Impartial Network Orchestration: Multiple Service Sector Networks and the Need for Intentional Neutrality

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Abstract

This study analyzes the potential for structural subgroups to form in complex, goal-directed networks, based on organizational domain or sector. Additionally, it proposes the concept of sector impartiality as a way to ameliorate the structural isolation of sub-network domain groups. Through two illustrative cases, we demonstrate both the presence of domain-based subgroups, and the structural effects of impartial orchestration on the whole network over time. The study contributes to both theory and practice by connecting research on network structure with the practical challenges of managing complex, multi-sector networks.

Keywords: Interorganizational network, network management, impartial orchestration

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The increasing complexity of modern society has created new and complex challenges to which the public sector is often expected to respond (Hjern & Porter, 1981; Kettl, 2015). Public managers have recently turned to multi-organizational, goal-directed networks to address the sorts of "wicked problems" for which collective action is often required (Rittel & Weber, 1973; O'Toole, 1997; Provan & Kenis, 2008). This is largely based on research which suggests that the merging of diverse ideas can spur creativity in problem solving and innovation, leading to new ideas and solutions to pressing problems (Uzzi & Spiro, 2005; Hardy et al., 2005). Thus, it is assumed that creating relationships between different organizations within a problem area can increase the ability of those organizations to collectively address the problem.

Intentional efforts to bring various organizations together to collectively address a problem is a goal-directed network. Provan and Kenis (2008) define goal-directed networks as "groups of three or more legally autonomous organizations that work together to achieve not only their own goals but also a collective goal" (p. 231). This type of network contrasts with networks made up of emergent entities, developed out of serendipitous interactions among organizations (Saz-Carranza et al., 2015) and with no formal governance structure (Provan et al., 2007) or collective goal to pursue. In essence, goal-directed networks attempt to accomplish collective goals which single organizations are unable to accomplish alone (Provan & Kenis, 2008).

As these networks are intentional organizing approaches to solve a particular problem, often involving a heterogeneous group of organizations, they often must be governed and managed. Bridging such diverse organizations to build unity within the network is an inherent tension in networks (Saz-Carranza & Ospina, 2011). In order to manage this tension, it has been argued that some form of network governance may be necessary (Provan & Kenis, 2008). Provan and Kenis (2008) define network governance as “the use of institutions and resources to coordinate and control joint action across the network as a whole” (p. 231). Following Paquin and Howard-Grenville (2013), however, we employ the term “network orchestration” to refer to the underlying governance processes, as the term does not imply a particular form of governance and can apply to a range of governance activities. Network orchestration involves those types of activities which attempt to recruit and secure effort of network participants, facilitate relationships between network members, develop common goals between members, and allocate resources as necessary to stabilize the network (Paquin & Howard-Grenville, 2013; Lemaire & Provan, 2018; Bartelings et al., 2017). Understanding how network orchestration may be important to unifying a diverse group of organizations for the purpose of addressing a complex problem is important to progressing our understanding of how to make goal directed networks successful.

While the scholarship on network orchestration has steadily increased, the vast majority only focuses on the specific orchestration behaviors and processes which might facilitate collaboration. There still remains, however, much we do not understand about the ways in which network orchestration may affect the physical structure of the network, especially over time (Paquin & Howard-Grenville, 2013). Thus, this article is motivated by the following questions: first, are there structural subgroups within networks, based on service sector? Secondly, how might network orchestration affect these structural subgroups? We begin by exploring previous theories of domain silos and structural subgroups, and the potential impediments they create to collaboration across diverse domains. We then present two network cases to illustrate the existence of structural subgroups, and the structural effects of orchestration over time. Based on our findings, we argue that *impartial* orchestration (or that which is not derived from a particular organizational domain) may offer a way to create ties across diverse domains, as well as a neutral playing field for all network members, and thereby increase the likelihood of successful cross-domain collaboration.

Goal-directed Networks and Organizational Domains

As noted above, the purpose of goal-directed networks is to bring together diverse organizations with different capacities, resources, and competencies to work together as a cohesive unit in their effort to achieve collective outcomes. However, attaining effective collaboration can be difficult, due to the very organizational domain diversity which makes networks so valuable (Saz-Carranza & Ospina, 2011). Organizational domain refers to the types of products and services an organization provides, as well as the types of clients or customers served (Scott, 2003). Organizational domain may impede effective collaboration across diverse network members due to several important factors. First, as previous scholarship indicates, organizations within the same domain are naturally more likely to possess complementary resources, as well as similar norms and missions, all of which facilitate collaboration to a greater extent than between organizations from different domains (Levine & White, 1961; Oliver, 1990; Lemaire & Provan, 2018). Previous research has shown that organizations with similar domains (or fields) have a greater likelihood of adopting the same forms and practices (DiMaggio & Powell, 1983). Following Biermann (2008), by domain similarity, we mean that organizations have a significant area of shared issue, but not complete overlap of competencies, which creates the potential for valuable collaboration.

Over time, this propensity for homogeneity creates homophily among organizations in similar domains; organizations in the same domain have been shown to have higher propensities for establishing relationships than those without domain similarity (Lemaire & Provan, 2018). It is often the case that complex, goal-directed networks contain organizations from numerous domains and this preference for collaboration with likeminded organizations may create organizational domain silos within these networks. For instance, the Federal Emergency Management Agency (FEMA) groups the necessary service sectors involved in responding to disasters by Emergency Support Function (ESF) based on the type of capability they provide, such as transportation, public health services, and firefighting (U.S. DDH, 2015). When disasters strike, all ESFs come together to collaboratively respond to the emerging threats. Yet, one would naturally expect stronger ties between organizations in the same Emergency Support Function than across Emergency Support Functions, creating cross-ESF collaboration challenges.

These selective collaboration patterns can create structural silos within networks, where network members are predominantly connected only to the organizations within their same domain. This phenomenon may persist even after the network is formally established, due to the potential for conflict between organizations based on domain differences. Organizations naturally enter into a network with their own unique demographic and cultural characteristics, as well as structural and institutional traits such as organizational forms and practices (Huxham & Vangen, 2005; Saz-Carranza & Ospina, 2011). In this way, network participants bring their own perspectives, professional standards, and norms into a collaboration, all of which may conflict with other network members' perspectives, standards and norms, creating barriers to collaboration (Moynihan, 2009). As noted previously, organizations with similar perspectives, standards and norms tend to collaborate with like-minded organizations, and when attempting to work with other network members, the silos created by these collaborative patterns may clash with each other. These conflicts may create barriers to achieving network-level outcomes.

Secondly, in large, complex networks often found in the public sector, these organizational domains may form distinct substructures within the network, which vary by domain. As Tatarynowicz et al. (2016) argued, each industry or domain has a specific structure which is, in part, dictated by the unique environmental demands within that domain. In short, organizations intentionally pursue specific types of collaborative ties in order to best meet the needs of the industry's environment. These strategic efforts combine to create an industry-wide network structure. Thus, it follows that in these types of large networks, multiple domains may exist, each of which contains numerous organizations, forming distinct structural subgroups based on tie distribution.

Subgroup Structures within Goal-Directed Networks

One potential consequence of the behavioral preferences for collaboration between similar organizations is the creation of structural subgroups within the network, based on tie distribution. Thus far, little research has explored the ways in which organizational domain behavior affects overall network structure, and even less has examined the potential for a whole, goal-directed network to contain multiple structural subgroups within its overarching structure. Several recent studies, however, have offered typologies for the various structural forms a network may take. We review these below, and build on the findings to argue that multiple structural subgroups may be contained in a single goal-directed network.

Network Structural Typologies

Two recent studies have posited the specific structural forms goal-directed networks may take, depending on the distribution of ties within the network (Tatarynowicz et al., 2016; Nowell, et al., 2017). Nowell et al. (2017) argue that most of these theories revolve around two central elements: closure and centralization. Dense or close networks refer to structures where there is a high amount of connectivity across all actors in the network (Nowell et al., 2017), or where ties are formed between partners that connected to one another (Burt, 1992). In contrast, in highly centralized networks, members are linked only by their connection to a single actor (Nowell et al., 2017). Based on these two dynamics, they posit four types of structures a network might take (see Figure 1).

< Figure 1 about here >

First, the subgroup may be centralized or closed. In *centralized* structures, members are connected through a single actor (at the extreme). In *closed* or dense network structures, there is high connectivity among all the members. In contrast, *brokered* or decentralized network structures have small groups of organizations which are connected through a series of brokers. This, in essence, is Milgram's concept of small world theory, wherein ties are both highly locally clustered and consist of short path lengths (Uzzi & Spiro, 2005; Watts, 1999). Finally, a *core-periphery* structure has dense connections among a central group at the core, surrounded by a periphery with sparser connections.

A second typology is offered by Tatarynowicz et al. (2016). They find that an industry's (to use their terminology) technological environment encourages firms to pursue open or closed network structures. For instance, in industries where the technical environment is relatively stable, there will be a tendency to pursue more of a closed structure, which helps to preserve and maximize existing resources, and to reduce transaction costs. In contrast, in industries with more technologically dynamic environments, more open network structures are pursued to maximize innovation and access to diverse innovation. They find that these propensities for open or closed networks create differences in both the level of network connectedness, as well as the community structure in networks. They define a network's level of connectedness as "the extent to which network actors can reach one another via network ties" (p. 62), whereas community structure describes the distribution of ties in a network. From these results, they propose three network "archetypes," which may be defined based on the level of connectedness and community structure, and are depicted in Figure 2.

< Figure 2 about here >

The first archetype is referred to as a *convention*, which has high network connectedness and weak community structure, and is associated with firms' propensities for very open networks. They second archetype they posit is a *community*, consisting of high network connectedness and medium-to-strong community structure, and associated with propensities for somewhat open networks. The final archetype is a clan, which has low network connectedness and strong community structure, and is associated with propensities for more closed networks.

Building on these two studies, we argue that a large, complex network may consist not only of different organizational domains, but also different structural subgroups, based on domain. In some domains, organizations will pursue ties which result in an overall network structure that may be entirely different from the network structure of organizations in other domains. Yet these different structures all fall under the same whole goal-directed network charged with achieving collaboration. To address these challenges, goal-directed networks often require some form of intentional facilitation, to create ties where they would not otherwise be established, and to develop common goals and norms of action (Paquin & Howard-Grenville, 2013). These sorts of actions have been coined "network orchestration."

Impartial Network Orchestration

In 2011, Saz-Carranza and Ospina argued that in addition to the three inherent network tensions initially posited by Provan and Kenis (2008), there exists one additional tension: that of balancing the need for unity with the competing need for diversity within a network. While this is a challenge in any network, we argue that in complex, goal-directed networks often found in the public sector, this balancing act is even more difficult, and more important due to the need for collaboration between whole organizational domains. As noted above, network orchestration involves a set of processes which is intended to increase the collaboration across the network. Dhanasai and Parkhe (2006) argue that network orchestration involves three distinct processes: *knowledge mobility*, *innovation appropriability,* and *network stability*. While the authors were speaking specifically with regard to innovation networks, these three processes are applicable in complex, goal-directed networks as well.

Knowledge mobility has been defined as “the ease with which knowledge is shared, acquired and deployed within the network” (Dhanasai & Parkhe, 2006, p. 660). Thus, in order for innovation to occur, members must first share their specialized knowledge with other members. *Innovation appropriability* involves efforts to ensure the value created by mobility of knowledge is distributed equitably among network members (Dhanasai & Parkhe, 2006). Network orchestration can aid in ensuring that valuable knowledge is distributed appropriately across the network by focusing on attaining trust, procedural justice, and joint asset ownership (Dhanasai & Parkhe, 2006). Finally, *network stability* refers to the efforts to maintain nonnegative growth of a network over time (Dhanasai & Parkhe, 2006). Hurmelinna-Laukkanen & Natti (2008) argue that long-term network stability may be fostered by “improving the image and common vision of the network through increasing the amount of ties between the actors…and through emphasizing the expected future benefits” (p. 2).

Dhanasai and Parkhe (2006) argue that in innovation networks, hub firms arise to conduct these orchestration activities. These firms, they posit, are those key actors which possess power and prominence in the network, and use that prominence to also perform a leadership role (p. 659). In this description, it is implied that the organization undertaking the orchestration activities is in itself, a member of the network, with additional goals and interests outside of the overall network goals. Hacki and Lighton (2001) provide an example of this when describing the emergence of network orchestrators in the private sector. In one example, they describe how Cisco, as its network's orchestrator, established its own virtual platform for network members to interact, called the Cisco Connection Online. Thus, the orchestration for the network came from a specific sector of the network, and all network members had to utilize the platform designed from a single organizational perspective. In this way, Cisco orchestrated the platform to serve its own interests as an independent organization, rather than creating a platform which best met the needs of the network as a whole.

While this type of partial orchestration may be appropriate in private sector innovation networks, in complex, goal-directed networks with numerous domain subgroups, we argue that the three orchestration processes may aid in fostering collaboration, but only if they are conducted with impartiality. By the term "impartiality," we refer to orchestration which is not derived from one particular service domain. Instead, it is independent of all sectors and comes from a domain-neutral perspective with separate frameworks and standards. In an impartially orchestrated network, no single service sector or domain receives prioritization or preference. Thus, the three aforementioned orchestration processes are conducted from a neutral perspective, and solely to benefit the network as a whole. Figure 3 provides an illustration of this concept.

< Figure 3 about here >

With regard to the first process (the mobility of specialized knowledge), in complex, goal-directed networks consisting of multiple organizational domain substructures, such mobility be hindered without the deliberate orchestration of ties across the substructures. Paquin and Howard-Grenville (2013) refer to this type of activity as "arranging marriages," or the selective enabling of certain ties (p. 1624). Once these ties have been intentionally created, network members may then achieve discourse, which, as Hardy et al. (2005) argue, is the first step toward the production of collective identities, and eventually, collaboration. If the orchestration of these ties is conducted from an impartial perspective, only those ties which behoove the overall outcomes of the network are created.

As noted above, the second process, innovative appropriability, refers to those orchestration processes which distribute the specialized knowledge of diverse members as appropriate, ensuring knowledge hoarding and knowledge leaking do not occur. If a partial orchestrator conducts this process, it is possible that, even if it is unintentional, they may ensure they are the recipient of knowledge which is particularly advantageous to their home organization, and withhold information which is advantageous to a competitor within the network. An impartial orchestrator, in contrast, only shares the knowledge with appropriate members, in a way that will best enable collaboration to further the goals of the network.

Finally, with regard to the network stabilizing process, impartial orchestrators have only the goal of sustaining the network, not their own organizations. As such, they are free to undertake whatever actions may be needed to keep the network functioning over time. In contrast, orchestration which is partial to one organizational sector may be conflicted between the competing needs of both the home sector and the network as a whole, resulting in less than ideal orchestration processes for the whole network.

Through the impartial conduct of knowledge mobility, innovative appropriability, and network stabilization processes, the needs of the whole network are prioritized over the needs of any particular organizational sector. Thus, we argue that as an impartial orchestrator "arranges marriages" (Paquin & Howard-Grenville, 2013) across structural subgroups, facilitates the sharing of specialized knowledge as needed throughout the network, and takes necessary actions to stabilize the overall network, the isolated structural subgroups which were delineated by sector will form ties across each other. Over time, the network structure will become denser, and while the structural subgroups will still be visible, they will eventually have cross-sector ties. Figure 4 depicts the anticipated results of impartial orchestration in a multi-sector network.

< Figure 4 about here >

Empirical Illustration

To demonstrate our argument empirically, we analyzed two cases to examine how service sub-network structure and neutral orchestration may impact network structure. This illustration is not a test of our argument, but rather an exploration to determine if we did find sub-network structures in these networks and whether those structures were associated with service sector. In addition, we do not examine network orchestration directly but rather indirectly via network structure. Both cases are goal-directed networks, but the network analysis conducted on the first was in its early stage of network development. The network analysis of the second case was conducted on a mature network that had been perceived as effective by network members (Lemaire, 2012).

Cases

Thrive. Thrive is a network located in southwest rural Virginia with the purpose of addressing food access. Its mission is to "collectively increase access to affordable nutritious food in the New River Valley through shared learning, informed advocacy, and responsive (strategic) action." Thrive has been in existence for approximately 3 years but has struggled to secure consistent involvement by organizations in the area. The network consists of public and nonprofit organizations working to ensure people in the region have access to food. Though it may seem that this would be a rather homogenous network, it actually consists of a broad array of types of organizations. Some organizations focus on feeding, such as pantries and backpacks, some on fresh foods, such as gardens, some on emergency services and some organizations provide holistic services to support families. The organizations range from large stable public organizations to small faith-based feeding programs reliant on volunteers. The heterogeneity of the organizations has presented challenges to the network's development.

The network is co-facilitated by two organizations. One organization is the community foundation in the area that is neutral because it is not involved in service delivery and its mission is to serve the community as a whole. The other organization is the extension department of the university located in the area. This organization is not neutral as it supports services related to agriculture and fresh foods.

SACYHN. The Southern Alberta Child and Youth Health Network (SACYHN) was founded in 2001 to facilitate more decentralized services for children and youth and to address the problem of fragmentation in the delivery of health services for children. The mission of SACYHN was to use the collective resources and expertise of participant organizations to advance high quality, coordinated programs and services for children, youth and families. Health for this network was defined broadly as health and well-being, thus an inter-sectoral perspective was important and one of the goals of the network was to build respect and collaboration across organizations in multiple child-serving sectors. These included both public and nonprofit organizations in physical health, mental health, education, social services, and justice.

The governance model for SACYHN resembled the NAO model proposed by Provan and Kenis (2008). Responsibility for the setting of policy and planning decisions was placed on the Steering Committee, which consisted of a subset of network members. In addition to the Steering Committee, the NAO also included staff positions and the staff had responsibility for the actual operations of SACYHN, which involved managing and coordinating network efforts. The SACYHN staff consisted of a full-time director and several full-time staff members. The staff was officially employed by one government agency, the Calgary Health Authority which also contributed about two-thirds of SACYHN's funding. The remaining funding came from the financial resources committed by participating organizations.

SACYHN was formally dissolved in the summer of 2009. Though the formal network was dissolved, SACYHN was in operation for eight years. Lacking is research on survival rates of goal-directed networks, but most networks are short-lived and thus, the dissolving of the formal goal-directed network after eight years should not indicate that the network had not been successful. If fact, the data that was collected on SACYHN shortly before its death indicates the network was a mature network with high impact ratings based on perceptions (self-reference).

Data Collection

The data collected on both Thrive and SACYHN used similar methods. The data on Thrive was collected recently, in Spring of 2018. Network data on SACYHN was collected years ago, fall of 2008, almost a year before its formal dissolution. The data was collected using an online survey for Thrive and a paper-based survey for SACYHN. Both surveys were adapted from network research by Provan and colleagues (cf. Provan & Milward, 1995; Provan, Huang, & Milward, 2009). The total number of respondents for Thrive was 110 individuals representing 73 organizations for a response rate of 81%. The organizational response rate for SACYHN was 88% (42/48 – 5 organizations did not have a respondent identified or no longer existed), while the individual response rate was 76%.

The data for this analysis comes from the first main section of the questionnaires which asked respondents to indicate the relationships their organization has with other organizations using a roster method. The Thrive survey asked respondents to first indicate which organizations they had a relationship with when looking at food security issues. Specifically, responses were asked about 5 types of relationships all of which were defined in the directions: information sharing, food exchange, client referral, sharing resources, and program coordination. The process was the same for SACYHN except that respondents were asked about their relationships related to child and youth health and development and were asked about 6 types of ties: strategic planning, shared resources, service delivery, education, research/evaluation, and information sharing. For both surveys, respondents were asked to only consider relationships in the past 12 months.

Individual responses were aggregated to the organizational level and ties were then confirmed. The confirmation process for network data is used to improve the reliability of the reported data, due to the demands on respondent's memory (Marsden, 1990). The minimization confirmation process (Wasserman & Faust, 1994) was used; meaning the lower of the values indicated by both organizations in a dyad for each specific type of tie was recorded. For instance, if organization A indicated a planning tie with organization B, but organization B did not indicate a planning tie with organization A, then no tie was recorded between the dyad. Thus, relationships were recorded as confirmed as long as both organizations indicated there was a relationship for a particular activity. The confirmation process does result in a loss of data, but is important in improving reliability since the data is based on perceptions of network ties. The focus of this study is on the overall structure of the network and a more conservative approach to the data was worth the trade-off. The confirmation process using the minimization process underestimates where there are links and increases the reliability that the confirmed relationships do in fact exist. For this study, reliably assessing the overall structure is of primary importance.

Analysis

To examine the structure of the Thrive and SACYHN networks, the different types of ties for each network were stacked into one multiplexity matrix. Using only the confirmed ties, the cells of the matrix indicate the number of confirmed relationships between the two organizations (i.e. information sharing, shared resources, etc.). If two organizations did not have any confirmed ties, then a 0 was recorded for that dyad. The possible range for dyads was 0-5 for Thrive and 0-6 for SACYHN. Using the multiplexity of the relationships allows us to examine sub-network structure considering the depth of relationships and not privilege weak ties.

Using these confirmed multiplexity ties, the Markov clustering function in UCINet was used to identify any clustering of subgroups. The Markov clustering is an iterative algorithm based on a bootstrapping procedure. The algorithm deduces the number of clusters based on the structure of the network by partitioning it into non-overlapping clusters (van Dongen, 2008). The Markov clustering was performed twice on each network, one time with the neutral orchestrator and one time with the neutral entity removed from the matrix. This allowed us to determine if the neutral orchestration node changes the structure and subgroup partitioning. The results were six groups for Thrive with the inclusion of CFNRV (the neutral lead agency) and five groups with the removal of CFNRV. For SACYHN, the results indicated only one group and this did not change with the removal of SACYHNF (the NAO staff node).

The groupings were then uploaded as node attributes along with service domain. The service domain attributes were created based on survey responses indicating the primary services respondents indicated their organizations provides. These attributes were used, along with the multiplexity matrices to create the plots in Figures 5-8. Figures 5 and 6 depict the Thrive network; figure 5 includes CFNRV and Figure 6 excludes it. Figures 7 and 8 depict SACYHN, first with SACYHNF (Figure 7) and then without (Figure 8). The color of the nodes indicates the Markov clustering groups. One group for Thrive is not depicted in either plot because that group consisted of the isolates and the isolates were removed so as not to distract from the structure of the network. The nodes are also shaped and are shaped according to service domain.

As can be seen in Figures 5 and 6, there are many subgroups within Thrive. What is interesting about these subgroups is not just the clustering, but that the structure of these subgroups differ. The green group can be characterized as a centralized network with FASWV as the hub. The yellow group is a network described best as closure. There are also small groups characterized by brokerage, like the dark blue group. There also seems to be a core/periphery structure made of a mix of dark green and light blue nodes.

What is most interesting, though, is not only the different sub-structures but the link with service domain. Many of these sub-structures are comprised of the same type of organizations. This is not 100% the case for all organizations, but for each group there is a dominant shape indicating that that subgroup structure is dominated by a certain service domain. The light green centralized subgroup is mostly comprised of circles which are feeding programs. The yellow closure subgroup is mostly comprised of squares which are fresh food organizations (i.e. gardens or farmer's markets). The core/periphery group is comprised of a mix, some circles (feeding programs) but also some triangles (support organizations) and diamonds (multi-service holistic programs).

With the removal of CFNRV, Figure 6, there is one less subgroup and many of those connected via the core/periphery structure become isolates. Other than those changes, there are still the same subgroup structures comprised of the same types of organizations. One subgroup which does emerge more clearly is the dark green subgroup in Figure 6. This subgroup is a brokered network comprised of mostly feeding programs (circles). Thus, it seems that the feeding service domain seems to be dominated by a brokered structure, but there may be different hubs among the feeding programs. It the instance here, one hub is Feeding America and the other is a faith-based program. It makes sense in this service domain to have a centralized structure as many of the spoke nodes are small volunteer-based programs with little capacity for maintaining many network ties, even ties to other similar organizations. In addition to the furthering emphasis of the feeding centralized sub-structures, the yellow fresh food group and structure is also clear. With the removal of the neutral entity (CFNRV), the subgroup and their sub-structures become more clear and what is also lost is some of the core/periphery structure that was providing connections across the groups and to otherwise unconnected organizations. One indication of this are the network level measures, centralization and density. Centralization measures how reliant the network is on central nodes and density indicates the number of ties present out of all possible ties. The removal of CFNRV only slightly reduces the density, but has a stronger change on the centralization.

The findings from Thrive are similar in some ways to SACYHN, but different in important ways as well. What is interesting about the results for SACYHN is that the Markov clustering only identified one subgroup. Despite this non-clustering, what can be seen from Figure 7 is that there are still subgroups with different structures and associated with different service domains. For instance there is a group of circles, health organizations that have a sub-structure characterized by closure. There is an education group (squares) that have a small world structure which is also similar to the structure of the social service/justice group (triangles and diamonds). Despite these different subgroup structures, there are enough connections among the groups resulting in the Markov clustering not finding any non-overlapping clusters.

We could assume that the reason that the network hangs together as one is because of the neutral entity, but that is not actually the case. As Figure 8 depicts, the removal of SACYHNF does not change the network structure. With the removal of the neutral orchestrator, there is still only one group. At the same time, the different subgroups and their structure are easier to decipher. The change in network measures is similar to the changes with Thrive and the removal of CFNRV, density goes down slightly whereas the change on centralization is more notable.

Thus, the analysis of the two cases provide support for our argument. First, we were able to identify different subgroups with different structures and these subgroups were associated with different service domains. The difference in the two cases is that one has numerous non-overlapping clusters and the other does not. The one that does not was a mature network in which the neutral governance management staff had spent years finding ways to build relationships among the heterogeneous group of organizations.

Discussion

This study examined the potential for multiple organizational domains to exist within a single, complex, goal-directed network. Additionally, it explored the different ways in which these domains might manifest structurally, at the level of the whole network. Using two network cases as illustrations, we find that in both cases, specific subgroups appear based on domain, and that they have different structures. These structural findings lead to the following proposition:

Proposition 1: In complex, goal-directed networks which consist of multiple service sectors, there will likely be multiple structural subgroups, following the service sector delineations.

Building on previous theory, we argue that impartial network orchestration may offer a way to diminish the isolation of these subgroups, and create cross-network ties. By employing the Markov clustering algorithm, we find that while both networks are impartially orchestrated and have multiple subgroups, only the mature network has a single Markov cluster. Moreover, this implies that relationships in this network have been established across service domains at such an extent that the algorithm cannot detect separate groups. Based on these results, we propose the following:

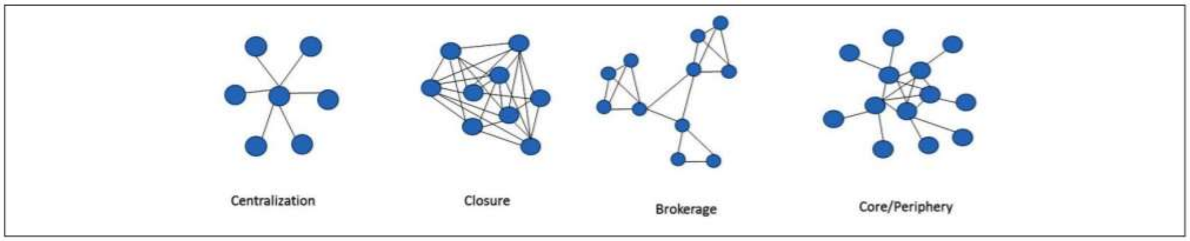
Proposition 2: Impartial network orchestration, over time, may create ties across structural subgroups, increasing network density and improving collaboration across the network.

Conclusion

The analysis presented herein suggests that structural subgroups based on organizational domain exist in complex, goal-directed networks, and that these subgroups may take different forms in different organizational domains. Additionally, impartial orchestration of these types of networks may increase the density with which the subgroups are connected, thereby improving cross-sector collaboration. The study has important implications for both research and practice. First, we have responded to the call for more research on network governance (Provan & Kenis, 2008), by connecting the scholarly areas of network structure with the challenges of managing across service sectors. In addition, we introduce the concept of service sector impartiality to the network governance literature, by using two network cases to demonstrate how impartial governance may reduce the isolation of structural subgroups. These findings also offer insight to practitioners in their efforts to effectively manage multi-sector networks, which are increasingly found in the public sector. By understanding the ways in which impartial orchestration may affect the structure of the network, public managers may better design network governance systems to account for the inherent challenges of managing organizations within multiple domains.

While we have introduced the notion of sector impartiality, this was an inherently theoretical analysis resulting in propositions. Future research should expound upon these propositions, and empirically study the existence of structural subgroups based on service sector. Additionally, network scholars should study how structural subgroups are affected by network orchestration over time, and whether impartial orchestration improves cross-network collaboration.

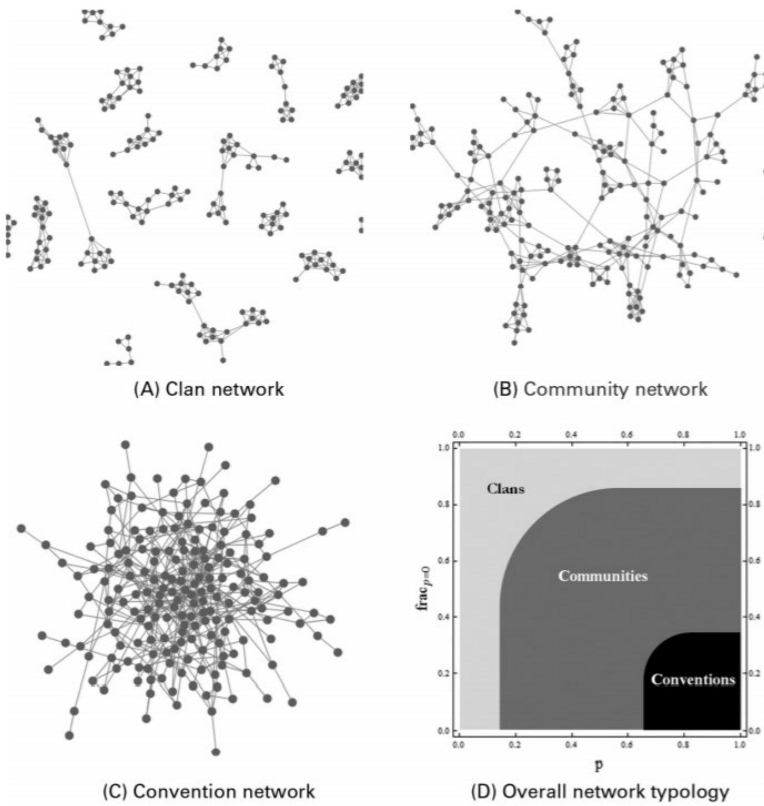
Figure 1: Four Network Structures



Adapted from Nowell, Steelman, Velez & Yang (2017)

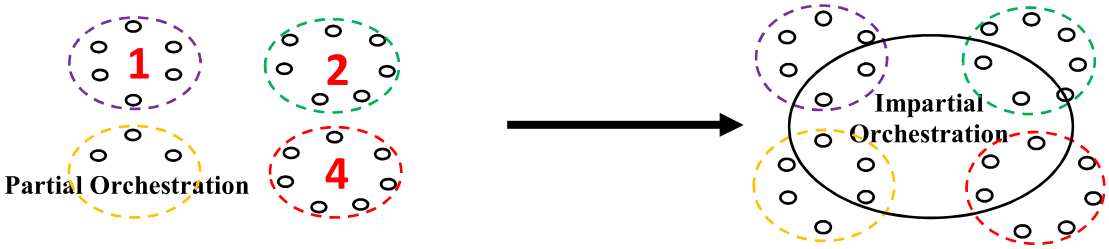
Small World (Watts, 1999)

Figure 2: Three Network Archetypes



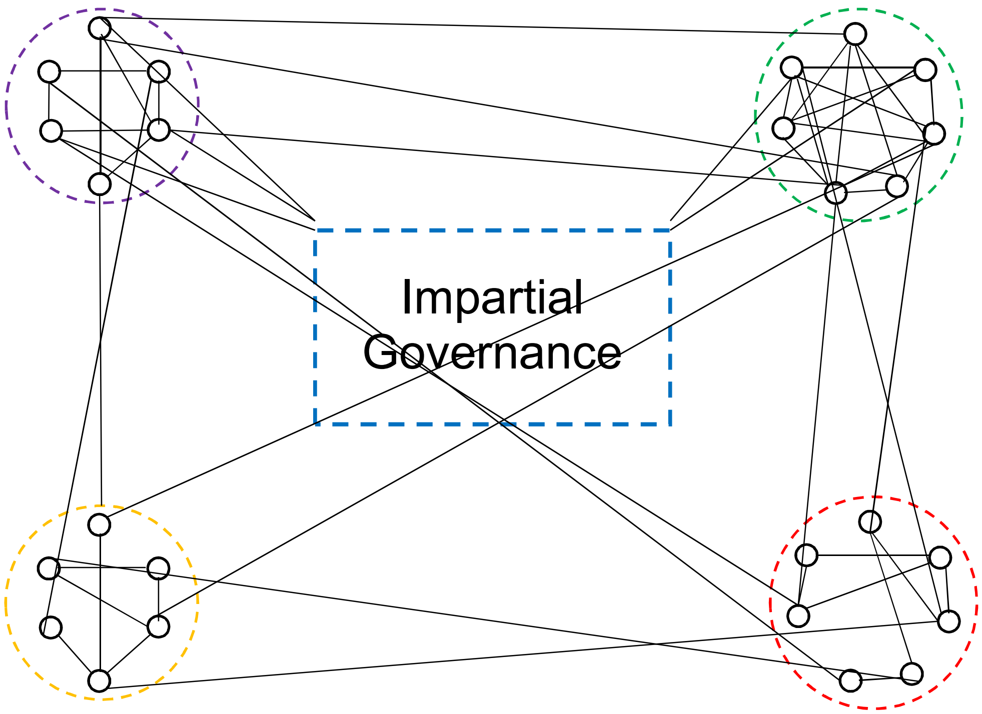
Source: Tatarynowicz, Sytch & Gulati, 2016

Figure 3: Impartial Network Orchestration



Adapted from Newman, M. E. J., & Girvan, M. (2004). Finding and evaluating community structure in networks. *Physical Review E, 69*(2), 1-16.

Figure 4: Impartial Orchestration Creates Cross-Sector Ties



Adapted from Newman, M. E. J., & Girvan, M. (2004). Finding and evaluating community structure in networks. *Physical Review E, 69*(2), 1-16.

Figure 5. Thrive Structure

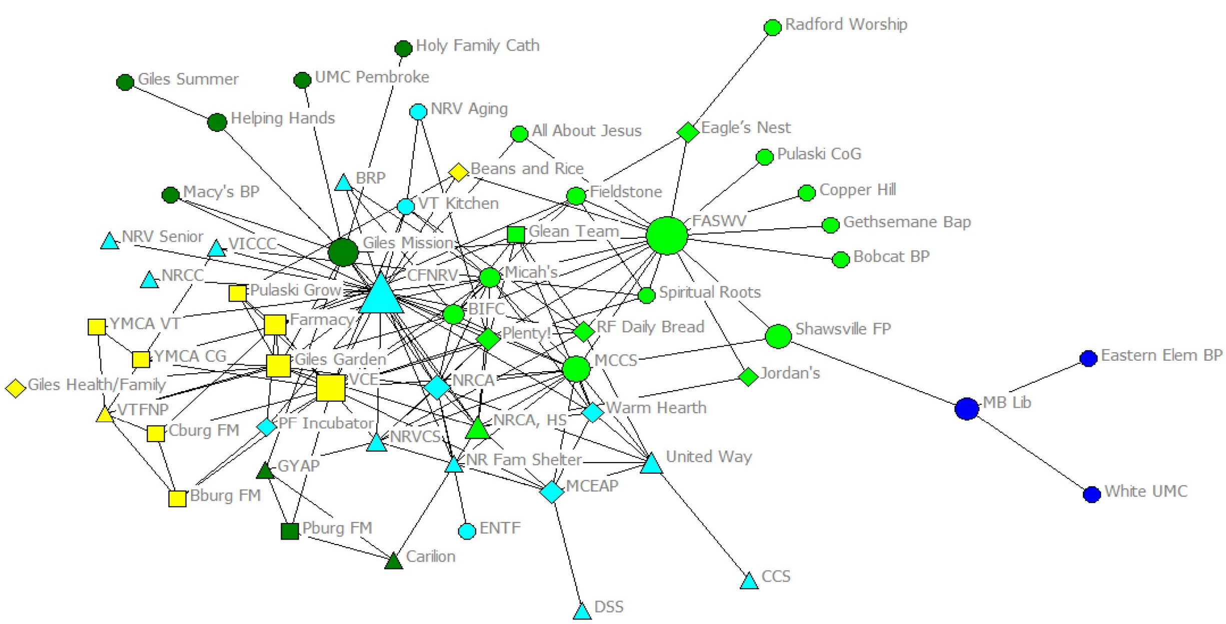


Figure 6. Thrive Structure with removal of Neutral Orchestrator

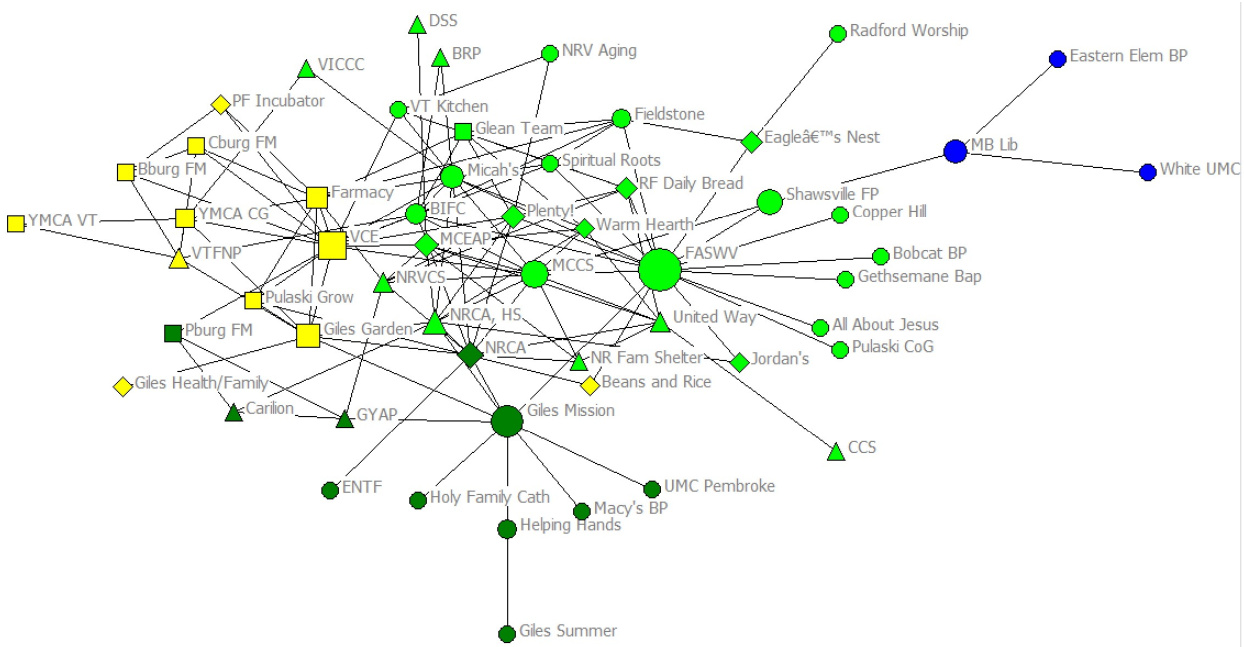


Figure 7. SACYHN Structure

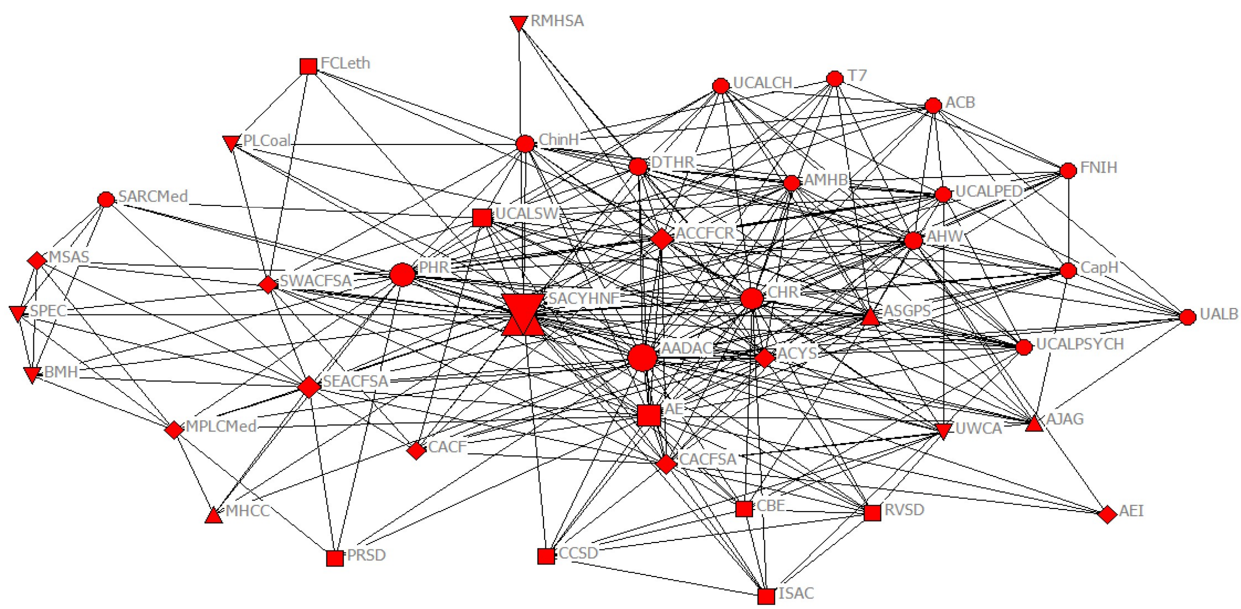
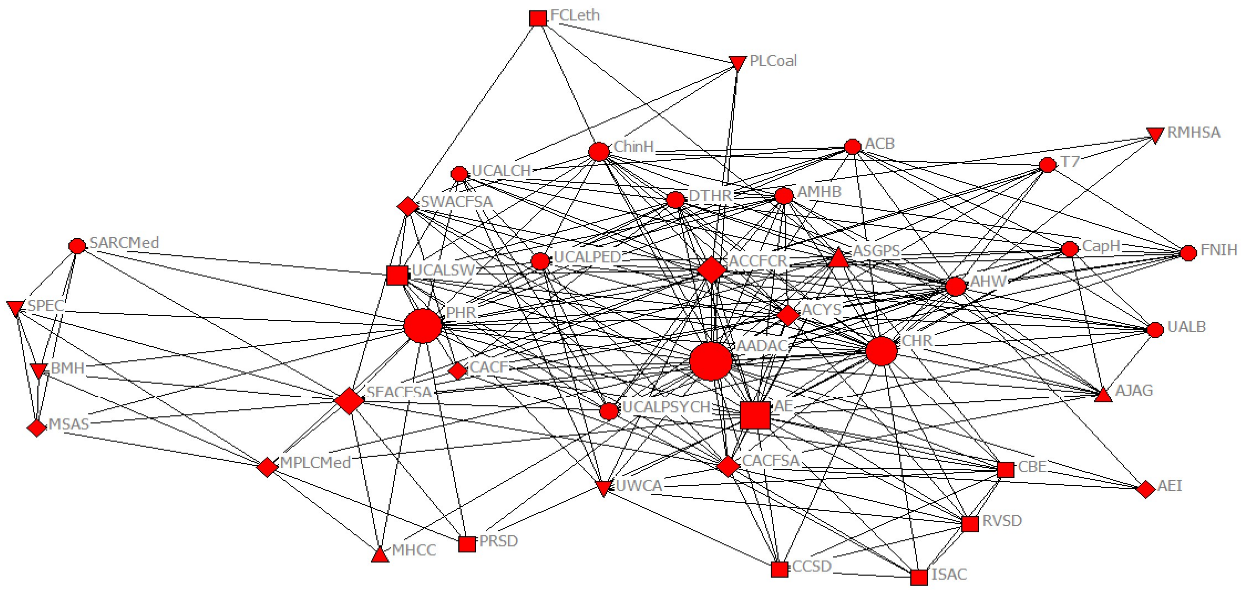


Figure 8. SACYHN Structure with removal of Neutral Orchestrator


FCLeth
PLCoal
RMHSA
ChinH
ACB
T7
UCALCH
DTHR
AMHB
SWACFSA
SARCMed
UCALPED
ACCFCR
ASGPS
CapH
FNIH
UCALSW
AHW
SPEC
PHR
ACYS
UALB
AADAC
CHR
BMH
CACF
SEACFSA
AJAG
MSAS
UCALPSYCH
AE
CACFSA
CBE
MPLCMed
UWCA
AEI
RVSD
MHCC
PRSD
CCSD
ISAC

References

Bartelings, J. A., Goedee, J., Raab, J., & Bijl, R. (2017). The nature of orchestrational work. *Public Management Review, 19*(3), 342-360.

Biermann, R. (2008). Towards a theory of inter-organizational networking. *The Review of International Organizations, 3*(2), 151-177.

Burt, R. S. (1992). *Structural Holes: The Social Structure of Competition.* Cambridge, M.A.: Harvard University Press.

Dhanasai, C., & Parkhe, A. (2006). Orchestrating innovation networks. *Academy of Management Review, 31*(3), 659-669.

DiMaggio, P. J., & Powell, W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review 48*(2), 147-160.

Hacki, R., & Lighton, J. (2001). The future of the networked company. *The McKinsey Quarterly*, Summer 2001.

Hardy, C., Lawrence, T. B., & Grant, D. (2005). Discourse and collaboration: The role of conversations and collective identity. *Academy of Management Review, 30*(1), 58-77.

Hjern, B., & Porter, D. O. (1981). Implementation structures: A new unit of administrative analysis. *Organization Studies, 2*(3), 211-227.

Hurmelinna-Laukkanen, P., & Natti, S. (2008). Network orchestrator and knowledge mobility in innovation networks. *In Proceedings 24th IMP Conference,* 4-6.

Huxham, C., & Vangen, S. (2005). *Managing to Collaborate.* London, England: Routledge.

Kettl, D. (2015). The job of government: Interweaving public functions and private hands. *Public Administration Review, 75*(2), 219-229.

Kettl, D. (2008). *The Next Government of the United States.* New York, NY: W. W. Norton.

Kilduff, M., & Tsai, W. (2003). *Social Networks and Organizations.* Thousand Oaks, CA: Sage.

Lemaire, R. H. (2012). The functions of the network executive: A case study of network management, leadership, and governance (Doctoral Dissertation). Available from UA Campus Repository. Retrieved from https://repository.arizona.edu/bitstream/handle/10150/242474/azu_etd_12404_sip1_m.pdf?sequence=1

Lemaire, R. H., & Provan, K. G. (2018). Managing collaborative effort: How Simmelian ties advance public sector networks. *American Review of Public Administration, 48*(5), 379=394.

Levine, S., & White, P. E. (1961). Exchange as a conceptual framework for the study of interorganizational relationships. *Administrative Science Quarterly, 5*(4), 583-601.

Marsden, P. V. (1990). Network data and measurement. *Annual Review of Sociology, 16*(1), 435-463.

Milward, H. B., & Provan, K. G. (2006). A manager's guide to choosing and using collaborative networks. *IBM Center for The Business of Government.* Washington, DC.

Moynihan, D. P. (2009). The network governance of crisis response: Case studies of Incident Command Systems. *Journal of Public Administration Research and Theory, 19*(4), 895-915.

Newman, M. E. J., & Girvan, M. (2004). Finding and evaluating community structure in networks. *Physical Review E, 69*(2), 1-16

Nowell, B., Steelman, T., Velez, A-L. K., & Yang, Z. (2017). The structure of effective governance of disaster response networks: Insights from the field. *American Review of Public Administration, 48*(7), 699-715.

O'Toole, L. J. (1997). Treating networks seriously: Practical and research-based agendas in public administration. *Public Administration Review, 57*(1), 45-52.

Oliver, C. (1990). Determinants of interorganizational relationships: Integration and future directions. *Academy of Management Review,* 15(2), 241-265.

Paquin, R. L., & Howard-Grenville, J. (2013). Blind dates and arranged marriages: Longitudinal processes of network orchestration. *Organization Studies, 34*(11), 1623-1653.

Provan, K. G., & Kenis, P. (2008). Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration Research and Theory, 18*(2), 229-252.

Provan, K. G., Fish, A., & Sydow, J. (2007). Interorganizational networks at the network level: A review of the empirical literature on whole networks. *Journal of Management, 33*(3), 479-516.

Provan, K. G., Huang, K. & Milward, H. B. (2009). The evolution of structural embeddedness and organizational social outcomes in a centrally governed health and human services network. *Journal of Public Administration Research and Theory, 19*(4), 873-893.

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences, 4*(2), 155-169.

Saz-Carranza, A., & Ospina, S. M. (2011). The behavioral dimension of governing interorganizational goal-directed networks: Managing the unity-diversity tension. *Journal of Public Administration Research and Theory, 21*(2), 327-365.

Saz-Carranza, A., Iborra, S. S., & Albareda, A. (2015). The power dynamics of mandated network administrative organizations. *Public Administration Review, 76*(3), 449-462.

Scott, W. R. (2003). Organizations: Rational, Natural, and Open Systems. 5th Ed. NJ: Pearson Education, Inc.

Tatarynowicz, A., Sytch, M., & Gulati, R. (2016). Environmental demands and the emergence of social structure: Technological dynamism and interorganizational network forms. *Administrative Science Quarterly, 61*(1), 52-86.

Uzzi, B., & Spiro, J. (2005). Collaboration and creativity: The small world problem. *American Journal of Sociology, 111*(2), 447-504.

U.S. Department of Health and Human Services. (2015). Emergency support functions. *Public Health Emergency*. Retrieved from https://www.phe.gov/Preparedness/support/esf8/Pages/default.aspx.

van Dongen, S. (2008). Graph clustering via a discrete uncoupling process. *SIAM Journal on Matrix Analysis and Applications, 30*(1), 121-141.

Wasserman, S., & Faust, K. (1994). *Social Network Analysis: Methods and Application* (Vol. 8). Cambridge University Press.

Watts, D. J. (1999). *Small Worlds: The Dynamics of Networks between Order and Randomness.* Princeton, N.J.: Princeton University Press.