Social Network Analysis Methods for Higher Education Development

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Talk Outline

- **Getting Grounded in SNA**
- **Why I am interested in SNA**
- **3 SNAs I have done in the higher education sector**

Getting Grounded: What is SNA?

Social networks are "a set of players and patterns of exchange of information and/or goods among these players" (Annan, 2005).

SNA is the process of investigating social structures using networks and graph theory. It characterizes network structures in terms of *nodes* (individual actors, people, or things within the network) and the *edges* (relationships or interactions) that connect them.
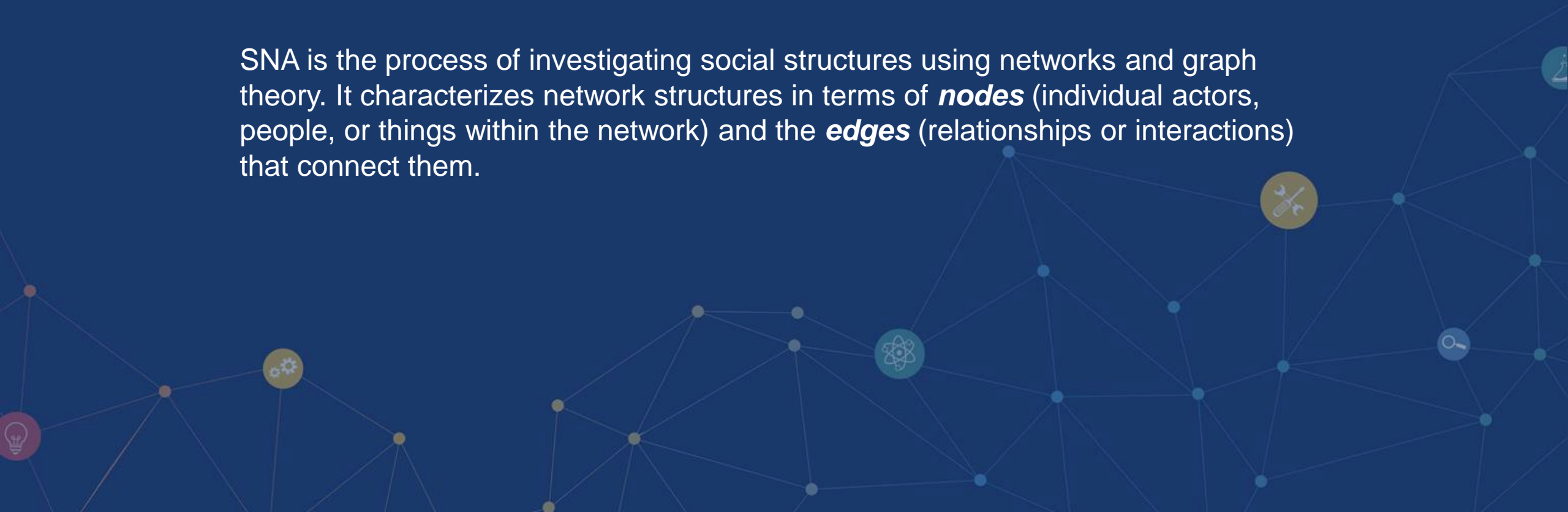
Getting Grounded: Why do SNA?

To answer research questions…

Networks as Independent Variables
- What network patterns spread diseases most quickly?

Networks as Dependent Variables
- What generates hierarchy in social relations?

Getting Grounded: How do SNA?

Collect data:
Surveys
Observations
Event attendance
Social media connections
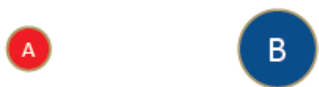Bibliographic citations
Places of employment

Analyze data:
Appropriate software
Characterize network structure
Explore individuals and communities

Getting Grounded: Graphs

Understanding Network Metrics

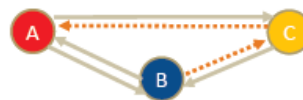**Node:** A circle indicating a unit of analysis (respondent).

Edge: A connection between two nodes, indicating a relationship.

(Un)Directed Network: In a directed network, all edges are directed from one node to another. In an undirected network, all edges are bidirectional.

Directed   *Undirected*

Density: Proportion of ties that exist, divided by all possible ties.

$Density = \frac{4}{6} = 0.66$

**Reciprocity:** In directed networks, proportion of "symmetrical edges" where nodes mutually nominate one another.

$Reciprocity = \frac{1}{3} = 0.33$

Modularity: Measure of partitioning between groups in a network. Higher scores (always between 0 and 1) indicate more within-group ties than between.
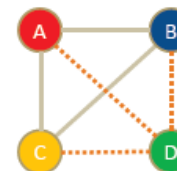
High modularity   Low modularity

Average Shortest Path Distance: The number of nodes a member will have to communicate through, on average, to connect to a node representing someone to whom they are not currently connected.
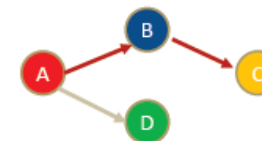
Shortest Path between *A* and *C* is 2

Transitivity: Proportion of "closed triangles" in a network, compared to all possible closed triangles.

$Transitivity = \frac{1}{4} = 0.25$

Getting Grounded: Metrics

SNA metrics are often grouped into two categories for analysis

- Network cohesion – measured in density, transitivity, degree centralization, and shortest path.

  More cohesive networks = better exchange of info, services, goods

- Network heterogeneity or diversity – measured primarily by modularity.

  More diverse networks = more efficient resource mobilization and implementation

Why I am interested in SNA

At their core, international development programs attempt to catalyze new relationships and new ways of working to increase social, economic, and/or political capital that is resident in networks.

3 Studies

- USAID El Salvador HE Program, 2019; N =120

- DFAT Indonesia Knowledge Sector Initiative, 2020, N= 65

- USAID Philippines Science Technology Research and Innovation for Development (STRIDE), 2022; N = 98

El Salvador: 5 Year USAID Program to improve HE, Government, and Industry collaboration in sector clusters

How important is this person to conducting your work well?

Sector
- Angro-industry and Food Processing
- Energy
- ICT
- Light Manufacturing
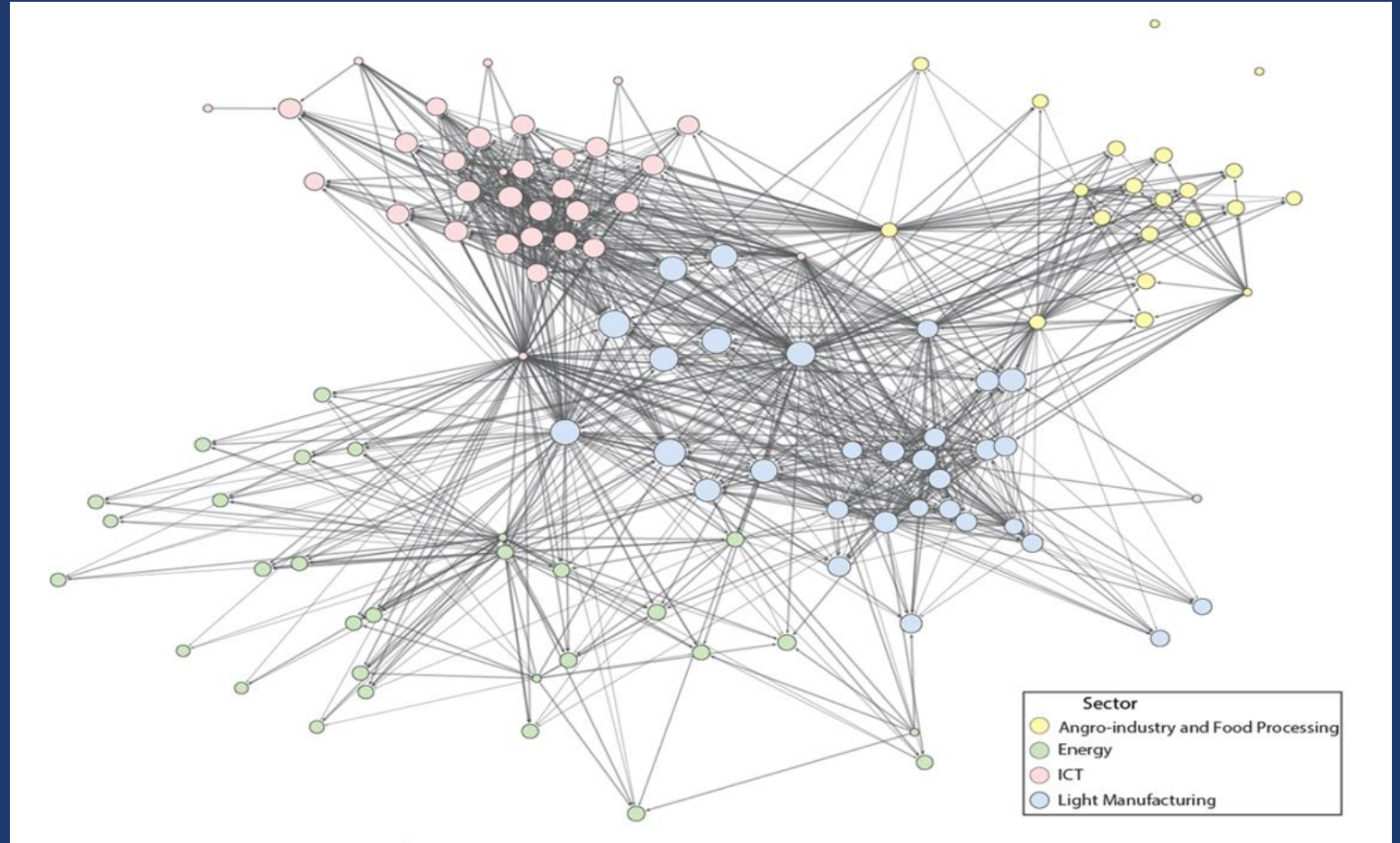
El Salvador: Change over 5 years

Table 1. Network scores for cluster connections in the light manufacturing sector

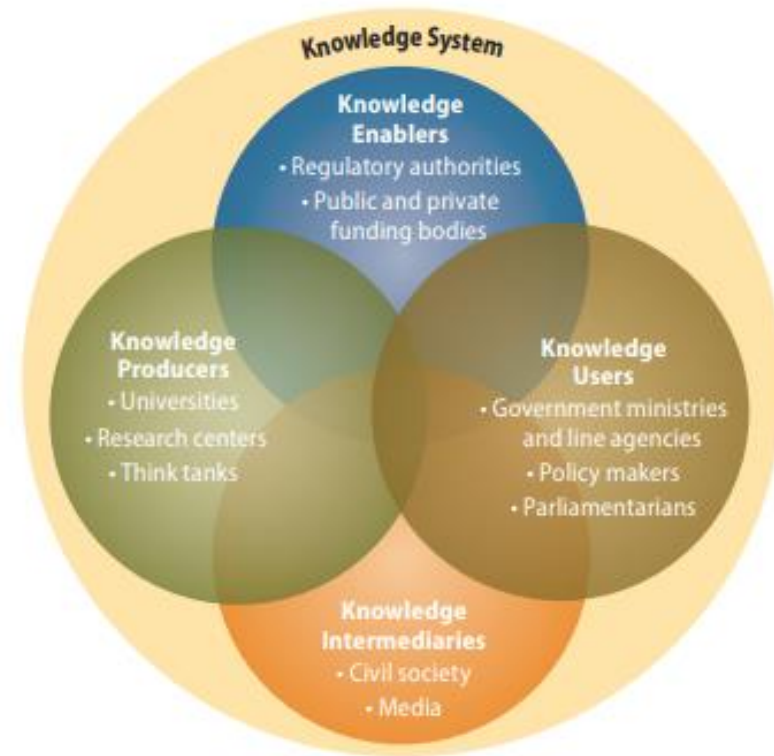|	Prior Collaborations	Current Collaborations	Future Collaborations
Density	7%	14%	22%
Reciprocity	10%	16%	12%
Average shortest path	2.2	1.8	1.6
Modularity	0.37	0.43	0.28
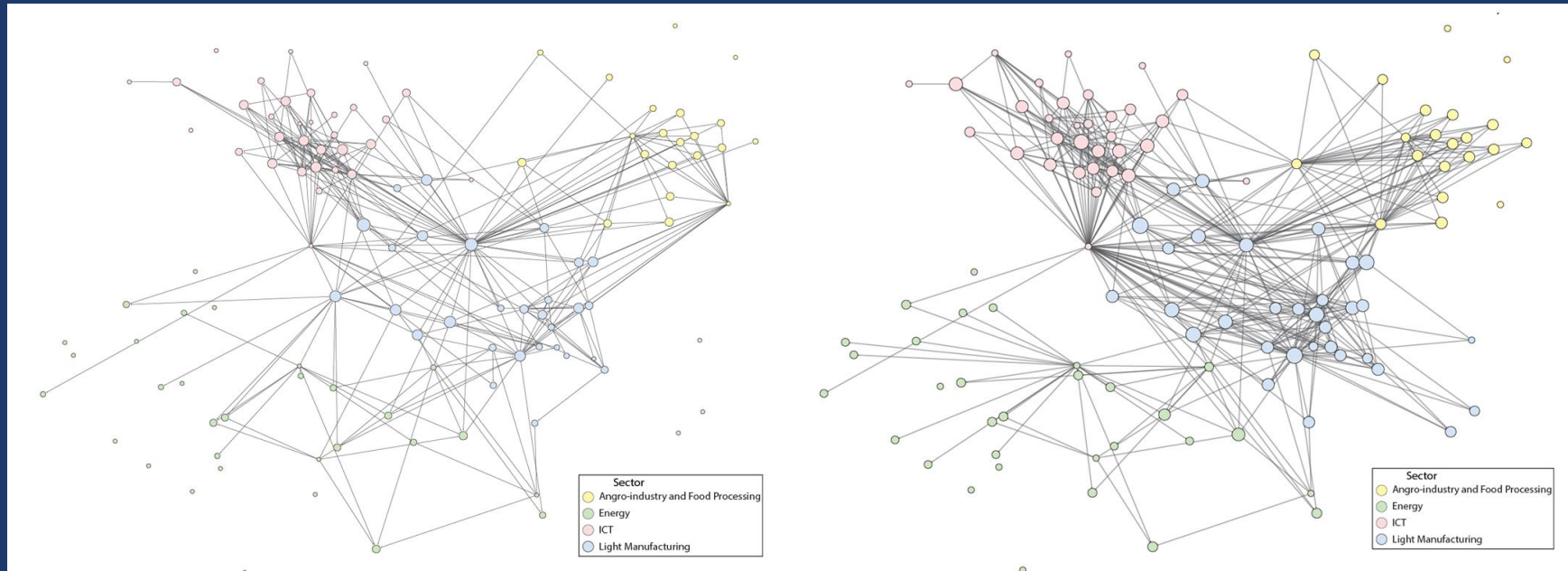
Indonesia Research: 10 Year program to improve evidence to policy networks

Figure 1. Knowledge system model

Source: Developed by authors, building on UK Department for International Development (DFID)[2] and Australia-Indonesia Partnership for Pro-Poor Policy.[3]

Table 2. Network metrics for aging and elderly policy networks in Indonesia

	Jakarta	Yogyakarta	Denpasar
Density	39%	17%	9%
Reciprocity	50%	32%	20%
Transitivity	48%	17%	14%
Degree Centralization	0.71	0.86	0.5
Modularity	-0.01	-0.01	-0.01
Average Distance	0.87	1.16	1.11

Indonesia Research
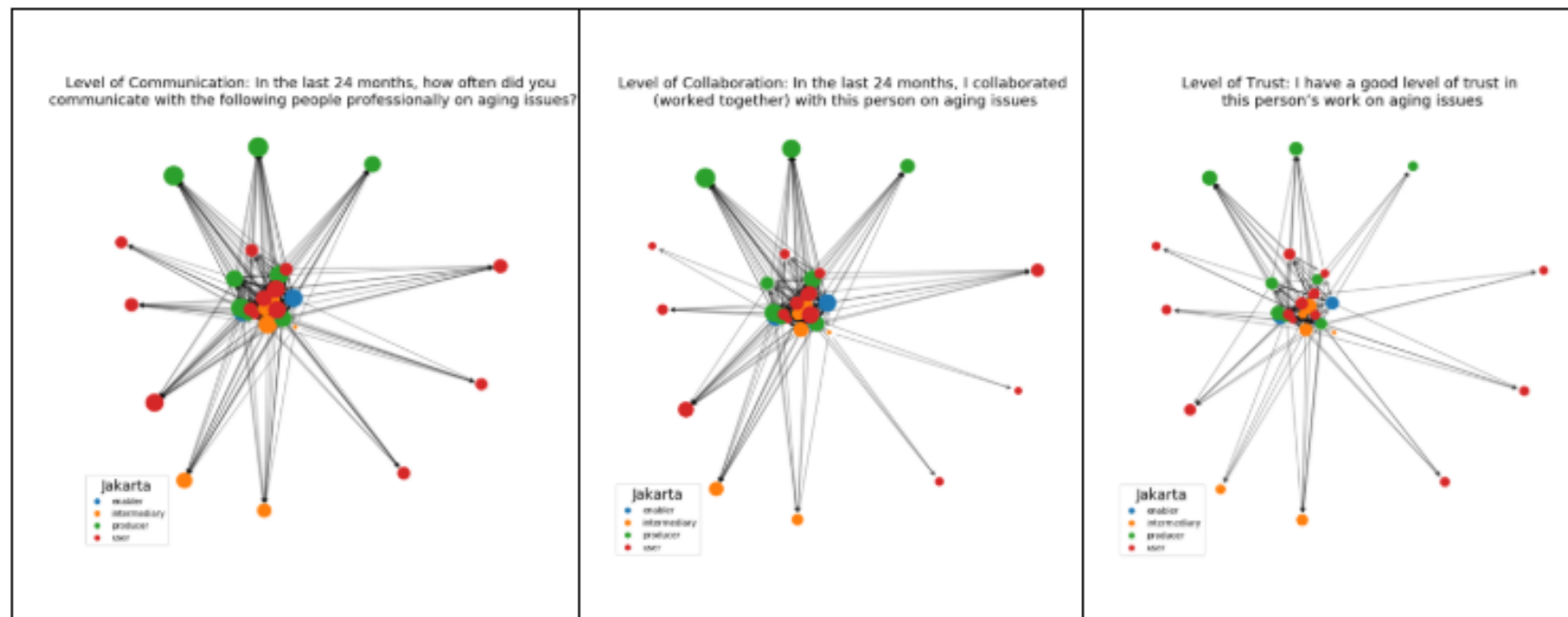
Philippines: 9-year program to promote innovation-led EG

Philippines

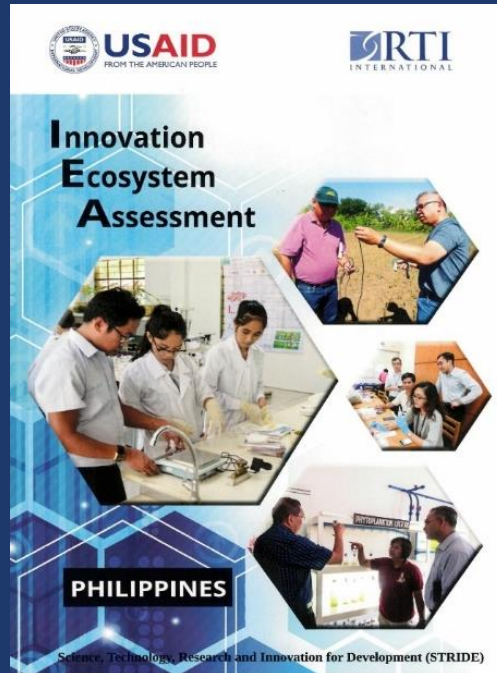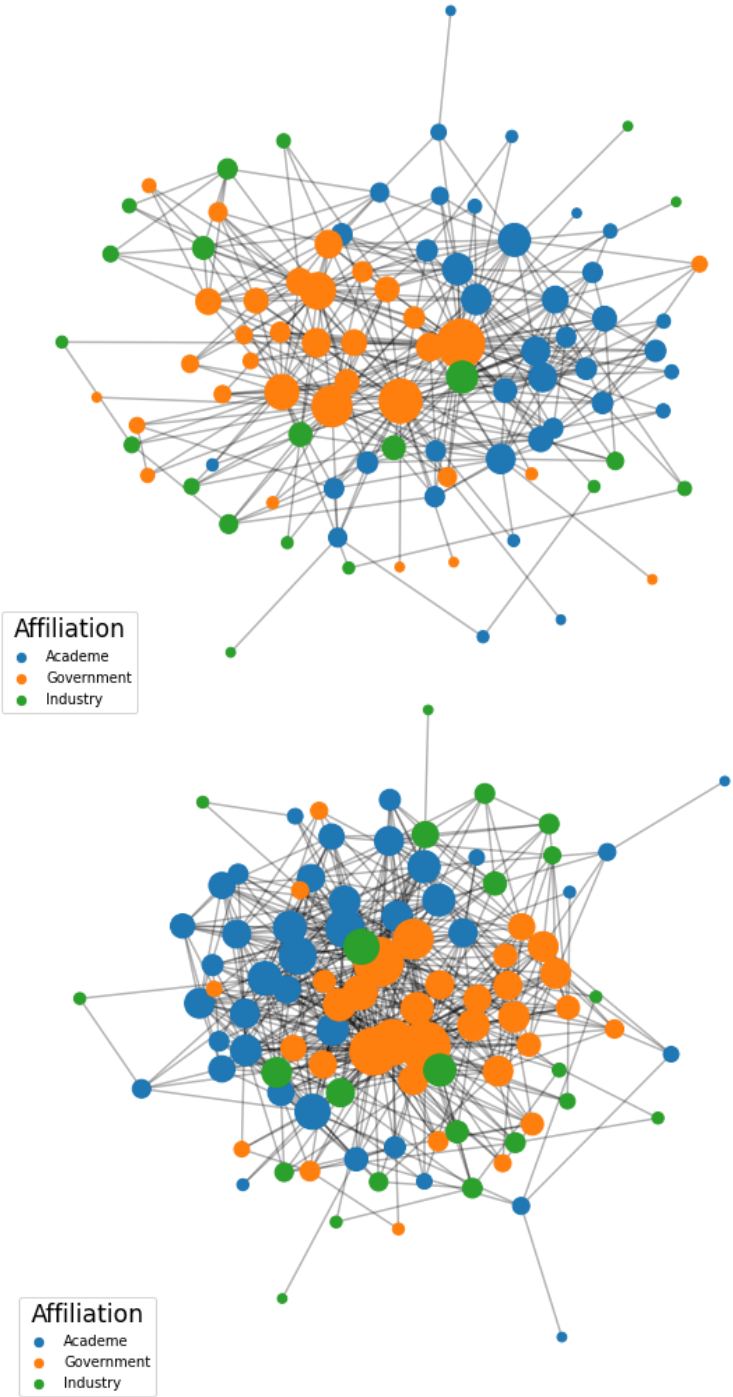| Measurement	Past Network	Present Network	Future Network
Nodes	91	97	97
Density	0.09	0.13	0.13
Transitivity	0.27	0.37	0.37
Modularity by Affiliation	0.17	0.17	0.17

Affiliation
- Academe
- Government
- Industry

Past

Present

Questions and Discussion

SNA Survey Approach

Name Interpreter 1

Close collaborator: This section asks you questions about your collaborations with other professionals working in the Philippines innovation ecosystem. Please check the box to the right of each person on this list for which you have collaborated closely over the past 2 years. Close collaboration **might mean** that you worked on a project together, conducted research together, served on the same committee or working group, **or** met frequently to discuss work related matters, among other possible ways that you collaborated closely with a person.

	This person is a close collaborator of mine. Choose all that apply.
	Click if Yes
Name 1	
Name 2	

Name Interpreter 1a

This section asks you several follow up questions about the close collaborators you selected in the previous section. Check all that apply.

	I have a high level of trust in this person's professional performance and reliability	I collaborated closely with this person more than 8 years ago, i.e. before the start of the STRIDE program.	I anticipate continuing my close collaboration with this person in the next year
	Click if Yes	Click if Yes	Click if Yes
Name selected 1			
Name selected 2			

Name Interpreter 2

Other contacts: Returning to the list of names from section one, please now select names from the remaining people with which you have had **_any contact_** in past 2 years. Contact might include that you have seen this person, spoken to them **or** corresponded by email, if even just once. We will not ask follow-up questions about these contacts, so please select all names you have had any contact with.

	I have had contact with this person in the past 2 years
	Click if Yes
Name 3	○
Name 4	○

General Network Question

The final question asks **_how you feel_** about this network as a whole. By this network – we are referring to people in the Philippines working in government, university, or the private sector to improve STEM education and/or promote innovation-led economic growth.

How much do you agree with the following statements?

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
I feel a sense of belonging to this network	○	○	○	○	○
I see myself as a part of this network	○	○	○	○	○
I am happy to be a member of this network	○	○	○	○	○
Members of this network have a high degree of trust in each other	○	○	○	○	○