

**Network Governance in a Publicly Funded Child and Youth Health Network: Sub-network
Embeddedness, Cohesiveness, and the Role of Brokers**

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The prevailing assumption in the inter-organizational network literature is that networks are an effective mode of organizing and that they lead to performance outcomes that go beyond what might have been achieved by network member organizations acting on their own. For instance, by working together, organizations can share resources and expertise (Provan and Milward 2001), enhance capacity (Agranoff 2003), or improve services offered to clients (Huxham and Vangen 2005). The research on inter-organizational networks has been growing rapidly in the last several years and several recent empirical studies have examined the impact of networks on organizational performance, particularly the performance of public agencies (Andrews et al. 2005; Nicholson-Crotty and O'Toole 2004). Despite this overall interest in networks, empirical research examining the performance of whole networks is still lacking (Provan, Fish, and Sydow 2007).

Examining overall network performance, and to a lesser extent, the impact of network activity on organizational performance, is no easy task, in part because of the difficulty of assessing performance, especially in the public and nonprofit sectors, and in part because it is not clear from past research how whole networks function and how this functioning either contributes to or hinders the accomplishment of collective outcomes. According to Provan and Kenis (2008), understanding network functioning is about understanding the relationship between network conditions and network outcomes, which is important to understanding why networks may lead to the outcomes they do, as assumed in the inter-organizational literature.

In the recent literature on public organizational networks, one prominent issue related to how networks function has been governance (Goldsmith and Eggers, 2004; Herranz, 2008; Provan and Kenis, 2008). Governing multi-organizational networks is a key issue because some form of governance is necessary to coordinate the collective actions of the network as a whole.

This is especially true for goal-directed networks (Kilduff and Tsai, 2003), which are common in the public and nonprofit sectors. In governing networks, the traditional forms of governance of organizations, such as hierarchy and formal accountability, are not options. How then are networks governed? Since governance in networks cannot be done by means of hierarchy and control, other mechanisms must be in place to ensure that network goals are met.

Rather than focusing on networks as a means of governance, Provan and Kenis (2008) discussed how networks are governed and managed, and offered three basic forms of governance: participant, lead-agency, and network administrative organization (NAO). In addition, they offered four contingency conditions that are likely to affect the success of each form and the tensions that are inherent to each form. Based on their conceptual reasoning, Provan and Kenis (2008) then go on to develop propositions regarding which governance form is likely to be most effective under each set of contingency conditions. While their work offers a much-needed initial attempt to understand network governance, their ideas are rather broad and not empirically based. In particular, the empirical reality of how public networks are actually governed may well be more complex than what they proposed, especially in a large network involving many competing and/or conflicting interests.

Taking the typology of Provan and Kenis (2008) as a point of departure, this paper will examine empirically a number of structural aspects of networks that may impact how effectively a network is governed. Our focus is on a single network that is governed through a network administrative organization. Specifically, we will examine the Southern Alberta Child and Youth Health Network (SACYHN). SACYHN is a large (50+ organizations), publicly funded, goal-oriented network covering the entire Southern Alberta region of Canada. SACYHN is governed through a NAO consisting of a steering committee and paid staff committed to the

administration of the network and the facilitation of ties among network members. According to the typology of Provan and Kenis, having a NAO model for SACYHN appears to be the most effective form because the network is too large to use a participative form and because there is no single dominant organization that is willing or able to assume the role of a lead organization.

SACYHN is also a very heterogeneous network; it includes participants from all child-serving sectors (i.e. health, education, social services, justice) and the participating members represent provincial-wide public authorities, regional authorities, and community organizations. In addition, SACYHN also governs a large, geographically diverse area. Given these additional complexities, the NAO form appears to be the appropriate network governance mechanism. However, public management scholars currently have only a very general understanding of the impact of network governance on network activities. Use of in-depth empirical data is needed to provide a deeper theoretical and practical understanding of how a NAO actually governs a network, what the structural properties of such a network are, and whether or not the network activities administered and facilitated by the NAO are contributing to the effectiveness of member organizations.

In this regard, our research is guided by two related research questions: How does a NAO governing a large, heterogeneous network coordinate activities among geographically diverse sub-networks? Are there significant differences in the impact of the NAO on organizational outcomes depending on how network sub-structures are governed?

This paper proceeds as follows. First we will discuss the theoretical rationale behind embeddedness as an effective structure, and the theoretical rationale behind cohesive sub-structures paired with an influential broker as an effective substitution for embeddedness. We will then present the case of SACYHN and its structure. Next we will present the analysis and

measures. We will use Qualitative Comparative Analysis (QCA) to test the different network sub-structures to see which ones are associated with high perceptions of performance. Finally, we discuss the implications that the different sub-structures have on overall network performance and on an understanding of network governance.

In a recent study, Schalk et al. (2009) examined the commonly accepted relationship between network centrality and impact on organizational performance. They also looked more narrowly at the impact of embeddedness in a cohesive subgroup on organizational performance. The authors found that cohesive subgroup membership had more of an impact on organizational performance than centrality in the network as a whole. .

In this paper, we will take an approach that is similar to the work of Schalk et al. as a starting point, while going well beyond their study to build a deeper understanding of network governance and effectiveness. We do not suggest that either high network centrality or cohesive network subgroups leads to higher organizational outcomes. Rather, we examine both. Our findings indicate that cohesive network subgroups, paired with a network broker, may have the same outcome for organizations as high centrality.

Theoretical Background and Rationale

Centrality

Centrality is defined as how involved an actor is in a network; a central actor is one that has high involvement, based on its many ties to other members of the network (Wasserman and Faust 1994). A central actor is prominent in the network because of its high visibility as a result of its connections to many others.

The effect of centrality on firm performance has been examined in many studies. For instance, Powell et al (1996) found that centrality in a network and collaborative experience

increased biotechnology start-ups' growth rates. Being central in a network with diverse information positioned biotechnology firms to have higher revenue growth. In a study of Canadian investment banks, Rowley et al. (2004) found members of cliques with similar centrality were the ones able to obtain higher market shares. In a public sector context, O'Toole and Meier (2004) found a positive relationship between the extent of network activity of superintendents (i.e., their centrality) and the performance of school districts, contingent upon resources and stability.

Based on these and other studies, we can conclude that there are positive benefits to organizations that maintain a central position in a network. Such organizations are able to benefit from greater access to resources and information, and thus, are likely to attain enhanced outcomes as a result of their participation. Consistent with this logic, we propose that organizations with higher network degree centrality, and thus, those that are most embedded in the entire network structure, will have more positive views of the impact of the network on organizational outcomes than will organizations that are less central in the network.

Cohesive Subgroups and Influential Brokers

Cohesive subgroups are defined as “subsets of actors among whom there are relatively strong, direct, intense, frequent, or positive ties” (Wasserman and Faust 1994: 249). Cohesion in networks has been used to explain consensus (Friedkin 1984) and homogeneity (Collins 1988). Cohesion is typically found in cliques, which refer to three or more actors who are all connected to one another.

At the network level, cliques have been found to be effective network structures. Provan and Sebastian (1998) found that highest effectiveness regarding the delivery of care to clients suffering from mental illness was found in the network having a small number of organizational

cliques with substantial overlap in activity. A network consisting of cohesive subgroups, like cliques, is consistent with the “small world” networks discussed by Watts (1999). The effectiveness of networks based on small world properties is that dense subgroups are connected to other dense subgroups in other parts of the network through bridges (Uzzi and Spiro 2004).

Cohesion and brokerage have been found to work together. Individuals or organizations that span “structural holes” are considered brokers (Burt, 1992). Bridging structural holes may give organizations an advantage either because of power or access to information. Bae and Gargiulo (2004) found organizational performance was positively impacted when organizations were in a position to broker between disconnected others, at the same time as having leverage from being a member in a cohesive set.

We propose that similar to small-world principles, cohesion and brokerage together will connect a network subgroup to the network as a whole. When this occurs, even if subgroup members are not central, perceptions of network effectiveness are likely to be high. Consensus is associated with cohesion and intensive coordination is easier among a smaller number of organizations. The problem is the integration of a small cohesive subgroup with the rest of the network structure. A broker can provide the bridge as in small world structures and if this broker is an influential player in the network as a whole, then the prominence of this actor creates a strong bridge for coordination and consensus to flow between cohesive sub-network and the entire network.

The broker in the research we present here is an organization that acts as an intermediary between a cohesive network subgroup and the NAO. We propose that having a strong tie to the NAO, through a broker, will be associated with high effectiveness by network subgroup members.

Research Methods

Research Setting

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 SACHYN has been to use their collective resources and expertise to advance high quality, coordinated programs and services for children, youth and families. SACYHN does not provide services, so its goal is to strengthen the existing connections between service organizations and create new linkages. Services integration, through many strong links among organizations serving children and youth, is thought to improve the experience of care for families, and subsequently, impact child health outcomes. The work of the network has been to seek opportunities to facilitate these linkages and connections rather than to create a new service delivery system.

SACYHN is a heterogeneous network where working across child-serving sectors was important. At its inception, the leadership decided to define health in the broadest sense; not healthcare, but health and well-being. Thus, in order to address child and youth health and wellness, an inter-sectoral perspective was needed and importance was placed on building respect and collaboration across organizations in a number of child-serving sectors in order to better address the needs of children and youth. These child-serving sectors include both public and nonprofit organizations in health, education, social services, and justice.

In addition to the cross-sectoral focus, importance was placed on coordinating services across geographical regions. The founding of the network was announced as part of the funding of a children's hospital in Calgary, and the network was seen as a reinforcement of a mandate of the children's hospital to offer specialized health services to children and youth throughout the

Southern Alberta region. Since this was such a large region, the SACHYN network was divided into 4 smaller regions consisting of 3 rural and 1 urban region (Calgary). These regions are geographically distant in that they cover the entire lower half of a province that spans over 250,000 square miles.

Inter-sectoral and inter-regional support of SACYHN is evident in the participation and financial support of the multi-sectoral cross-regional group of organizations involved in the network. One-third of SACYHN's funding comes from the financial resources committed to SACYHN by the participating organizations that span both sectors and regions. The remaining two-thirds of SACYHN's funding is paid by the Calgary Health Authority.

SACYHN is governed through a NAO, with the Calgary Health Authority taking a lead in its support. The network is administered by staff members who work to further the goals of the network; however, this staff is officially employed by the Calgary Health Authority. All policy and planning decisions are made by the SACYHN Steering Committee and the operations of SACYHN are managed by a director and several full-time staff members.

SACYHN covers all of Southern Alberta (a large region) so it acts as an umbrella network for smaller regional networks. There are four regional networks: Calgary, Central Alberta, Southeast Alberta, and Southwest Albert. The members of the regional committees are representatives of the local agencies in the region. The regional committees are not subordinate to the Steering Committee, but serve more of an advisory role. Between the regional committees and the Steering Committee, the goal is to integrate the priorities of the regions and the province. The official tasks of these committees are to engage partners in the four regional areas, extend the impact of SACYHN initiatives, and contribute to a seamless system of care.

Data Collection

The data on SACYHN were collected between September 2008 and March 2009. Due to announcements of a possible reorganization of the entire SACHYN child and youth health system, our goal was to collect the data before any system-wide change was implemented. In fact, a total reorganization of the system was begun in January 2009, including elimination of the NAO, which was shortly after our data had been collected.

The data collection involved an organizational questionnaire, elite interviews, and a focus group of parents of the children being served by SACHYN. For purposes of this paper, the questionnaire is the main source of data, but the interview data will be drawn on as well to supplement the questionnaire.

The bounding of the SACYHN network for purposes of the research was based on how members defined the network. That is, any organization that was a member of the Steering Committee, a regional committee, or a working group was asked to respond to the questionnaire. This consisted of a total of 53 organizations. Since multiple individuals in each organization were asked to complete the survey, the total number of respondents surveyed was 137. The actual organizational response rate was 88% (42/48 – 5 organizations did not have a respondent identified or no longer existed), while the individual response rate was 76%.

The questionnaire used was adapted from one used previously by Provan and Milward (1995). The main components of the questionnaire were organizational demographics, questions regarding organizational ties (i.e., network relationships), and perspectives of the impact of SACYHN. In order to determine organizational ties, respondents were provided with a matrix listing all 53 organizations in SACHYN and asked to identify which of six types of links (if any) their organization had with the other 52 organizations “over the past year.” Types of links were based on the activities most important to the work of SACYHN: strategic planning, shared

resources, service delivery, education, research/evaluation, and information sharing. Responses to this question were only counted if confirmed. That is, both agencies in a dyad pair had to indicate that a particular type of link existed for it to be considered as a valid response (Marsden, 1990). In the last column of the matrix, respondents rated the overall quality, or trust, of any relationship they maintained using a five point Likert scale. Quality was defined as “the confidence that the organization will follow through on partnering work.” The respondents were also provided with a list of questions regarding the impact of SACYHN on the work of their organization, on the child and youth health system in general, on the challenges that typically arise from working in the SACHYN network, and a question asking them to rate the extent to which their organization identified with SACYHN.

In the last stage of data collection, elite interviews were conducted with SACYHN staff and key individuals in the system. The list of individuals who were contacted for an interview was created through strategic sampling. Individuals representing different sectors, different organizational levels, and different levels of involvement in the network (i.e. core/periphery) were identified. The interviews were conducted by three different individuals, so a list of questions was used as a guide. The goal of the interviews was to gain a better understanding of the broader context of the network, so the interview protocol was used only as a guide. A total of 16 interviews were conducted with a total of 25 participants.

Preliminary Findings

The Network Structure of SACYHN

Using the typology of Provan and Kenis (2008), NAO governance appears to be the appropriate form for SACYHN. The following are the conditions proposed by the authors as those where a NAO is likely to be the most effective network governance form:

NAO network governance will be most effective for achieving network-level outcomes when trust is moderately to widely shared among network participants (moderate density trust), when there are a moderate number to many network participants, when network-level goal consensus is moderately high, and when need for network-level competencies is high. (241)

Trust was generally high and widely shared among SACYHN participants. Aggregating the ratings of relationship quality, or trust, obtained from each respondent regarding their ties to other organizations, we developed an indicator of the trustworthiness of every organization. Using this measure, the overall mean trustworthiness score across the entire network was 3.59, based on a scale from 1 (poor relationship) to 5 (excellent relationship) with a standard deviation of .29. The scores for the trustworthiness of individual organizations ranged from 3.02 to 4.18.

Regarding network size, the number of participants in SACYHN seems relatively large compared to other networks. Using a structural approach to bounding the network, the number of participants is 53 organizations, which only includes those individuals and organizations regularly participating in network activities. Whether 53 is actually “large” is rather subjective, although it is certainly far too many organizations to operate effectively using a participative governance form (Provan and Kenis, 2008). In addition, the size and heterogeneity of the network raised questions about the capability of the NAO to govern the network in the ways outline by Provan and Kenis.

Network-level goal consensus in SACHYN was also moderately high. One indicator of the level of goal consensus is the level of organizational identification with SACYHN as indicated by questionnaire respondents. Questionnaire respondents were asked to indicate the extent to which their organization identified with SACYHN. On a scale from 1 (does not identify at all) to 5 (identifies as an integral part), the overall mean was equal to 3.61 with a

standard deviation of 1.04. For a network based on a mission as broad as that of improving the health and well-being of children and youth, this level of identification seems to suggest goal consensus was at least moderately high.

Finally, SACYHN member organizations had a high need for network-level competencies. The stated goals of SACYHN, initially developed by the members themselves, were to develop and adopt a shared vision and purpose around child and youth health; identify and create opportunities for positive change in service delivery; involve families and service providers in significant ways in planning and service delivery; build and sustain inter-regional, cross-sector, and clinical connections; and develop, improve, and utilize electronic linkages. These are broad goals that could not be achieved by the individual organizations that comprised the network, especially acting on their own. Thus, network-level competencies, provided and facilitated by the NAO, were clearly needed.

Based on our data, and consistent with the theorizing by Provan and Kenis (2008), the NAO appears to be the appropriate governance form for SACYHN. However, in their discussion of the difficulties in managing large networks, the authors also point out that, “The problem of network complexity is especially acute when participants are spread out geographically, making frequent meetings of all participants difficult or impossible” (238). Their structural solution is to centralize network governance, either through a NAO or a lead-agency. Rather than all organizations having to interact, the participants can interact directly with an NAO or lead-agency for network related coordination.

As discussed above, in addition to SACYHN’s large size, it is a heterogeneous network involving many organizations serving the population of children and youth in different ways and across a large and diverse geographical region. Under such conditions, it seems reasonable to

question whether or not it is feasible, even for a NAO to effectively govern a network. And if so, the question is how this might be done, since direct interaction with every network participant seems unlikely and infeasible. In fact, according to the executive director of SACYHN's NAO at the time of data collection, eventually they reached a point where they could no longer respond to every organization's request as they had before. At some point, even a network with a NAO needs other structural mechanisms to effectively govern the entire network.

Figure 1 is a network plot of the overall structure of the SACYHN network. Multiple individual responses within each organization were aggregated by recording a link between two organizations any time at least one respondent indicated a link existed. The relationships for each of the six types of activities considered (see data collection section) were then confirmed through a direct confirmation process based on minimum intersection, meaning that both organizations had to indicate a relationship for a confirmed tie to be recorded thereby enhancing reliability of the data (Marsden, 1990). The structure depicted in Figure 1 includes all relationships from all six activity networks. A line connecting two nodes, or organizations, indicates at least one confirmed relationship between them.

Insert Figure 1 about here

In the figure, the nodes are colored and shaped according to what SACHYN refers to as regional committee membership, which we use to operationalize regional network sub-structures. The numbers assigned to each node also indicates to which regional committee the organization belongs. The node labeled 5, with the shape of two triangles intersecting, is the NAO. Nodes indicated by a plus sign and the number 0 indicate an organization that does not have regional committee membership. The size of each node indicates that organization's betweenness

centrality score. Betweenness centrality measures how often one node is in a structural position (based on its links) between two or more other nodes that are not themselves directly connected. This is a good measure of network brokerage, because it indicates when a node/organization is providing a high number of short paths between other organizations. Brokers occupy powerful network positions because they act as bridges between people and organizations that are not otherwise connected. Thus, they are central in the flow of information and resources that other organizations depend on (Burt, 1998).

What can be seen in Figure 1 is how the regional committees differ regarding how they are structurally connected in the network. The red square nodes labeled as 1 represent organizations in the Calgary regional sub-network. Many of these organizations are central players in the network, though not all. This is not an unexpected finding since this committee is based in Calgary, as is SACYHN's NAO. Though not all the Calgary region members are central players in the network, the sub-network does have at least two members that are in very strong brokerage positions for organizations in the region as well as for many other organizations across the full network.

We do not have enough information about the second regional sub-network, represented by purple triangles, to make statements about their sub-network structure. This region has only two organizations in our data set, and though these organizations are well connected to the rest of the network, there is little to say about their within group structure, other than that they are connected to each other.

The third regional sub-network, represented by blue circles, is quite different structurally from the first regional sub-network. It is clear that region three members are at the periphery of

the global network structure, based on their weak connections to the network core, including the NAO. These organizations do have connections to other organizations in the network, but there are very few of these. In contrast, most of the organizations in this region are directly connected to one another. There is also a broker. One of the region's organizations is highly connected not only to the other regional organizations, but also to both the NAO and to the global network structure. This committee member is distinguishable by the size of its node, indicating high betweenness centrality. This organization does not have the highest betweenness centrality in the global network, but it is in the top five, providing a strong link between the region's members and the rest of the network. Visually, it can be seen in the figure that this organization is providing the shortest path between many of the region's members and the rest of the network. This sub-structure is thus one that is internally cohesive while being connected to the global structure through a broker.

The fourth regional sub-network also differs from the other two regional structures. The organizations in this region are all at the periphery of the network. There are connections between these organizations and the global structure; however, not a great number. The difference between these organizations and those of region 3, who are also not central actors, is that the organizations in region 4 do not have a central member who can act as a broker to the rest of the network. Thus, regional sub-network 4 members are reliant on their own connections to link them to the global network structure.

Table 1 provides a comparison of the characteristics of each regional sub-network.

Insert Table 1 about here

In view of these differences in regional sub-network structure, we then wanted to determine what, if any, relationship structure might have on perceptions of SACYHN's impact on organizational outcomes. For instance, do only those organizations that are directly connected to the global structure of the network have positive views of the impact of SACYHN on outcomes, or does having few direct ties, but with a highly central broker, lead to the same outcome? And are perceptions of outcomes affected if there is no broker at all for the sub-network?

Analysis and Measures

To examine if the regional structure of the network is related to perceptions of the impact of SACYHN on the organizations within each region, Qualitative Comparative Analysis (QCA) was used. QCA is appropriate for this study not only because the number of cases is small (i.e., only three sub-networks), but also because of the causal complexity. Different configurations of sub-network structure could well be effective, and rather than looking for whether or not any one structural feature might explain perceptions of organizational outcomes, the goal is to find all the structural configurations that in combination lead to a particular outcome. Also, it is possible there are so-called "Inus" conditions, or conditions that are insufficient by themselves, but are necessary parts of the overall causal recipe needed to explain outcomes (Ragin, 2008). For instance, having a broker alone may have no bearing on perceptions, unless having a broker is coupled with a highly cohesive sub-network structure. What is of interest here is not the net effect of any aspect of the network structure, but which configurations of structures can lead to high perceptions of network impact on the organizations within each regional sub-network.

In order to examine which sub-network configurations are associated with perceptions of network impact, we used organizations within a particular regional sub-network as the cases, and

high positive perceptions of the impact SACYHN had on that organization as the outcome. Since we have data on only two organizations for regional committee 2, only committees 1, 3, and 4 were examined.

Perceptions of the impact of SACYHN involvement on organizations were based on a question asking respondents to separately rate the impact SACYHN has had on their organization regarding 18 specific areas, including service quality, access, stability, acquisition of funding, and so on. Using factor analysis, these items were first collapsed into three factors that collectively had an Eigen value equal to 1 or higher. The three dimensions/factors were improving services, enhancing capacity, and professional development. Because these three dimensions were themselves highly correlated (mean $r = 0.84$), and to simplify the analysis and interpretation of results, we combined the three factors into a single scale.

Overall, the mean value of the impact scale was 3.69 with modest variance, indicating a positive view of network involvement (see Table 2 for descriptive statistics). The mean outcome scores were then calibrated into a fuzzy set (Ragin, 2008) using QCA. Fuzzy sets allow for variation by level or degree of membership. In this case, and consistent with the response scale for the 18 items, a value of 3 indicated an impact that was “pretty much neutral” while 4 indicated an impact level that was “mostly positive”. Based on this, the scores were calibrated into fuzzy sets using values of 3.5 or greater (positive outcome is present) and less than 3.5 (positive outcome is not present). Therefore, actual scores were calibrated based on the degree to which the score was close to one of these values (see Table 3 for the descriptive statistics for the calibrated variables).

Insert Table 2 about here

In order to determine the conditions that were associated with each outcome, causal conditions were calibrated into fuzzy sets as well. The causal conditions include the degree of high organization degree centrality, the level of cohesiveness of the regional sub-network, the extent to which a broker is present, and the level of direct connectedness to the SACYHN NAO. Descriptive statistics for the fuzzy set variables are presented in Table 3.

Insert Table 3 about here

The trustworthiness of the organization, both within the region and across to the global structure, and whether or not an organization was in the health sector, were both included initially. In the interest of parsimony, and because neither measure had much impact on perceptions of outcomes, both measures were ultimately dropped from further consideration.

In order to measure the cohesiveness of sub-network structures, we used the ratio of within group ties to between group ties (Wasserman and Faust, 1994). We calculated the density of within region confirmed relationships and the density of the confirmed relationships between the regional sub-network and the rest of the global network structure. The connections between regional sub-network members and the NAO were not included in this measure since these relationships were represented in another causal condition. In order to include the strength of the ties among regional sub-network members and between the region and the global network, we calculated densities using the total number of types of activities actually reported and confirmed divided by the total number of relationships possible ($n(n-1)$). Thus, instead of using dichotomous values, indicating either the presence or absence of a relationship, the relationships were valued, ranging from 0 (no relationship) to 6 (relationship present based on all 6 types of activities assessed in the survey). Using this indicator of multiplex ties, we were then able to

calculate a measure of cohesiveness, considering strength of ties, which distinguished among the three regional sub-networks. Specifically, cohesiveness was calculated as the ratio of ties within the sub-network to the number of ties to the rest of the global network. This measure indicates more precisely how the regional sub-structures differed from each other, than simply looking at the network plot in Figure 1. The details of how these values were calibrated into fuzzy sets are included in Table 2.

Measuring the degree to which a broker was present for each sub-network is based on betweenness centrality scores, as discussed in the section above. The highest betweenness score for the organizations in each regional sub-network was used to indicate the extent to which a broker was present, and this score was then calibrated into a fuzzy set.

To examine whether being a central player was associated with perceptions of high impact of the network on outcomes, the degree centrality of each organization was calculated and these values were then also calibrated into a fuzzy set.

The final causal condition is how connected organizations were to the SACYHN NAO. This value represents the total number of confirmed activities each regional organization had (again, 0 to 6) with the NAO, thereby representing not only the existence, but also the strength of the relationship. Since having a strong connection to the SACYHN NAO seems likely to lead to a more positive opinion of the impact of SACYHN on an organization, this causal condition was calibrated according to how strong or weak the connection was, or even if there was a connection.

QCA Results

To determine the combination of causal conditions associated with an outcome, QCA uses what is called “truth” tables. Truth tables sort cases by the combinations of causal

conditions they exhibit. All logically possible combinations are considered, whether or not there are empirical instances. Then, the consistency of the cases in each row of the table is assessed with respect to the outcome. The results of the analysis of the causal conditions that are associated with perceptions of the impact of SACYHN on organizational outcomes are presented in Table 4.

Insert Table 4 about here

The findings from the QCA indicate that there are three paths associated with high SACYHN impact. Each path describes the structural attributes of those organizations who reported a positive impact on their organization. There are three paths because there are three regional sub-network structures, and each region has some organizations who considered the impact of SACHYN on their outcomes to be positive, which we defined as having an overall outcome scale score of 4.0 or higher (on a 5 point scale). Overall, these three paths have a consistency of 0.76, meaning that 76% of the time these conditions are present, the outcome of perceptions of high impact was also present. Also, these three paths have a solution coverage of 0.82, meaning that these three paths explain 82% of the cases with high outcomes.

The first path represents region 4. Organizations that do not have a weak connection with the NAO and are not in a highly cohesive regional sub-network, view the impact of SACHYN involvement very positively. Therefore, based on structural conditions, a strong direct connection to the NAO is needed for organizations in a regional sub-network who are not themselves strongly connected, if they are to view their network involvement positively.

The second path represents region 1. Organizations that do not have a weak connection with the NAO, are in a regional sub-network that has a well-connected broker, and have high

degree centrality, view the impact of SACHYN involvement very positively. This path speaks to the need for embeddedness in a network. Being embedded through a high number of connections to other organizations in the full network, being connected to a broker, and having a strong connection to the NAO, is positively associated with perceptions of impact.

The final path represents region 3. Organizations that have weak direct connections with the NAO, low degree centrality, but are in a regional sub-network that is highly cohesive and having a broker to span the rest of the network, view the impact of SACHYN involvement very positively. This path is consistent with small-world principles in which a cohesive group connected to others through a broker can be an effective structure.

Implications for Network Governance and Conclusions

The results reported here are important because of the implications they have for network governance. For a network to be effectively governed and to have a positive impact on organizational outcomes, having highly involved members helps considerably. This is the participative governance model discussed by Provan and Kenis (2008). But when the network has many members, such a governance structure is less likely to be effective. Provan and Kenis suggest that when the network is larger, either a lead organization or network administrative form of governance is most appropriate. We have examined a single large network where the NAO form was in place and where that form seemed appropriate, based on our analysis of trustworthiness, network size, and needs of the participants for network-level competencies. But even with NAO governance, it seems likely that it would be easier for a NAO to govern when network members are strongly connected to the NAO, thereby facilitating the flow of information, clients, and the like. However, what happens if the network is large, heterogeneous, and geographically spread out? Will a NAO be able to govern effectively? Under these

conditions, getting all organizations highly involved or building strong connections to and among each organization in the network is not only impractical but may even be impossible.

What we have demonstrated is that rather than having a highly cohesive network with all members strongly connected to the NAO, maintaining regional sub-networks may offer network administrators a way to effectively govern an entire network, especially when it is beyond their resources to build strong connections to every organization. If a NAO can rely on a broker to build the connections within a subgroup of organizations and provide a strong connection back to the rest of the network and to the NAO, then this lessens the demands on the NAO and can result in positive outcomes. Rather than everyone having to work with everyone and rather than the NAO having to work with everyone, subgroups of organizations who are themselves connected (in this case, based on regions) can interact with the rest of the network through other organizations that maintain strong bridging ties. The NAO can then spend its resources on building relationships with brokers and among brokers without diluting the impact of the network on organizations that may not themselves be well-connected to many others.

This structure is similar to the hierarchy found in organizations. A CEO of a large firm cannot directly govern the entire organization. Instead he/she relies on subordinates to manage certain areas of activity. Though a network does not have hierarchy and organizations are not subordinate to the NAO, the relationship is similar. The NAO can rely on the broker to support the NAO through governance of sub-networks.

By examining the relationship between perceptions of SACYHN's impact on organization and the different regional sub-network structures using QCA, we found that different sub-structures can still lead to an effective outcome. Not all organizations have to be connected to each other, nor does the NAO have to be strongly connected to all organizations, at

least if cohesive sub-structures are connected to the global structure through a broker. This conclusion has implications for network governance because it offers a way for sub-networks to support the NAO and lessen its administrative burden, especially under conditions when it may be difficult even for a NAO form to effectively govern the entire network. At the same time, however, structure is not enough and relying on a broker may not be effective unless the broker is an influential player in both the sub-network structure and the global structure. Also, relying on brokers may result in areas where the structure of the network is vulnerable and not robust to environmental changes.

Examining the variance of sub-network structures in one network and how it relates to perceptions of network impact on individual organizations is useful in that it has led us to find that different sub-structures can result in the same outcome, given that most contextual factors are held constant since all organizations studied were involved in the same network. However, this is a case study and it is difficult to make any generalizable statements based on the examination of one case. The network in this case was also a strong network with high overall perceptions by organizational participants of the network's impact on their effectiveness. Therefore, there was not a great deal of variance in perceptions of effectiveness. Ideally, other large networks with regional sub-structures should be examined to see if similar results are found.

In addition, this study is mostly based on a structural analysis. Context matters, especially when examining autonomous organizations and different regions. In an interview with a SACYHN NAO administrator, this informant discussed how each region had its own unique culture. In addition to regions having their own cultures, so do organizations. Therefore,

structural properties of a network, or a sub-network, may be conditioned by context, and in this study, we have not addressed contextual factors.

Hopefully, though, the more we examine networks, through both structural and cultural lenses, the more we will learn about how network functions. By probing around in the black box that networks still seem to be, eventually we will understand what it is about networks that may make it an effective mode of organizing, which forms of governance seem to work best under which conditions, and how each form uniquely operates. Then perhaps public managers could approach networks strategically and stakeholders could make them accountable to performance standards.

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Figure 1

SACYHN Network Structure Including Regional Subgroups

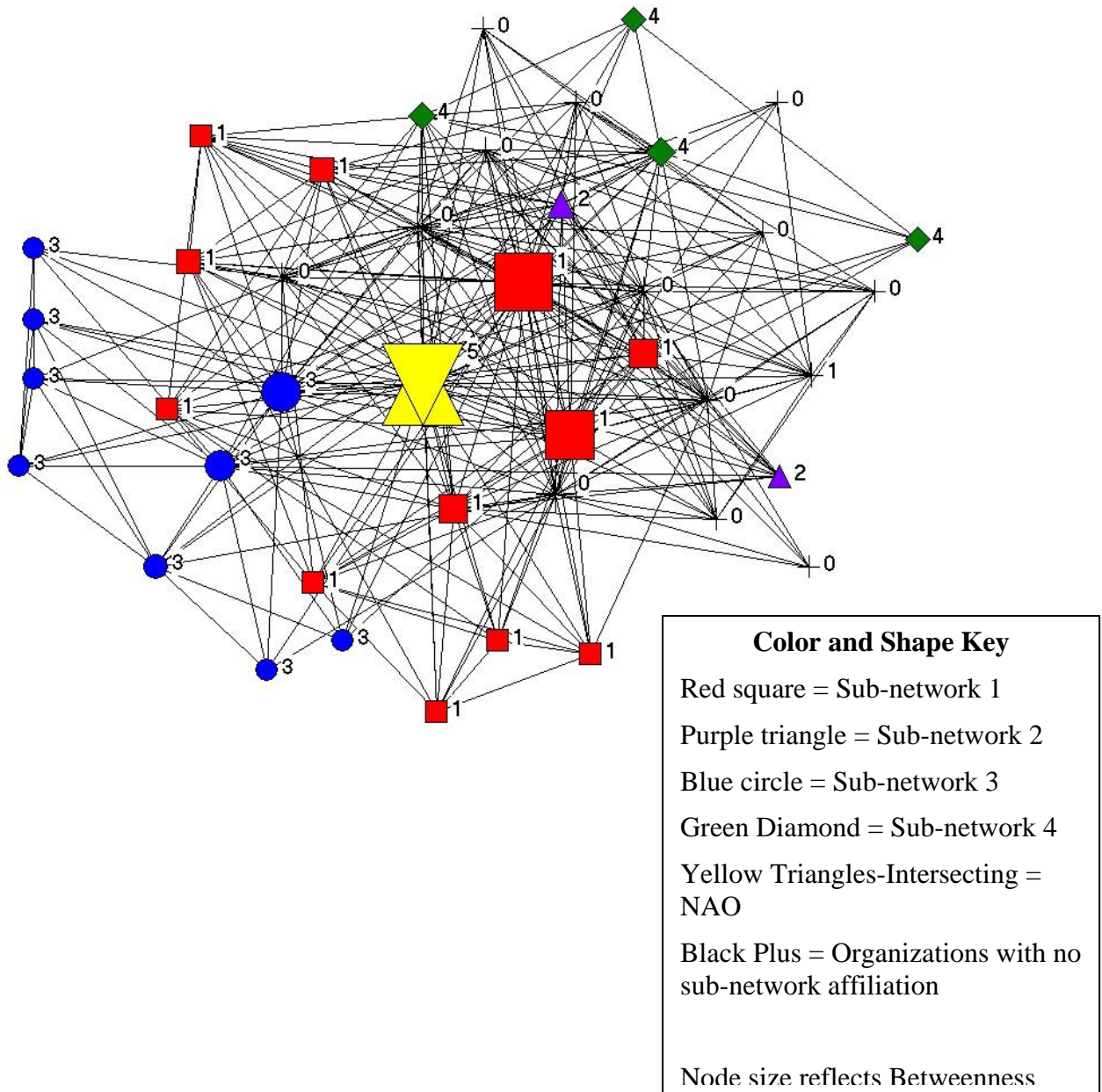


Table 1 The Characteristics of Regional Sub-networks

Region Sub-network	Type of Structure	Size	Within Sub-network Density	Sub-network to Global Network Density	Cohesiveness (Ratio of Densities)	Broker Betweenness Centrality	Organization Centrality		Strength of Organization to NAO Connection		Perception of Impact on Organizations	
							Mean	Range	Mean	Range	*Mean	Range
1	Embedded Structure	12	0.442	0.174	2.540	44	14	9 - 31	5	5 - 6	3.76	2.45 - 4.17
3	Cohesive with Broker	7	0.484	0.105	4.610	23	11	6 - 24	3	2 - 6	3.7	3.21 - 4.18
4	Cohesive No Broker	4	0.472	0.154	3.065	7	10	5 - 17	3	0 - 6	3.45	3.00 - 3.84
*Overall global network mean = 3.83												

Table 1 Descriptive Statistics of Variables

Variable	Mean	Standard Deviation	Minimum	Maximum	N Cases	Missing	Calibration Cut off Values
Perceptions of Impact	3.69	0.49	2.45	4.65	22	1	4, 3.5, 3
Organization Centrality	13.78	7.43	5	33	23	0	20,15,10
Broker	31.17	14.42	7	44	23	0	40,20,10
Regional Cohesiveness	3.68	0.98	2.97	5.16	23	0	4,3,2
Organization-NAO Relationship	4.17	1.78	0	6	23	0	5,3,1

Table 2 Descriptive Statistics of Fuzzy Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
High Impact	0.6386364	0.3639093	0	1
High Centrality	0.3508696	0.3976771	0	1
Broker Present	0.6952174	0.3476989	0.02	0.97
High Cohesiveness	0.4326087	0.3563488	0.18	0.97
Weak NAO Relationship	0.2782609	0.4213916	0	1

Table 3 QCA Results, Outcome = High Perceptions of Impact on Organizations

Causal Recipes	Raw Coverage	Unique Coverage	Consistency
Not weak NAO * Not High Cohesiveness	0.611387	0.340213	0.800559
Not weak NAO * Broker * High Centrality	0.328825	0.061210	0.726415
Weak NAO * High Cohesiveness * Broker * Not High Centrality	0.164413	0.147331	0.757377
Solution Coverage	0.82275		
Solution Consistency	0.756545		