

Explaining new relationships: Sector, network, and organizational impacts on the growth of linkages in multi-sector service delivery networks

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ABSTRACT

A secondary data analysis was conducted to understand the factors that impact the new relationships forming within interorganizational networks. Nine health and human service networks focused on the delivery of services to adults who were homeless and suffer from serious mental illness were studied to assess the organizational and network impacts on the decision to create new linkages with other members of the network . We found that although each of the separate levels of analysis does have some explanatory power for understanding the relationship building in networks, consistent with calls for mutli-level analysis, the combined models provide a better explanation. Specifically, agency mission/focus, time exposed to innovations, status as a government agency, and being a sub-unit of a larger organization all impact collaboration within networks.

INTRODUCTION

Networks have become a topic of interest in the literature relevant to public sector organizations. The literature on policy networks and new public management seem to be key to the rapid expansion. One reason that networks might have gained prominence in recent years is their ability to help solve wicked problems (O'Toole, 1997) more than other, more traditional, forms of organization. At minimum, networks seem to move us closer to addressing the uncertainties surrounding these problems.

In their purest form, networks are governance mechanisms that bring together otherwise autonomous and independent organizations to work toward a joint goal. Networks are best suited to the efficient transfer of resources (be it information, knowledge, services, or clients) among its members. Networks provide its organizational members with the benefits of being both small –the flexibility and speed with which to respond to market changes –and large –through economies of scope and sometimes scale (Piore & Sabel, 1984; Sabel, 1989). Networks may address joint production functions or seemingly intractable social issues. They serve as the medium through which jointly invested actors can come together to work on their problems without sacrificing the independence of their organizational decision making and missions.

While all interested parties would agree that networks are inherently made up of linkages of actors, we know little about how those linkages are formed. The public sector interorganizational network literature has focused on structural characteristics of

networks (Graddy & Chen, 2006; Isett & Morrissey, 2006; K. G. Provan & Sebastian, 1998), network or cooperation management (Herranz, 2007 (advance access); Page, 2004), performance (Keifer & Montjoy, 2006; K. G. Provan, Milward, & Isett, 2002, 2006), outcomes (Huang & Provan, 2007b; K. G. Provan & Milward, 1995) and implications for managers (Agranoff, 2006; Koppenjan & Klijn, 2004). Although many of these topics still need further elaboration, much less work has been completed on how relationships have been formed and their impacts on network structure.

Sociologists have done considerable work on relationship/linkage generation focused on individuals and social networks. For example, Feld (1997) found that new linkages between individuals are more likely to be forged through common acquaintances, forming a triad, rather than at random. Likewise, Smith-Lovin and McPherson (1993) illustrated the power of homophily in gendered networks. While White and colleagues (Boorman & White, 1976; White, Boorman, & Breiger, 1976) did a series of work that explained how individuals may move into and out of a social role, but those roles and the relationships that accompany them remain stable over time.

While these studies, and many others like them, illustrate some important elements of how relationships are made and their durability, they are focused on the individual, not organizations. Organizations are different from individuals in several important ways, here we highlight two. First, organizations have missions that guide their activities (Collins & Porras, 1996; Kaufman, 1960) and provide a roadmap for what activities and relationships they pursue. This is not to say that individuals are not goal driven –indeed

the entire rational choice literature, despite its pathologies (Green & Shapiro, 1994), has a sound and empirically validated set of theories. Rather, individuals need only to move themselves toward a goal whereas organizations need to motivate its members toward concerted and coordinated action (Barnard, 1938; Simon, 1945, 1973). Second, is that decision making processes in organizations are products of guiding coalitions that may change over time and be influenced by important stakeholder groups with varying legitimacy claims (Cyert & March, 1963; Mitchell, Agle, & Wood, 1997). This decision-making game affects what decisions are made through timing, interest, and other inputs (Cohen, March, & Olsen, 1972; Kingdon, 1995), whereas individuals are more likely to make consistent decisions based on their cost-benefit calculus (Heikkila & Isett, 2004). All of this is further compounded by the dynamics of making decisions in different contexts, such as the difference between public and private organizational decision-making (Nutt, 2005). So while the organizational literature may be guided to some extent by the findings in the individual relationship literature, the dynamics and elements of organizational relationship building and maintenance still need to be explored.

All of this is not to say that relationship among organizations have not been examined – quite to the contrary. The interorganizational relationships literature is well established in both sociology and management. From this literature we know the forms of relationships, their antecedents, and the “why” of relationship formation. Van De Ven and colleagues (Van de Ven & Ferry, 1980; Van de Ven & Walker, 1984) lay out the different forms that interorganizational relationships may take: they can be coerced, formal, informal, ad hoc, or a variety of these forms at any given time. Oliver (1990b), in

a seminal article, provided an exquisite treatise on the six determinants of interorganizational relationships, while Galaskiewicz (1985b) helped us to understand that interorganizational relationships can come from resource allocation concerns, political pressures, or legitimacy seeking. Following these critical works, a bevy of researchers added to our knowledge by further fleshing out the “why” of interorganizational relationships. Some of the reasons are resource dependency (K. Provan, G., Beyer, & Kruytbosch, 1980), embeddedness (Uzzi, 1996, 1997), and environmental legitimacy (Human & Provan, 2000; Larson, 1992) to name a few.

Although these studies of interorganizational relationships provide a strong foundation from which to build knowledge on interorganizational relationships in networks, they can not fully address the dynamics of relationship building in networks. As Isett and Provan (2005) pointed out in a recent article, networks are facilitated environments. These environments decrease the transactions costs associated with relationship development through the repeated interactions that build public reputation effects and, as a result, trust (or mistrust). Further, networks are more than just a series of dyadic interactions. They are a series of dyadic ties that are impacted by the other relationships that exist in the network, both a focal actors’ relationships and all of its “alter” actors. In other words relationships in a network are not independent, autonomous relationships. New relationships are predicated on the relationships that already exists, the reachability of other nodes in the network, and the centralization and centrality properties of the focal node. For all of these reasons, it is important to understand the dynamics of relationship formation in networks.

This paper provides a look at the pattern of how new relationships are formed in a pre-existing formal network of health and human service agencies that provide services to adults who are homeless and suffer from severe mental illness. The ACCESS study (access to community care and effective service supports) was implemented to improve the connectivity, called services integration, of service providers in nine cities across the United States. We perform a secondary analysis on these data that were collected in three waves from 1994 to 1998. We focus on both the patterns through which the intervention diffused through the network, as well as sector, network, and organizational level variables that may have affected the adoption of the intervention.

Our analysis shows that although the separate levels of analyses (measurement occasion, network, and organizational) does have some explanatory power for understanding the increase in interorganizational relationships in networks, the multi-level models provide a better explanation. Specifically, agency mission/focus, time exposed to innovations, status as a government agency, and being a sub-unit of a larger organization all impact the adoption of collaborative strategies of organizations within networks.

BACKGROUND: EMPIRICAL CONTEXT AND THEORETICAL DEVELOPMENT

Innovation is a departure from existing practices or technologies and represents a significant departure from state-of-the-art at the time it appears (Hall, 2002b).

Innovation is not random and takes place in relation to the past and present conditions

of the organization. During the 1980s and 1990s the idea of “systems/services integration” came into vogue in national mental health services circles as a result of the devolution of treatment and services from state hospitals to community mental health centers (Grob, 1991). As it became apparent that deinstitutionalization of individuals with mental illness from state psychiatric facilities presented communities -communities ill-equipped to handle the array of services needed by their new clients -with coordination and cooperation issues that hadn’t previously existed, a services integration movement began to try to address the new joint production issues of services specialized to the mentally ill.

Integration, the effective and efficient connection of service providers to provide coordinated care, has long been a goal for health and human service delivery systems (Ann E. P. Dill & David A. Rochefort, 1989), and within mental health services (Steinwachs et al., 1992). This is particularly true for services to individuals who are likely to have difficulty navigating complex service systems due to some impairment, such as those who suffer from severe and persistent mental illness. The benefits of integration are believed to be the more efficient transfer of clients among service agencies, coordinated care across agencies, greater access to services, and improved client outcomes. Among those organizations and individuals in a continued call for integration in mental health services today is the landmark New Freedom Commission on Mental Health (New Freedom Commission on Mental Health, 2003).

As evidence of the commitment to the idea that increased services integration is a “good”, there have been several large scale intervention projects in the past twenty years that have examined integration and its effects on the delivery of services and its impact on clients. The first of these projects was the Program on Chronic Mental Illness (PCMI) sponsored by the Robert Wood Johnson Foundation. PCMI was a 5-year (1986-1991) \$29 million dollar effort to centralize administrative, fiscal, and clinical responsibilities in a local mental health authority in nine cities (Lehman, Postrado, Roth, McNary, & Goldman, 1994; Morrissey, Calloway, & al, 1994). This centralization was supposed to bring about closer service ties among the agencies in the network. The results of this study showed, however, that integration and centralization may not be compatible goals (Morrissey et al., 1994), and that the increase in case management to coordinate services is a barren effort if there are not quality services or agencies to integrate (Lehman et al., 1994).

The Fort Bragg Demonstration, an \$80 million project through the Department of the Army, (Bickman, 1996b, 1996c) recruited 984 children between the ages of 5 and 17 from the CHAMPUS medical system of the U.S. Army. The children were enrolled quasi-experimentally into a “services as usual” and a continuum of care group. In the “services as usual” group, children and families received services as they would at any other time, coordinating services themselves in a community setting. In the continuum of care group, services were coordinated through a case manager and a full range of services were secured by the intervention organization –in effect they centralized services. The results of the study showed that although parents and clients in the

continuum of care group were more pleased with the services they received than the comparison group, no significant differences were found in terms of clinical improvement for the continuum of care group despite its increased costs (Bickman, 1996a, 1996b).

In many respects, the Access to Community Care and Effective Service Supports project (1993-1998) sought to remedy the main problem experienced in the PCMI and Fort Bragg studies -the lack of quality services. In this intervention study service provider organizations received funding and training to deliver quality services in the form of assertive community treatment programs. In addition to clinical services, the intervention group received funds to implement any number of 12 integration strategies such as interagency councils, cross-training, and co-location of services. The ACCESS design, then, was a test of the value-added effects of system integration over and above good clinical services (F. L. Randolph et al., 2002). While the experiment did yield increased linkages among service providers, the increases were lower than expected and were not significantly higher than in a control group (Joseph P. Morrissey et al., 2002). A recent analysis of a fourth wave of data collected two years after the intervention project ended showed a lack of delayed effects of the integration strategies and an abrupt improvement of the control sites to the level of connectivity of the intervention sites (Isett & Morrissey, 2006)

While the measures employed in each of these studies were able to index the level of linkages/integration achieved by participating sites at a given point in time, they do not

convey information about patterns through which new relationships were created in the networks. It is likely that new relationships will be created and travel through a network at different rates and through different mechanisms. Dill and Rochefort (1989) convey that integration will be affected by many factors including geographic location and funding availability. This suggests that individual-level organizational factors affect integration within a network.

Provan and Sebastian (1998) argue that connectivity will exist unevenly throughout a network. They illustrated that in any service delivery network, there will emerge a critical core of actors in the center of the network that become crucial to network functioning. This core of service providers will become tightly coupled and integrated with one another while the other members of the network are more loosely affiliated within the network. This core-periphery configuration of relationships concretely illustrates the differential impact of integration/connectivity efforts among providers, but again, this work does not systematically explain how those agencies are arrayed in the core-periphery pattern or how that pattern emerges.

Provan and Sebastian's work is commensurate with the diverse management literature on diffusion of innovation, more broadly. In a classic study by Coleman, Katz, and Menzel (1957) the authors showed that adoption of a new pharmaceutical was dependent upon the individual's knowledge of another person using the medication, as well as the perceived effectiveness of the drug. In newer studies of diffusion, both Tolbert and Zucker (1983) and Greenwood, Suddaby, and Hinings (2002) illustrated that

as institutional entrepreneurs adopted new practices and overcame embedded institutional norms, organizations that were most similar to the entrepreneurs adopted the practices first and then more peripheral actors then adopted the practices at a later point in time.

Rogers (2003) also tells us that innovation is more likely to spread from those who know each other than from complete strangers. Structurally this makes sense, given that transmission of information is only possible through two connected nodes in a network. While the strength of ties in a network can impact the speed at which an innovation diffuses (Burt, 1987, 1992; Granovetter, 1982), previously unconnected nodes are more likely to become connected through their existing relationships (Feld, 1997) than by chance –facilitating the embedded nature of resource flows within networks.

The diffusion findings also illustrate that credibility of the adopting or implementing organization plays an important role in whether other organizations follow suit in adaptation of standard practices. This dynamic can be an important factor in multi-sector networks, such as delivery systems delivering service to many populations with broad needs. Since multi-sector delivery systems are bringing together organizations with diverse levels of professionalization, treatment ideologies, and major funding streams, an effort toward systems change and integration by one service sector may not be accepted or perceived as important to those agencies whose status is bestowed in other sectors or institutional environments. Innovation purveyors must first seek

legitimacy and credibility for their initiatives before organizations outside their home domain will adopt their initiatives (Heikkila & Isett, 2004; Weiss, 1990).

In addition to the diffusion and innovation literature, the general organization theory literature also points to some agency-level factors that may impede or facilitate organizational change and interorganizational relationships. Such variables as organizational complexity, organizational size, resource dependence, legitimacy, reciprocity, political pressures, and organizational and environmental stability all contribute to an organization's decision to have relationships with other organizations (Galaskiewicz, 1985a; Hall, 2002a; Oliver, 1990a).

The presence of antecedents to interorganizational relationships is not always enough to drive the development of a new relationship, however. Opportunity and incentive for building relationships affect an organizations' ability to realize potential relationships (Eisenhardt & Shoonhoven, 1996; Wells, Lemak, & D'Aunno, 2005) . Further, just belonging to an interorganizational network does not necessarily mean that an organization will be highly integrated with the rest of the network. If this was so, all organizations would have the same level of connectivity within a network. But this is not true for a myriad of possible reasons such as differing organizational incentive systems, power dynamics, the iron law of oligarchy, or the like.

Since organizational strategy and organizational structure are inherently linked (Chandler, 1962), understanding how they influence one another by creating

opportunities or barriers to different organizational choices is important. If joining a network or adopting an innovation (for legitimacy, resource acquisition, liability of newness, buffering, etc.) is an organizational strategy, then there are likely structural elements that are correlated to these strategic choices. Thus, in order to gain a full understanding of how organizations enter into relationships within a network, organizational level variables also need to be explored.

The organizational structure literature is well established and dates back to the early 1960s in organization theory. Organizational structure has many components and can be categorized in many different ways. Here, we present two broad classes of variables that may impact any organizations' choice to engage in an interorganizational relationship. The classes are complexity and context.

The group of variables that we are calling complexity are related to those features of the organization that make operational decisions contingent on scope or scale issues. The degree to which an organization is specialized into a particular service domain is important, although the literature is unclear as to how this might affect relationships among organizations. As organizations expand their breadth of operations (whether through increased services or diversity of clientele), they may need interorganizational relationships to manage the interdependencies created by those expanded functions (Alter & Hage, 1993; Wells et al., 2005). As an organization's diversity of scope increases, organizations need more competencies to address the diverse needs of their clients. The need for competencies may entice an organization to seek relationships

that can buffer this uncertainty (Milliken, 1987). Alternatively, specialty organizations only provide one or a limited number of functions so they may have larger joint production functions and as a result need more relationships to mitigate these needs. Finally, the extent to which an organization is subdivided, traditionally called organizational complexity, can impact an organization's need for interorganizational relationships. The literature is also unclear as to the effect that being a functional sub-unit within a larger organization, and participating in a service implementation network (K. G. Provan & Milward, 1991) has on relationship formation. Does belonging to an umbrella unit affect connectivity with other, external organizations? Wells and colleagues (2005) found that it might, depending on the affiliation and the services provided by those affiliations. But this relationship needs to be further explored.

The second set of variable we are calling context has three components. The first component focuses on organizational relationships. The level of initial *a priori* connectivity of an organization may signal a willingness to engage in other interorganizational relationships or the development of assets to manage relationships (Gulati 1985; Wells et al 2005). On the other hand, relationships are resource intensive, especially if they are not arms length (Uzzi 1997). Thus, if an organization has a number of intense relationships, this may hamper other linkages, or encourage the formation of only less intensive, arms length links. Relatedly, there is evidence that location matters: this is as true in organizations (Mechanic 1968) as it is in networks (Granovetter 1985; Burt 1992). Decisions to have create interorganizational relationships can reflect the legitimacy seeking behavior pointed out by Stinchcombe

(1965) where organizations create links with more prestigious or stable actors in their environment to overcome their liabilities.

The second component of the context variables are more traditionally conceived organizational variables. Age of organization can impact the linkage seeking behavior of organizations. Older organizations are not focused on stability and overwhelmed with viability concerns. They have resources that may be used to build other competencies or assets (Kimberly 1979). As organizations age and move further into their life cycle, resources are moved away from newness activities and are mobilized elsewhere as slack, which is good for innovation (Nohria and Gulati 1985) and can include establishing external linkages with the environment. Additionally, organizations are attracted to other organizations that are like themselves (Larson, 1992; Smith-Lovin & McPherson, 1993). This similarity can be on any number of dimensions. This is because the similar organizations understand their operations, philosophies, or socialization (Clegg, 1981). However, when there are interdependencies to be managed or joint production functions organizations may need to seek out organizations that are less like themselves. The relative strength or temporal dimension of these two dynamics is unknown at this time.

The final and third component of context is related to organizational funding. The profit status of an organization may have an impact on interorganizational linkages. There may be important differences between the sectors because of legal and administrative culture (Nutt, 2005). A rich set of literature has emerged that illustrates public sector

organizations react differently to stimuli in the environment than do private sector organizations (Heinrich & Fournier, 2004; Olmstead & Sindelar, 2005). Further, Perry and Rainey (1988) and Bozeman and Bretschneider (1994) talk about degrees of “publicness” and the impacts on organizational functioning. Meyer Scott and Strang (1987) and Isett and Provan (2005) illustrated that even indirect coercive institutional pressures can have an impact on organizational choices. Thus the norm of cooperation in health and human service organizations, especially those involved in government provided services, could impact interorganizational linkages. Following this, organizations might link to other organizations to give the appearance of conformance to the pressures of the operating environment and legitimacy concerns (Meyer & Rowan, 1977).

Given the dearth of knowledge about both how relationships diffuse in networks and the impact organizational level variables have on this process, our research was guided by exploratory research questions, rather than specific hypotheses. Our research questions are:

R1: How does relationship building diffuse within a formal network and what are the important variables that affect those linkages?

R2: To what extent are sector, organization, and network level variables differentially responsible for explaining new relationships in an interorganizational network?

METHODS

The current study makes use of secondary data from the Access to Community Care

and Effective Service Supports (ACCESS) demonstration project. The design of this five-year study has been described in detail elsewhere (J. P. Morrissey et al., 2002; Randolph, Blasinsky, Leginsky, & al, 1997; F. Randolph et al., 2002), and therefore is described only briefly here. The goal of the project was to measure the impact of service system integration strategies on system-level integration and on outcomes for homeless persons with severe mental illness (SMI). Through peer review of applications from 25 U.S. states, nine states were selected to participate, with two study sites per state, each located in a large city. In each state one site was randomly assigned to the intervention condition and the other to the comparison condition. Each site received approximately \$500,000 per year to conduct intensive outreach services to homeless persons with SMI and to provide assertive community treatment to 100 individuals per year. Each intervention site received an additional \$250,000 per year to implement any combination of 12 system integration strategies in order to create a coherent system of care encompassing mental health, substance abuse, housing, primary care, and income maintenance (F. L. Randolph et al., 2002). The current study uses hierarchical linear models to examine organizational network data from the ACCESS intervention sites only. These models assess the effects of system-level variables, agency-level variables, service sector, and time on the degree to which individual agencies are integrated with their local service networks.

Sample and data collection

The current study makes use of interorganizational network data collected from intervention sites during the ACCESS project at baseline (wave 1, 1994) and at the first

two follow-up points (wave 2, 1996; wave 3, 1998), spanning the time period during which the planned intervention was taking place. At each site, these data were collected through personal interviews with key informants at the local agencies that provided services to homeless persons with SMI (intervention N=578 agencies). The analysis dataset for the current study includes 1,456 observations across the three time points (n=482, 494, 480 at waves 1-3 respectively).

Respondents were selected based on their knowledge of the agency's relationships with other local service providers. Comprehensive information was collected about agency characteristics, services provided, clients served, and working relationships with other identified local agencies. Respondents used a Likert scale to indicate the extent to which their agency was involved in sending and receiving clients, information, and funding to and from each agency in the local service network (Joseph P. Morrissey et al., 2002; F. L. Randolph et al., 2002).

Measures

Measurement occasion level

Time was operationalized using a pair of dichotomous variables, one indicating whether the observation was from wave 2 and another indicating whether the observation was from wave 3.

Organizational level

While there are many organizational level variables that ought to be explored in

an ideal study, the variables we used in this analysis was constrained by the availability of data collected by others for another study. Thus, we were constrained in our variable selection based on the limits and presence of the existing data set.

The dependent variable, *agency-level integration*, indicates the degree to which a single agency is connected with others in the same network at a particular point in time. Similar to system-level integration (or network density), agency-level integration is a local measure that was calculated as a proportion comparing the agency's actual number of linkages to its total possible number of linkages.

Service sector was reported by agencies according to six categories that were defined in advance: mental health, substance abuse, housing/homeless services, primary health care, social welfare (i.e., income supports and entitlements), and other. Mental health served as the reference category.

The *betweenness centrality* of an index agency is a measure of the extent to which relationships in the network depend on that agency (or the extent to which the index agency controls, brokers, or mediates relationships between other agencies (Scott, 1991; Wasserman & Faust, 1994)). For each pair of agencies in the network (other than the index agency), a calculation is made of the proportion of geodesics (i.e., shortest paths) between them that involve the index agency. The raw betweenness centrality is the sum of these proportions. It is normalized by dividing its maximum possible value, which is also the number of agency pairs excluding the index agency: $(n-1)*(n-2)/2$.

Funding source was measured in two ways: (1) *percentage of funding from non-governmental sources* (or degree of publicness) was reported as part of a task in which

each respondent was asked to report agency funding sources according to seven categories totaling 100% of the operating budget. (2) *Status as a government agency* was determined from responses to an item in the Wave 2 interview that asked respondents to classify agencies according to one of 13 categories (four for-profit, six government, two not-for-profit, and one other). Classification in one of the six government categories (state mental health agency, other state agency, district or regional authority, county or city government, Department of Veterans' Affairs, tribal government) constituted status as a government agency. Because this item appeared only at Wave 2, missing values were replaced by searching agency websites and by following up with telephone calls to individual agencies where necessary.

“Child” status was determined by organizational documents that indicated the unit participating in the project was a service unit inside a larger freestanding organization. This variable was scored dichotomously, with a “1” indicating child status.

Network level

A *linkage* was defined as the sending or receiving of clients, information, or funding between two organizations. There are six possible combinations of the direction and content categories, yielding six types of interagency relationships. If a pair of agencies responded to the survey and only one acknowledged a particular type of relationship between the two, the pair was considered not to have a relationship of that type. For the purpose of this study, the existence of one or more relationships of any type between a pair of agencies constitutes a linkage, regardless of content.

System-level integration indicates the degree of connectedness among all

service providers in a site's network at a particular point in time. This measure was calculated using the standard social network analysis metric for global network density (i.e., a proportion comparing the actual number of linkages in a network to the total possible number of linkages in the same network).

The *betweenness centralization* of a network represents the extent to which relationships in the network are dependent on a small number of central actors. Betweenness centralization was calculated according to formula 5.14 given by Wasserman and Faust (Wasserman & Faust, 1994, p. 192).

Statistical analyses

Using SAS PROC MIXED (SAS Institute, 1999), hierarchical linear models were constructed using a two-stage approach. In Analysis 1, agency-level integration was modeled as a function of service sector, time, and three system-level (i.e., network) characteristics: system-level integration, network size, and network centralization. Interactions between time and the other predictors were included in order to assess the influence of system-level characteristics on the amount of change in agency-level integration over time.

Analysis 2, also predicting agency-level integration, included the same initial set of predictors as well as four additional agency-level variables: betweenness centrality, the two measures of funding source (percentage of funding from nongovernmental sources and status as a government agency), and status as a "child" of a parent agency. Interactions between time and other predictors were included. As a sensitivity analysis

in case of multicollinearity between the two measures of funding source, the modeling process for Analysis 2 was performed a second time excluding percentage of funding from non-governmental sources; the final model was unchanged.

For each analysis, initially a three-level hierarchical linear model was constructed with site at level three (N=9), agency at level two (35 to 68 per site at any given time point), and measurement occasion at level one (one to three per agency). All predictors of agency-level integration were modeled as fixed effects. The intercept was allowed to vary randomly between sites and between agencies (i.e., an error term was included at levels two and three as well as level one). Through the inclusion of random intercepts, these models took into account the clustering of measurement occasions within each agency and of agencies within each site.

A final model for each analysis was generated by removing non-significant random intercept terms and interaction terms in a backward stepwise process. Significance was tested at the .05 level. Following Snijders and Bosker (2000), a null model (i.e., a three-level model excluding the fixed effects) was also constructed in order to estimate the proportion of variance located at each level and, similarly, the likeness of observations within each level.

RESULTS

Based on the null model, the proportions of variance at the site, agency, and measurement occasion levels were 7.4%, 49.7%, and 42.9% respectively. These

variance components can also be used in calculations to describe the likeness of units (i.e., intraclass correlation) at different levels of the model (Snijders & Bosker, 2000). The intraclass correlation expressing the likeness of agencies within the same site was .13, and the intraclass correlation expressing the likeness of observations within the same agency and site was .57.

Analysis 1

In the initial predictive model for Analysis 1 (i.e., the three-level model including fixed effects), the between-site variance was estimated at zero, indicating that the site-level variation in agency-level integration was fully explained by the fixed effects in the model. Therefore the site-level random intercept was deleted from the model. Based on omnibus tests of the sector x wave2 and sector x wave3 effects, the sector-by-time interaction terms were also non-significant, indicating that service sector did not affect the amount of change in agency-level integration over time. Network size and centralization did not significantly affect Wave 1-to-2 change in agency-level integration. Therefore these interaction terms were also deleted, resulting in the final model.

The results for the fixed-effects portion of the model are shown in Table 1. Agencies in the primary health care, housing/homeless, and “other” service sectors had significantly lower agency-level integration than did agencies in the mental health sector—seven to 11 percentage points lower, controlling for time and system-level variables. Agencies in the substance abuse sector had slightly lower agency-level integration than did those in the mental health sector, but this effect was not statistically significant ($p=.09$).

At Wave 1, system-level integration had a significant positive association with agency-level integration, such that an increase in the proportion of potential system-level linkages that were actualized would correspond to a nearly equal increase in the proportion of an agency's potential linkages that were actualized. However, system-level integration was negatively associated with change in agency-level integration over time. There was a small negative association between Wave 1 network size and Wave 1-to-3 change in agency-level integration. Similarly, there was a negative association between Wave 1 network centralization and Wave 1-to-3 change in agency-level integration.

INSERT TABLE 1 ABOUT HERE

Analysis 2

Due to the Analysis 1 finding that site-level variation in agency-level integration was fully explained by the fixed effects in the initial model, Analysis 2 began with a two-level (measurement occasion within agency) version of the same initial model, plus the set of agency-level predictors. The backward stepwise modeling process had similar results to those in Analysis 1, except that with the addition of the agency-level predictors, a significant association was found between service sector and the amount of change in agency-level integration over time (Wave 1-2 $F[5,861]=2.61$, $p<.05$; Wave 1-3 $F[5,861]=3.01$, $p<.05$); therefore, the sector-by-wave interactions were retained. Percentage of funding from non-governmental sources was deleted due to non-significance. The remaining agency-level characteristics had non-significant

interactions (which were deleted) but significant main effects.

With respect to service sector, the pattern at Wave 1 was similar to that found in Analysis 1, with the substance abuse, housing/homeless, and “other” sectors showing slightly lower agency-level integration scores than the mental health sector (Table 2). The housing/homeless sector showed a more positive change from Wave 1-2 than did the mental health sector, and the substance abuse sector showed a more positive change from Wave 1-3 than did the mental health sector. There were similar trends for social welfare from Wave 1-2 and 1-3 ($p=.12$ and $p=.09$ respectively), and for substance abuse from Wave 1-2 ($p=.08$).

The estimated effects for system-level integration, network size, and network centralization were virtually identical to those found in Analysis 1, with one exception: Analysis 2 found a larger and statistically significant effect of centralization at Wave 1.

Three significant main effects were found among the added agency-level predictors. Betweenness centrality was positively associated with agency-level integration. Government agency status had a small negative effect, and child status had a small positive effect.

INSERT TABLE 2 ABOUT HERE

Table 3 shows the raw and adjusted mean level of agency-level integration by service sector and wave, based on the final model from Analysis 2. System-level predictors

(integration, network size, centralization) and agency-level predictors (betweenness centrality, government agency status, child agency status) are held constant at their grand mean values.

INSERT TABLE 3 ABOUT HERE

Limitations

It would be preferable to analyze data from 25 to 30 sites instead of only nine, in order to have sufficient statistical power to detect site-level effects (Little, 2004). Similarly, a larger number of measurement occasions would increase the power to detect temporal trends. However, in the current study the focus is on the agency level rather than the site level, and the study makes efficient use of existing resources by analyzing secondary data. Furthermore, in the current analysis, between-site variation was detected and was fully explained by the fixed effects in the model.

The authors believe that the nine study sites are representative of U.S. networks of agencies serving persons with SMI. However, to the extent that this belief is incorrect and to the extent that homeless persons with SMI are a unique subgroup, the ability to generalize the current findings to the population of agencies serving people with SMI may be limited. The findings may also have limited applicability in non-metropolitan areas.

The statistical models used in the current analysis assume that system-level integration has a linear effect on agency-level integration. This view is simplistic given that the relationship between these two variables depends on network structure. However,

representing the effect of system-level integration by means of this approximation is useful in that it controls for between-site differences and allows a focus on service sector, system-level variables, and agency-level variables as predictors.

DISCUSSION AND IMPLICATIONS

The ACCESS project focused on a subpopulation of persons with SMI (i.e., those who were homeless) and on the agencies serving them. However, the treatment needs of homeless persons with SMI are not unique to that subgroup, and there is a large degree of overlap between their service network and the network of agencies serving persons with SMI generally. Therefore, the authors believe that the findings of the current study may reasonably be generalized to agencies serving persons with SMI. Furthermore, the population under study here is one that represents a vulnerable population that relies on public services to address basic human and medical needs. The organizations included in this study, for the most part, serve our target population as just one piece of their relevant clientele, therefore we have no reason to believe that the results of this study are not informative, if not fully generalizable, to the health and human service delivery sector more generally.

The innovation studied in this paper was sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA). This particular intervention project, although sponsored by SAMHSA, was implemented through the mental health systems in each of the sites studied. The first observation that we can make is that mental health agencies created relationships earlier and at slightly higher levels than other

types of organizations. However, two groups of agencies displayed innovation adoption levels similar to our reference agency type, mental health, in this network: substance abuse and social welfare agencies, although their pattern of adoption was different. In both cases, these agencies' adoption of the innovation (interorganizational relationships) increased over time. The overall levels of integration remained just slightly lower than that of mental health agencies, but increased in its rate of relationship building over the three waves of data collection.

In both cases of substance abuse and social welfare agencies, the organizations have professional and technological similarities with mental health agencies that make diffusion from one set of agencies to another relatively easy to understand. Most prominently, these agencies serve similar populations, if not the same population (and in the case of substance abuse agencies, likely even the same *people*). Estimates of individuals with co-occurring substance abuse disorders and severe mental illness range from 15% to 50% (Kessler & al, 1996; Regier, 1990) of these populations. Further, the Federal agency sponsoring this initiative, SAMHSA, has strong normative influence on substance abuse agencies –substance abuse agencies would like SAMHSA to have a favorable disposition toward them. Thus, substance abuse agencies were early adopters of the innovation of integration in these networks –for both network reasons (they identify closely with the organizational innovator) and they are closely aligned professionally with the innovator (SAMHSA). Social welfare agencies are also closely associated with mental health providers in that many individuals with severe mental illness are wholly supported by entitlement and income

support programs. They are also “people processing” organizations, rather than service producing agencies, reflecting similar technologies.

Overall, this analysis lends support to the idea that diffusion of innovation is not uniform in a network. Although this result is consistent with some more classical work in networks (J Coleman, E. Katz, & H. Menzel, 1957) and sociology (McPherson and Smith-Lovin 1993), it provides new insight into the dynamics of how these innovations do spread in network contexts. We added support to the idea that organizations will adopt innovations based on the identity of the innovator –meaning that if they are very similar to that organization (same industry or professional identity) they will be among the first adopters of the innovation. Although not directly applied to network settings, the work done by Lee and Pennings (2002) related to professional effects of diffusion are supported by these results.

The implications for policy are that innovators that introduce new policies or initiatives into a multisector network need to be cognizant that their organizational identity will impact the way that the innovation is taken up within the network. Although the network structure will facilitate the transmission of the innovation and even perhaps provide some normative support for the innovation (A.E.P. Dill & D. A. Rochefort, 1989; Isett & Provan, 2005), the professional identity and affiliation of the network members will have an impact –either to facilitate adoption for those most closely aligned with the innovator or to hinder adoption for those furthest from the innovator professionally –on the timing and extent of adoption.

In the past, such as in the ACCESS demonstration and in other large scale integration demonstrations, the assumption was that the network structure would induce fairly consistent integration once the intervention was introduced. This faulty assumption led to disappointing results in the interventions since, although integration improved over time, it was not improved at the levels expected. Thus, this study ought help to shape realistic expectations for policy implementation in networks forms of organization, at least calling attention to important variables that may affect adoption.

The network variables had an important impact on diffusion of relationships in the network. As expected, diffusion in networks does not operate independent of *a priori* network structure. Both the levels of pre-existing network integration and centralization had a negative effect on the establishment of new relationships over time. In terms of systems integration, the level of connectivity in the network can have a dampening effect since building linkages and maintaining and sustaining relationships takes resources (A.E.P. Dill & D. A. Rochefort, 1989), and the greater the intensity of the relationships (either through multiplex links or importance) the more resources it may use. Therefore, new relationship building is, in part, a function of an organization's existing relationships, the intensity of those relationships, and the slack resources available for and committed to new relationships generation.

As with systems integration, the overall network centralization results make sense with regard to network dynamics. Network centralization is a metric that reflects the extent

to which linkages flow toward one or a small set of nodes in a network. Thus, thus more a network is centralized, the more that new linkages will likely be directed toward those few central nodes. As relationships are added at the agency level, there will be fewer linkages to make over based on the centralization of the network and those nodes in the pathway to the central actors. Indeed, this is consistent with previous research that found an inverse relationship between centralization and density (Johnsen et al., 1998).

These results are consistent with the existing literature on new relationships in networks and network structure. As Provan and Sebastian (1998) point out, most network functions in service delivery networks are performed by a small clique of agencies. This clique creates centralization in the network as well as a need for less central agencies to seek relationships with them to participate in network activities. Further, the research done by Feld (1997) and Isett and Provan (2005) suggest that network relationships have specific patterns through which they are built –specifically through either common existing network ties or as a response to coercive environmental pressures. Thus, the findings in this paper add to the literature on the evolution of network relationships over time and understanding the patterns through which relationships are built.

There also seems to be a limit on the overall connectivity that service delivery systems may have. Table 3 illustrates that over time, the agencies in the networks in this study almost never rose above one-third of the possible relationships in the network and only marginally increased over time. Actually, this local density measure is a bit higher than the measures typically found globally in the literature for service delivery networks, both

in the initial analysis of this study reported elsewhere (global integration measures were around .29) (Isett & Morrissey, 2006; J. P. Morrissey et al., 2002), and in other service system studies (measures below .20) (Huang & Provan, 2007a; K. G. Provan et al., 2002) . This suggests a ceiling in networks for the amount of linkages that may be possible since each of these networks vary in size and location but yield fairly consistent results, even in the face of concerted efforts to increase linkages.

These results have some interesting implications for network management. While there is a norm of collaboration in many health and human service networks, this norm is limited by the realities of operating and resources. Thus, networks can only achieve so much coordination and collaboration within its limits and expectations for these activities should be tempered by the realities of network life. These limitations may increase the uncertainties faced by network managers (Koppenjan & Klijn, 2004) and pose the possibility that some wicked problems may not be addressed by networks despite their advantages over bureaucracy. Further, network structure has yet to be explored in many applications of the network form of governance used in public systems. In particular, a structural study of disaster management networks both in planning and practice might be enlightening with regard to their disappointing mobilization in recent events (Keifer & Montjoy, 2006). Regardless of its effect on disaster management performance, the generalizability of the ceiling on networks has yet to be explored in diverse types of networks and the nuances of this effect fleshed out.

The organizational level variables also impacted the level of integration of agencies in

these networks. Betweenness centrality had an impressive, and the largest, effect on agency level integration in a network. The coefficient is difficult to interpret on its face since integration scores range between 0 and 1. However, the large number indicates that an organization's location in the network, particularly the extent to which it lies in the path of other important organizations, has the most important effect on how well connected that agency is. In several instances, networks employed a services coordinator to better connect clients to agencies, setting up a brokered network to some extent, which would both serve to centralize the network and to create geodesics that are forced to flow through a limited set of nodes. In these cases, agencies would be forced to make connections to the service coordinators' organizations in order to participate in client and information sharing.

The other two variables at the organizational level, indication as a government agency and as a child agency, also had significant effects. The government agency variable was negatively associated with agency-level integration. This could be due to the fact that government agencies are constrained in their actions by political and legal forces that may restrict the number and types of organizations with which a government agency can establish linkages. These linkages may be more governed by public contracts and input than by efficiency or production needs (Nutt, 2005). On the other hand, being a "child" agency, a smaller operating unit inside of a larger service organization, had a small positive effect on agency integration. As a small operating unit, it makes sense that the duties and capacity of the child unit is limited and must therefore seek other organizations with whom to partner to mitigate joint production

functions, receive overflow, or enhance or complement their own services. Those linkages might be with other independently operating units in the same larger organizations or completely independent autonomous organizations in the community.

Theoretically, all of the organizations in the networks not only had the opportunity to create new relationships, they had a somewhat enhanced opportunity due to the concerted intervention seeking to improve network integration. Our results support Wells et al.'s (2005) findings that the child status of an organization could impact interorganizational linkages depending on the services and affiliations of the focal organization, although the dimensions of this concepts still need to be further explored. Our findings also add to the networks literature through illustrating the importance of network location in the development of networks structure. Although the importance of network linkages for information and resource flows has been established through ideas of structural holes, bridging and bonding ties, and weak ties, we add to these concepts through illustrating how these structural properties might be thought about in service delivery networks. In this class of networks, the denseness of connectivity toward the center of the network may have much more important and beneficial effects and outcomes -such as clients having access to an array of core and important services – than the concern for making loosely connected nodes better integrated into the center.

In addition to the areas of future research outlined through this discussion, the results of this analysis has yielded some important areas for future research on networks and the building of relationships within networks more generally. First, this is the first study to

look at a multi-level model that takes into account organizational, network, and sector level variables as discrete levels of analysis. We found that, consistent with calls for multi-level analysis (Goodman, 2000), our model was improved through the use of HLM techniques. While some critics have complained about the over-use of this technique, understanding the nested relationships among organizations, their missions, and their network positions is useful and appropriate since these elements do not exist in a vacuum.

We also call for future network research that can address the full breadth of variables outlined in the early part of this paper. We were constrained by the use of an existing data set that did not represent the full range of organizational variables that are important to understand the strategy-structure interface. While our data had limitations, it still yielded some important insights and suggests that a more fully developed data collection effort is worthwhile. Nonetheless, the interface between networks and organizations is an important one that deserves concerted effort and attention in future network studies.

Table 1 Fixed-effect estimates from Analysis 1 final model, predicting agency-level integration from sector, time, and system-level variables

Effect	Estimate
Intercept	0.09397
Service sector (Reference: Mental health)	
Social welfare	-0.01854
Primary health care	-0.06895 **
Substance abuse	-0.03635
Housing/homeless	-0.06619 ***
Other	-0.1095 ***
Time (Reference: Wave 1)	
Wave 2	0.1501 ***
Wave 3	1.311 ***
System-level integration (at Wave 1)	0.8926 ***
Wave 2 * System-level integration	-0.5732 ***
Wave 3 * System-level integration	-1.4822 ***
Network size (at Wave 1)	-0.00003
Wave 3 * Network size	-0.01405 ***
Betweenness centralization (at Wave 1)	-0.2643
Wave 3 * Betweenness centralization	-1.724 ***

* $p < .05$

** $p < .01$

*** $p < .001$

Table 2 Fixed-effect estimates from Analysis 2 final model, predicting agency-level integration from sector, time, system-level variables, and agency-level variables

Effect	Estimate	
Intercept	-0.04406	
Service sector (Reference: Mental health)		
Social welfare	-0.02492	
Primary health care	-0.03283	
Substance abuse	-0.04082	*
Housing/homeless	-0.05723	***
Other	-0.04181	*
Time (Reference: Wave 1)		
Wave 2	0.1355	***
Wave 3	1.2964	***
Time * Service sector		
Wave 2 * Social welfare	0.04927	
Wave 2 * Primary health care	0.01227	
Wave 2 * Substance abuse	0.03903	
Wave 2 * Housing/homeless	0.04671	**
Wave 2 * Other	-0.01217	
Wave 3 * Social welfare	0.05512	
Wave 3 * Primary health care	0.005737	
Wave 3 * Substance abuse	0.06839	**
Wave 3 * Housing/homeless	0.01861	
Wave 3 * Other	-0.02007	
System-level integration (at Wave 1)	0.9732	***
Time * System-level integration		
Wave 2 * System-level integration	-0.61	***
Wave 3 * System-level integration	-1.5064	***
Network size (at Wave 1)	0.000627	
Wave 3 * Network size	-0.01408	***
Betweenness centralization (Wave 1 network measure)	-0.4368	*
Wave 3 * Betweenness centralization	-1.6988	***
Betweenness centrality (agency measure)	6.3511	***
Government agency	-0.03146	**
Child of another agency	0.03762	***

* p < .05

** p < .01

*** p < .001

Table 3 Raw and adjusted mean agency-level integration by service sector and wave, based on final model from Analysis 2

Service sector	Raw			Adjusted ^a		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
Mental health (n=181)	.31	.30	.33	.30	.27	.30
Social welfare (n=26)	.31	.30	.34	.28	.30	.33
Primary health care (n=68)	.27	.24	.30	.27	.25	.28
Substance abuse (n=71)	.24	.25	.32	.26	.27	.33
Housing/homeless (n=146)	.24	.26	.27	.24	.26	.26
Other (n=86)	.25	.19	.20	.26	.22	.24

^a System-level predictors (integration, network size, centralization) and agency-level predictors (betweenness centrality, government agency status, child agency status) are held constant at their grand mean values.

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