

# APPLYING SOCIAL NETWORK ANALYSIS TO EXAMINE PROGRAM OUTPUT AND IMPACT

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# INTRODUCTION

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The COVID-19 pandemic has changed social lives across the United States. Not only have the individuals we interact with changed, but so has the manner and frequency of our interactions with others. The changing social dynamics remind us how our lives are dependent on the people and communities around us as well as the relevance of community connections to social policy design and implementation.

Research on social connections and communal interactions plays a key role in improving social policies and public services. Knowing that social networks come in different sizes, durations, and strengths, researchers have used social network analysis (SNA) to examine the systems of relationships among individuals and the social and economic impact of such systems. With advances in technology and the increasing use of social media platforms, researchers now have access to richer data on human interactions than ever before and have demonstrated how to collect and analyze these data.

In this paper, Manhattan Strategy Group (MSG) presents two applications of SNA to illustrate how social network data can help us understand the impact of federal programs. The first study focused on an education program intended to enhance services that promote adult literacy. The second project focused on a federal program designed to promote cross-disciplinary collaboration among scientists to address environmental challenges. MSG contracted with these programs to deliver technical assistance and conduct program evaluation. The social network analyses in the two studies documented program performance as measured by program participation and grantee collaboration.

We conclude the paper with a discussion of SNA's potential to evaluate the performance of social programs and suggest potential ways to use social networks as measures for intangible program outcomes.

# APPLICATION 1: Tracking Interactions in a Community of Practice

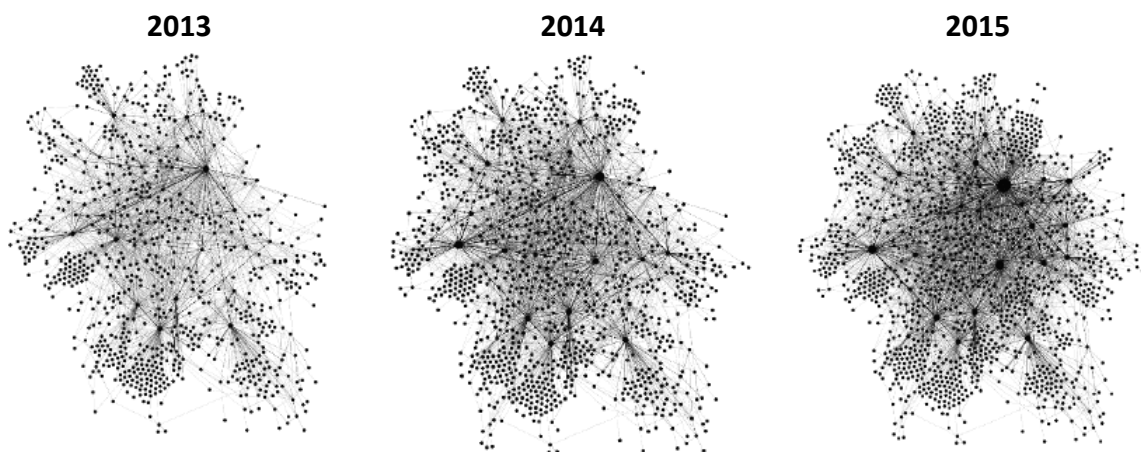
In a Community of Practice (CoP), community members provide communal support to each other through regular interactions to facilitate learning and improve practices in a particular topical area. Since 2016, MSG has supported a CoP for users of the Literacy Information and Communications System (LINCS), a program funded by the U.S. Department of Education. This CoP supports adult educators' professional learning and provides a place for adult educators to collaborate, network, and share knowledge and resources. The virtual community consists of 16 groups and 7 micro groups, with 11,754 registered users (members) in 2016. Moderators in this community help members access information and engage in productive, ongoing peer interactions.

To identify patterns of interaction among CoP members, the project team conducted an SNA study to examine changes in user activities between 2013 and 2015. In Figure 1, each dot represents a person, and each line represents a connection. The larger a dot, the more connections this person has. The connectivity of community members intensified through

community-building activities over 3 contract years. The intensified interaction and the shifting patterns of communication among group members illustrate the impact of LINCS on building a learning community among its stakeholders.

In 2020, the project team conducted a follow-up SNA study and used back-end data from the LINCS platform between 2016 and 2019 to examine how users connected with each other through online discussions. These data included posts and comments associated with those discussions as well as Likes and other opportunities for users to connect. The project team analyzed user activity levels, including participation in groups and micro groups, access to resources, and utilization of additional platform features such as Likes and Bookmarks. The project team performed aggregate analyses to gauge changes in levels of participation and engagement and overall platform growth. The follow-up analysis showed that more CoP members became connected through LINCS and the average number of connections per user increased.

**Figure 1. Changes in CoP Engagement among LINCS Users between 2013 and 2015**



Further analysis showed that connecting to other users has helped LINCS members gain access to new ideas, solutions, and experts that they would not have been able to access otherwise. Public Groups and Courses are the most successful features for facilitating connection and collaboration, and it is more important to users to connect with experts rather than other users, although users prioritize connecting to others sharing similar issues, from similar types of organizations or sectors, or holding a similar organizational role. During the COVID-19 pandemic, the CoP has been helpful to users, many of whom have reported the importance of having access

to best practices for online education and technology integration in such an uncertain time.

The LINCS project illustrates how SNA can yield keen insights about educational outcomes with network data. An even more extensive application of SNA in this instance can link changed behaviors with the learning experience and results of adult educators. In particular, a future study could explore CoP impacts on program outcomes of interest by linking individual-level outcome data to the network data presented above.

# APPLICATION 2: Understanding Interdisciplinary Collaboration

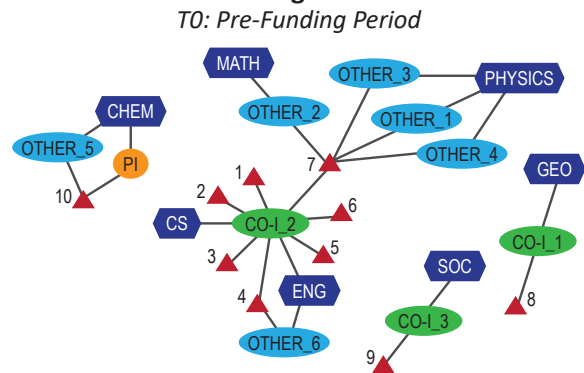
One particular type of social network is a professional network. It plays a crucial role in one's career development, allowing individuals to access information about career opportunities, be exposed to different perspectives, and create innovative solutions to career challenges. However, some professional networks, particularly in academia, are more tightly bounded and siloed to specific bodies of knowledge and practice, leading to a disciplinary divide. The disciplinary divide of a professional network not only limits our understanding of complex issues but also results in duplicated efforts to solve similar or identical problems. Recognizing the need for a diverse workforce to solve the increasingly complex issues we face today, many organizations and governmental agencies have designed and implemented programs to foster interdisciplinary collaboration.

Between 2014 and 2018, MSG staff studied the impact of a federal grant program to promote multidisciplinary collaboration for scientists to address environmental challenges. The project team surveyed principal investigators (PIs) who received grants from this federal program and asked them to list their five most important collaborators. The project team also collected information about PIs' funding history from the agency's administrative record and extracted PIs' professional connections from public sources, such as publications and contacts on LinkedIn. The compiled PIs' networks provided tracking records of collaborative networks before the funded project started, during the funding period, and after the funded project was complete.

With these network data, the project team conducted two types of social network analyses, one focusing on the PI's entire network (egocentric analysis) and the other on the strength of the connection of all collaborators on an awarded project (whole network analysis). The social network diagrams in Figure 3 are an example of the egocentric analysis.

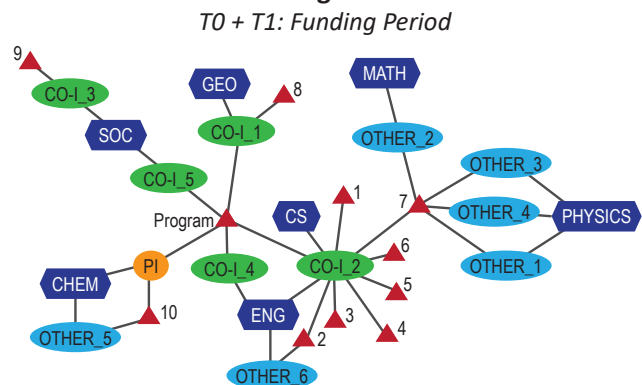
They show the networks of a PI in chemistry and the PI's collaborators in geology (CO-I\_1), engineering, computer science (CO-I\_2), and social science (CO-I\_3) before, during, and after the funding period. The four researchers had disconnected research networks before the funding period, as shown in Figure 2(a). CO-I\_2 had a more extended network than the other three.

**Figure 2(a). Professional Network of a PI before a Funding Period**



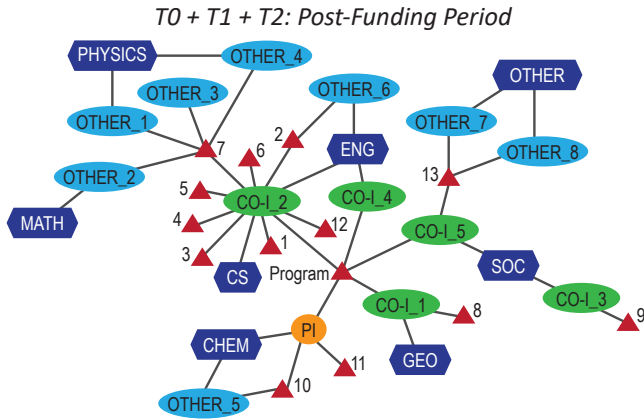
Through the federal program, their networks were connected and expanded to include new collaborators in engineering (CO-I\_4) and social science (CO-I\_5).

**Figure 2(b). Professional Network of a PI during a Funding Period**



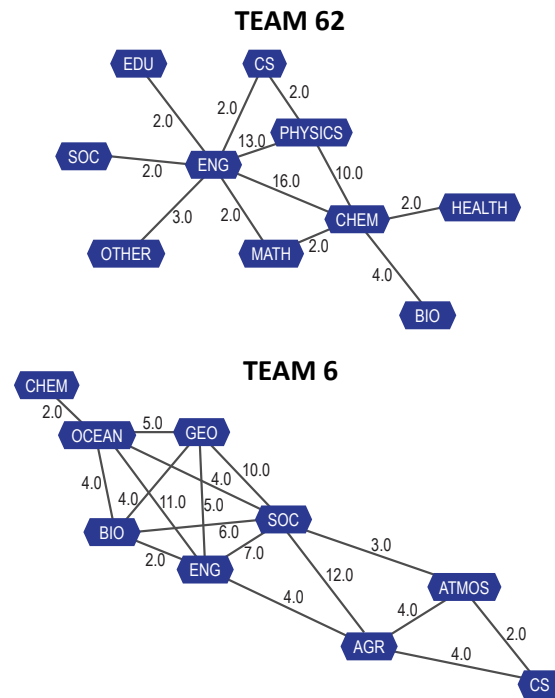
After the funding period, not only did these expanded networks stay active, the connectivity of these networks also intensified.

**Figure 2(c). Professional Network of a PI after the Funding Period**



The project team then used the whole network analysis to explore the strength or intensity of the connections among collaborators on a project team. A connection is considered to be strong if two individuals appeared on two or more awards together. Figure 3 shows the collaboration intensity of two teams, Team 6 and 62. Team 62's collaboration is centered around scientists in engineering, physics, and chemistry. The other collaborators in this network had little direct contact with each other. The collaboration took place mostly among researchers in physics, engineering, and chemistry. In comparison, Team 6's collaboration is more multidisciplinary, with collaborators directly interacting with others in the network. Compared to Team 62, the strength of collaboration in Team 6 is stronger across disciplines.

**Figure 3. Professional Network Structure of Team 62 and Team 6**



Collectively, the changes in network structure and intensity demonstrate the impact of this federal program on fostering research collaboration across disciplines. By taking a closer look at some of the networks of the researchers, the project team was also able to illustrate the different types of collaboration that were formed through the program. Together with data on cross-disciplinary collaboration and social impact, future work in this area can examine which network types may lead to broader and more sustained social impact.

# CONCLUSION

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Understanding human interaction and networking holds great value for the design of public policy and programs. In this paper, MSG showcased two projects that used SNA to document the implementation of a learning community and to measure professional collaboration. These examples demonstrated the importance of SNA as a means of measuring program impact and alluded to its future potential in measuring social networking's contributions to achieving desired outcomes.

Besides professional networks, researchers have used SNA to address many pressing social issues, such as poverty and income inequality. Social networks are essential for low-income individuals to cope with poverty and achieve financial independence. However, the social networks of low-income individuals tend to be marked by intense localism, separation, and isolation from the social networks of higher-income individuals. The social network of an individual in a low-income community tends to be bounded by immediate familial ties (Bowen, 2009) and individuals with shared demographic and socio-economic characteristics. While strong, these social ties tend to be enclosed within a small community with an almost total absence of non-low-income individuals (Marques, 2012).

Similarly, those who experience long-term unemployment tend to report lower participation

in informal socializing and community events or activities (Lindsay, 2010). They have minimal job search networks and rarely use them as part of their job search strategy. Such a network pattern limits the abilities of unemployed individuals to convert their local connections into tangible economic and social opportunities.

SNA studies have significant public policy implications, as they can inform the design of public programs based on knowledge of stakeholders' behavioral patterns. When these programs create opportunities to introduce new perspectives and information to established social ties, they have great potential to broaden segregated network systems and remedy the homogeneity of these social networks. Public programs informed by SNA are also more likely to gain participant buy-in during implementation and ultimately achieve desired social outcomes.

As policymakers and administrators increasingly recognize the importance of social networks in achieving their program goals, we hope that this paper helps illuminate the value of SNA for addressing a wide array of social issues. Finally, SNA's appealing graphic visualizations can be a powerful tool for organizations and government agencies looking to convey to the public the effects and impacts of their program initiatives.



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