

EXPLORING ABSEL USING SOCIAL NETWORK ANALYSIS

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ABSTRACT

Beginning with Swiss mathematician Leonhard Euler's forays into graph theory to the development of cancer drugs based on cellular networks, the mathematical tools developed for understanding the structure and behavior of networks have allowed us to more rigorously explore complex social phenomena. The ABSEL organization is a complex social system that can be regarded as a network of interconnected researchers. With co-authorship data from the past fifteen years of ABSEL conferences, we have modeled the ABSEL network using the social network analysis tool Gephi. By exploring the structure, stability, and dynamic development of the ABSEL co-authorship network, we gain insight into the past, present, and future of the organization. With this insight we can formulate policies to increase the value of being a part of ABSEL's network.

INTRODUCTION

One of the primary purposes of the Association of Business Simulation and Experiential Learning (ABSEL) is to provide a forum for the interaction between researchers. This was recognized by Duane Hoover (2013) in his conclusion that "ABSEL is an association. Its activities and publications are important, but its real meaning is the association among people interested in simulation, games, and experiential learning." The emphasis here is on the "association among people" or the personal relationships that make up the ABSEL network. Does ABSEL actually achieve this purpose? To date only anecdotal evidence from surveys and case studies have been offered as support. (Markulis, Ricci, & Strang, 1989; Patz & Morgan, 2014) Even if the sparse evidence suggests that ABSEL is achieving its networking purpose, we must still ask whether the organization could do better. And if ABSEL could do better, what policies can be implemented to achieve better results?

In this study, we propose to use social network analysis (SNA) to study the community of researchers who publish in ABSEL's annual proceedings, "Developments in Business Simulation and Experiential Learning." Using SNA we attempt to answer some fundamental questions about the ABSEL network: Is the ABSEL network of researchers random or does it have structure? Is it clustered and dependent on a few high profile researchers? Who are the influential members? What are the strengths and weaknesses of this network? Answering these questions will enable us to formulate and support policy recommendations.

OVERVIEW

To use SNA on the ABSEL organization we must be able to identify the relationships between members. One way to capture the interaction between members is by looking at co-authorship relationships reflected in the organization's proceedings. Although it has been argued that co-authorship relation-

ships are only a partial indicator of collaboration (Laudel, 2002). Other studies have shown the strong correlation between co-authorship and overall collaboration activity (Glänzel & Schubert, 2005).

In this study, the ABSEL co-authorship network consists of a collection of researchers who are connected by the papers in which they have collaborated. The assumption is that co-authors have a relatively high level of social connection. We recognize that some ABSEL researchers have a close social connection but have never co-authored a paper; unfortunately, these relationships are not included in our current SNA. The collection of additional primary data may allow us to extend the co-author network to include these significant relationships and perhaps sharpen the conclusions of this study.

BACKGROUND

Beginning with Swiss mathematician Leonhard Euler's forays into graph theory to the development of cancer drugs based on cellular networks, the mathematical tools developed for understanding the structure and behaviors of networks (i.e., SNA) have allowed researchers to rigorously explore complex social phenomena. Studying research collaboration networks using bibliographic data has been used in a number of previous SNA studies (Newman, 2004). Used in this way, SNA provides a visualization of the hidden pattern of interactions in an organization. From these revealed patterns, we can assess the overall health of the organization and discover opportunities for improvement.

Following the work of previous studies, we use SNA to identify patterns and relationships between ABSEL researchers and to discover the underlying structure and past dynamics such as: central nodes that act as interconnecting hubs in the network; highly connected research groups; and organizational communication efficiency.

METHODOLOGY

The ABSEL network is represented as a set of author nodes and edges denoting co-authoring relationships. Using co-authorship data from the past fifteen years of ABSEL conferences, we have modeled the ABSEL network using the SNA tool Gephi. The complete dataset resulted in 684 nodes (unique authors) and 1222 edges (unique co-authorship connections). The raw data was carefully edited to correct for multiple entries, typographical errors, and inconsistencies in authors' names.

FINDINGS

The ABSEL network resulted in one giant component that contained an interconnected network of 266 researchers (38% of the total). This sub-network contained over 54% of the total network connections (edges). One view of the giant component can be seen in Figure 1.

It is clear that even the giant component is not a fully connected network. In fact the connectedness of this sub-network as measured by the density is 1.9% (the number of actual connections over the total number of possible connections). A commonly used measure of the communication efficiency of the network is the diameter; the shorter the diameter the faster the diffusion of communication. The ABSEL giant component has diameter of 11, meaning that every researcher in the sub-network can be reached by 11 or fewer connections. This is higher than the small-world concept that spawned the saying “six-degrees of separation” (Barabási & Frangos, 2014).

In Figure 1 the key individuals are represented in a larger font and more frequent interactions are shown as thicker connections. It is clear the Jimmy Chang is a key individual in this network and the research collaboration between Daniel R. Strang and Perer M. Markulis is significant. There are number of quantitative measures that can be used to validate this observation (e.g., degree), but are omitted here for brevity. Finding these key individuals and relationships allows us to purposefully explore the network at the ego level.

The Hungarian mathematician Paul Erdos was one of the founders of graph theory and the basis for SNA. A prolific writer with over 1500 publications and 507 coauthors, his ego network was explored in detail (Barabási & Frangos, 2014). Being a part of the Erdos network became a goal of many mathematicians and a badge of pride. Thus, a measure, called the Erdos number, was developed to show how closely a particular mathematician was to Erdos in terms of publications. Those who had published a paper with Erdos were given a number of 1, those who had published a paper with one of Erdos’s coauthors but not Erdos himself received an Erdos number of 2, and so forth.

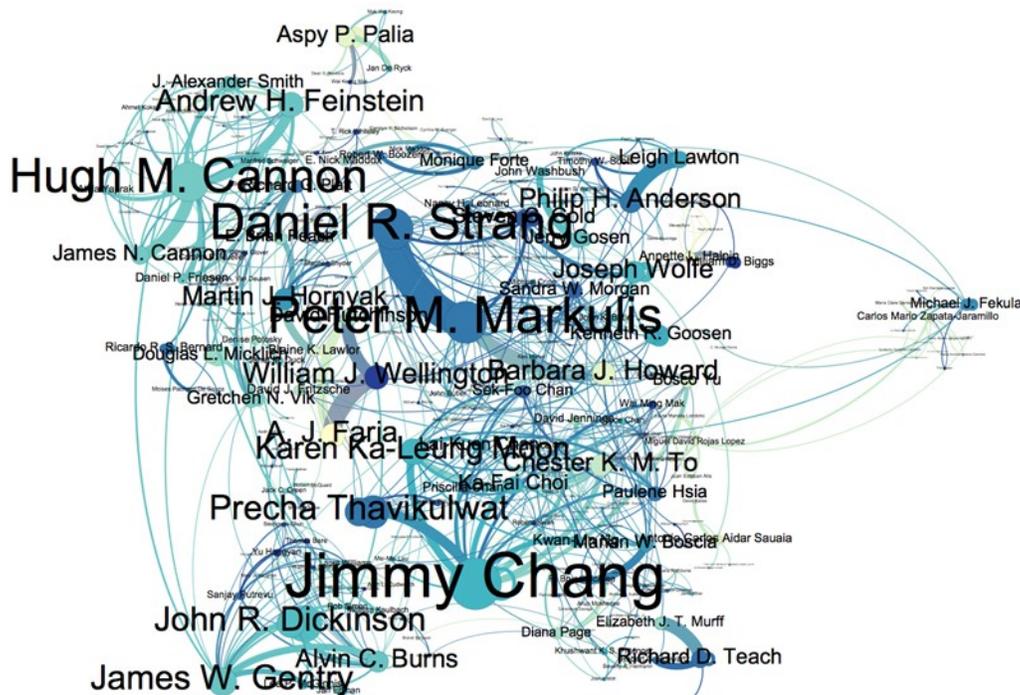
Perhaps ABSEL should have a Jimmy Chang (JC) number. In the ABSEL network the average JC number is 4.5 with Daniel R. Strang having a JC number of 3, Hugh M. Cannon having a JC number of 6, and Precha Thavikulwat having a JC number of 1.

CONCLUSION

The ABSEL organization is a complex social system that can be regarded as a network of interconnected researchers. Creating the ABSEL co-authorship network provides a visual way to identify the primary collaborations and communication channels. The network’s underlying structure, stability, and dynamic development reveals both risks and opportunities for the ABSEL organization. With 61% of researchers unconnected to the giant component there are ample opportunities to strengthen the network.

Future work could be pursued to better understand the ABSEL organization. Specifically, an investigation of the track affiliations could help to better target policies for strengthening the network. Similarly, identification of research methods (e.g., case study, empirical, theoretical) could provide a meaningful affiliation network for exploration. It may also be possible to extend the current network by capturing social relationships outside of the co-authorship activities. Finally, a full bibliographic network analysis could be done, to understand how ABSEL researchers influence each other through prior publications.

**FIGURE 1
ABSEL GIANT COMPONENT**



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