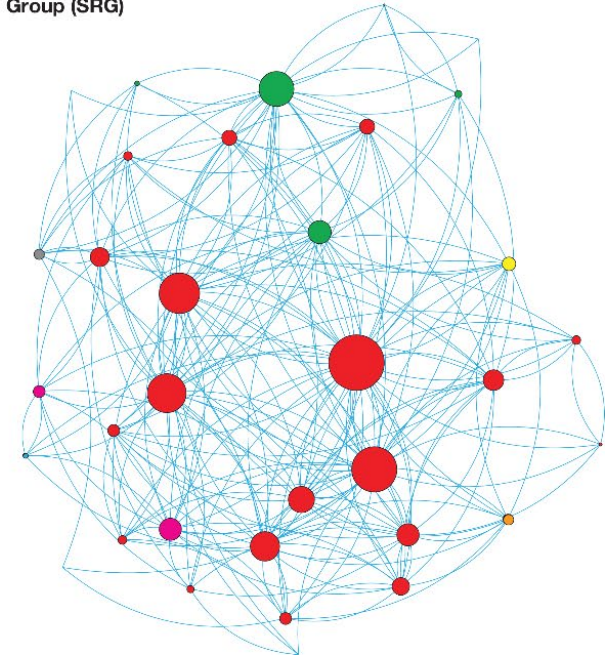
Ghana Land Use Project (GALUP)

● Ghana
● United States



Sahel Research Group (SRG)

● Canada
● Chad
● Germany
● Netherlands
● Niger
● Senegal
● United States

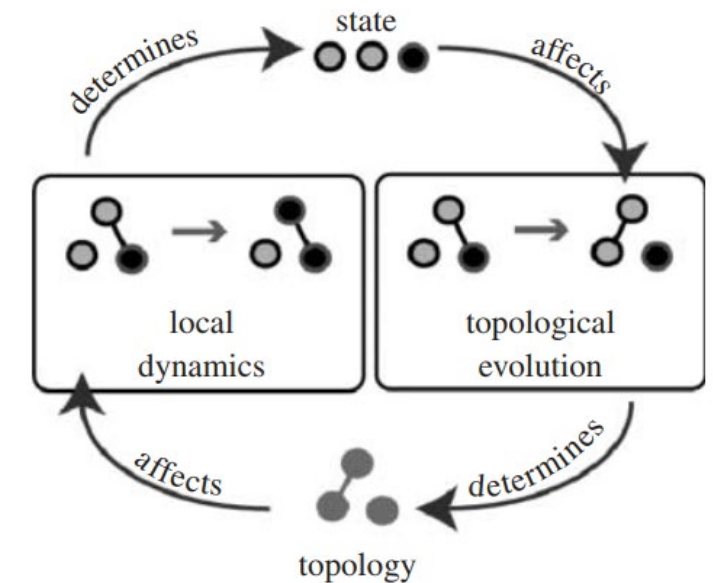
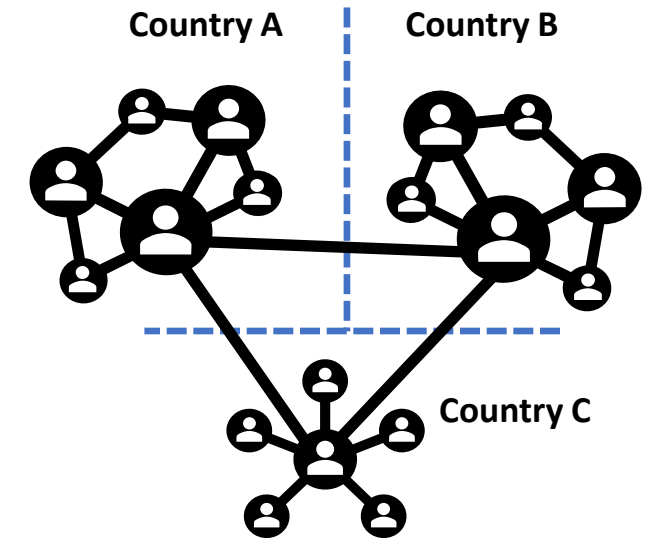
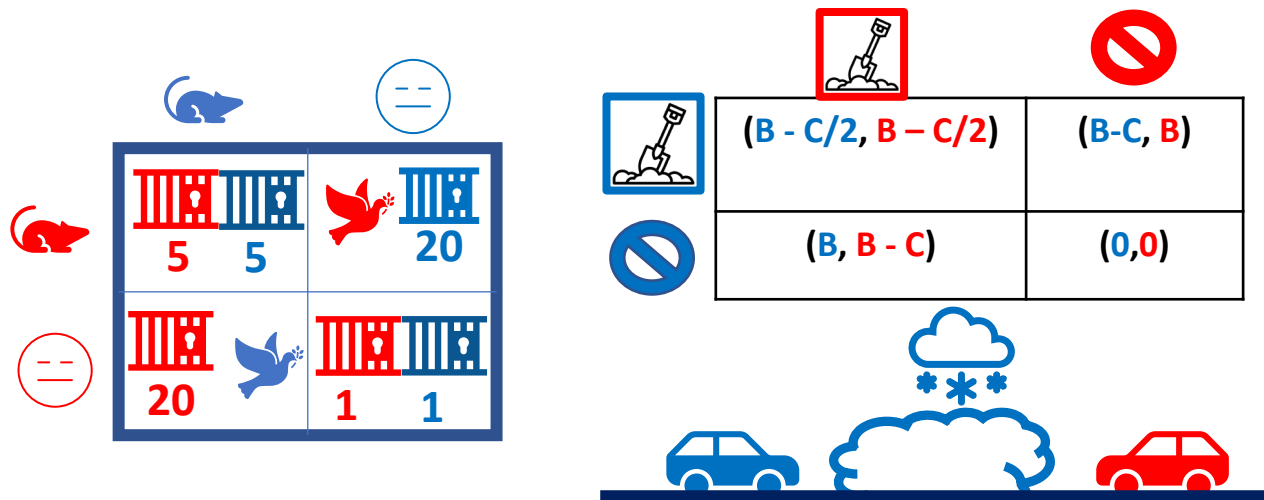


Walter et al (2022) *in final preparation*

Take Home Message: International teams are polarized by a handful of coordinators who have established durable relationships both within and outside their country (High degree centralization, betweenness centralization low). High LSIL eigenvector centralization scores indicate that the most central authors publish with co-authors who also have numerous co-publications. In GALUP and SRG, most central actors are connected both to numerous colleagues in the US and to foreign partners in Africa.

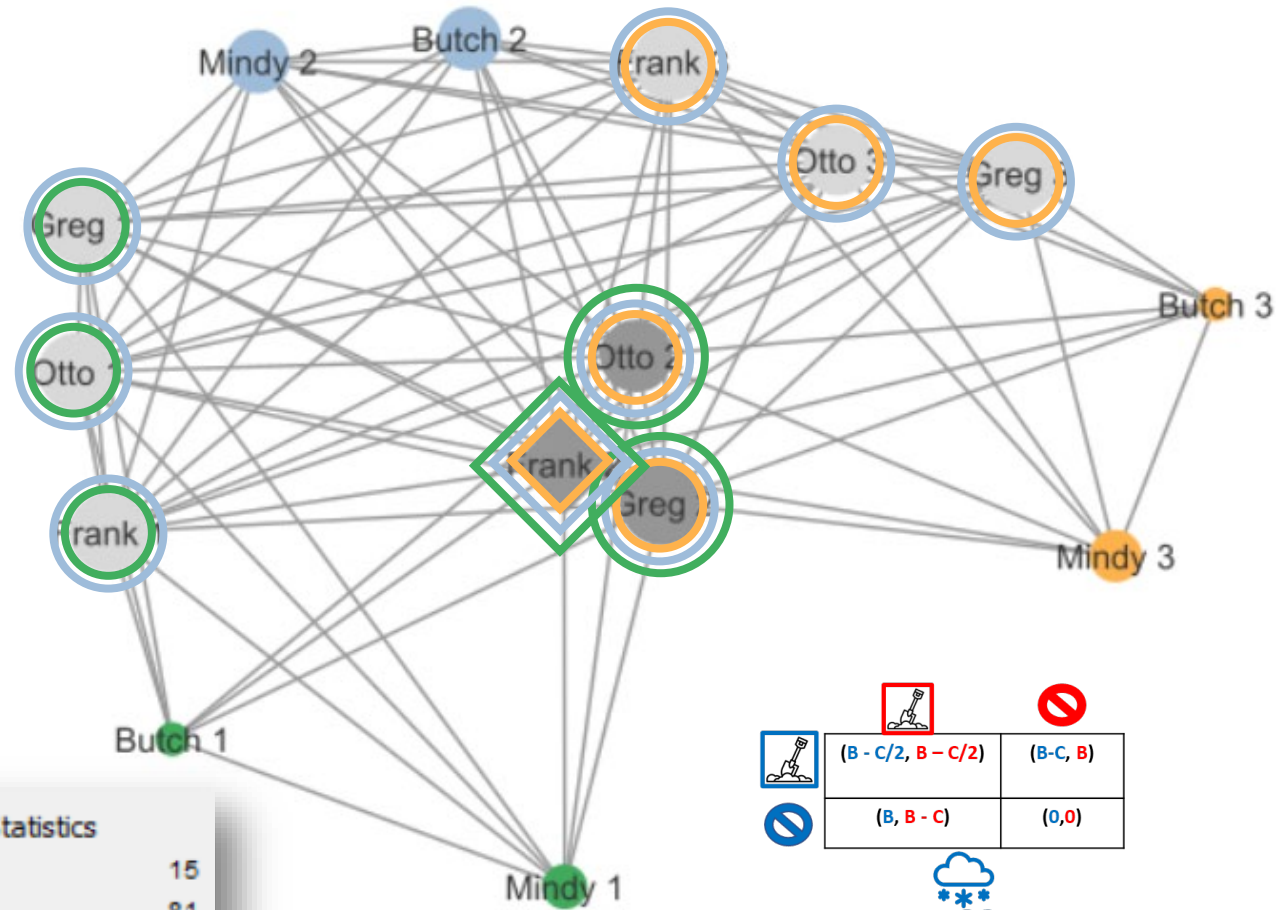
DIAN: Diversity and Inclusiveness Adaptive Network

- Java-based, adaptive network model with XML-based inputs
- Network generator coupled with iterative simulation capacity based on game theory (prisoners dilemma, snow drift, etc..)
- Multiple Networks available, Nodes with attributes acting over time...
- **Internal Dynamics:** Nodes cooperate/defect, links can established/strengthened/weakened/lost
- **External Dynamics:** Resource limits, removed nodes/links
- Cytoscape-/Orange-compatible for expanded analysis of networks

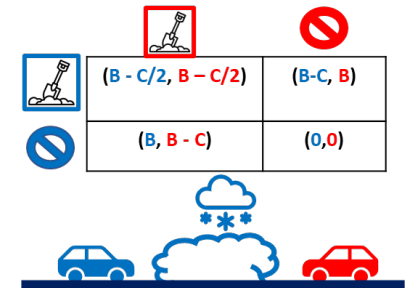


DIAN: Example Results

- Small regular mesh network
 - 3 teams
 - 15 people with some people on multiple teams
- 105 rounds, simplified SD game
- Team members who belong to >1 groups gain higher benefits
- Team metrics benefits?
- Institutional metrics benefits?
- How does diversity/inclusion change system features?
- Efficiency vs Resilience...



Summary Statistics	
Number of nodes	15
Number of edges	81
Avg. number of neighbors	10.800
Network diameter	2
Network radius	1
Characteristic path length	1.229
Clustering coefficient	0.887
Network density	0.771
Network heterogeneity	0.237
Network centralization	0.264
Connected components	1
Analysis time (sec)	0.027

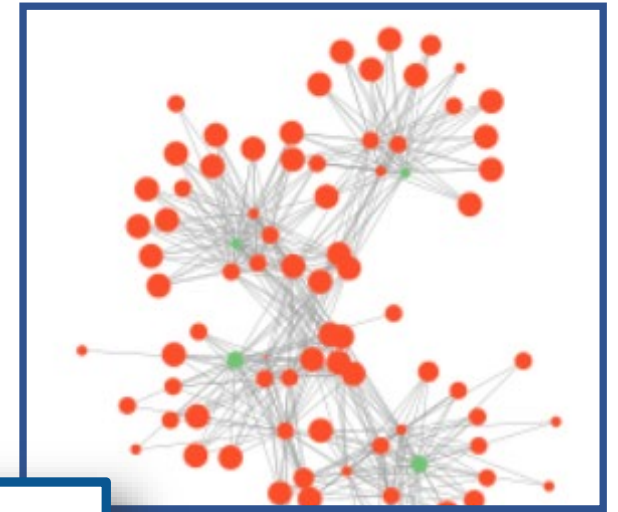
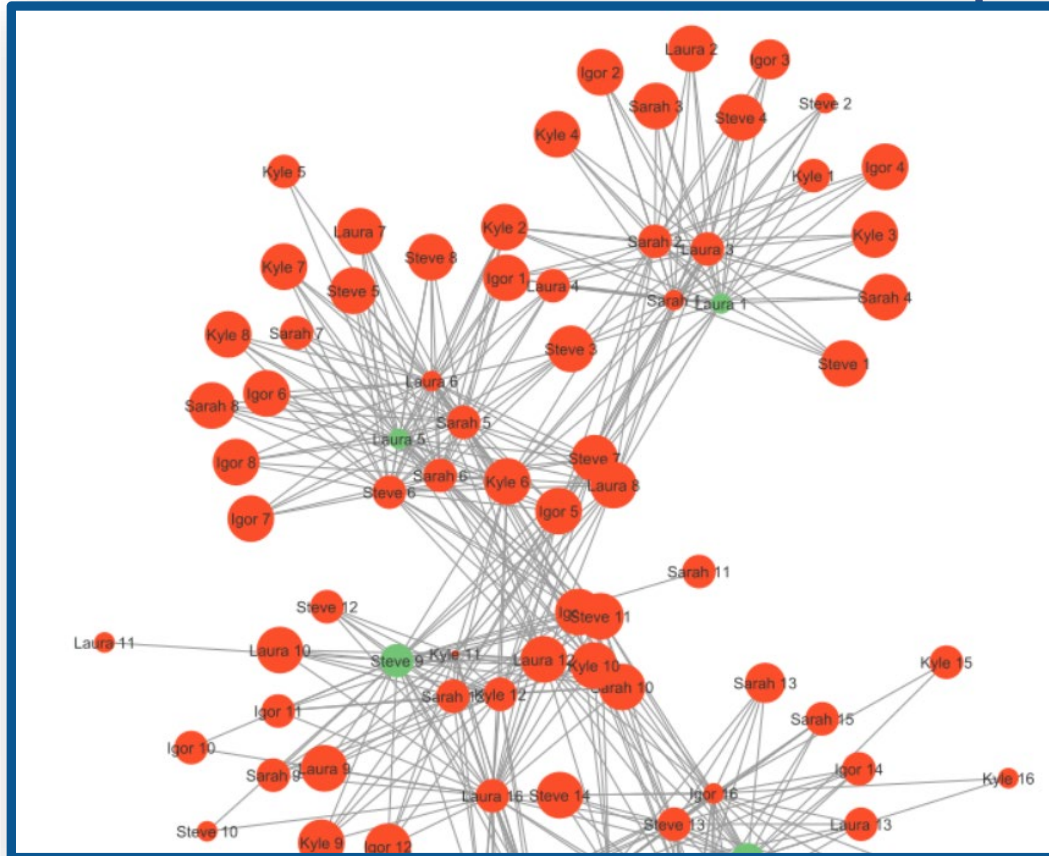


DIAN: Example Results

- Larger networks... Multiple Teams
- 5 rounds, SD
- Similar questions...
- Is there resilience in multiple teams? Portfolios of teams?
- Resilience phases? (Plan/Absorb/Recover/Adapt)
- Team formation/function/evolution?

Summary Statistics

Number of nodes	200
Number of edges	979
Avg. number of neighbors	9.790
Network diameter	10
Network radius	5
Characteristic path length	4.536
Clustering coefficient	0.694
Network density	0.049
Network heterogeneity	0.895
Network centralization	0.123
Connected components	1
Analysis time (sec)	0.078



Key Findings ... so far ...

- The benefits of diversity and inclusion can be integrated in team models through metrics-based and network science approaches
- Our metrics-based and network models show that:
 - International teams are powered by a handful of coordinators who have enduring diverse and inclusive relationships, both within and outside their own country.
 - Smaller international research teams rely on closely-knit “small world” communities.
 - International teams tend to exchange information or trust each other irrespective of their social and professional attributes.
 - Newer teams had more challenges responding to COVID-induced challenges.
 - The impact of COVID increased all teams’ cohesiveness.
- Diversity and inclusion may benefit smaller teams more than larger teams.
- Adaptive co-evolutionary network software allows useful exploration of collaboration among researchers, their teams and different institutions under different temporal phases.



**Thank you for your
attention!**

Acknowledgements

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**EAGER International Type II:
Inclusiveness and Diversity as
Building Blocks of Resilient
International Research Teams in
the Age of COVID-19**