Antecedents and consequences of performance information use in collaborative networks

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ANTECEDENTS AND CONSEQUENCES OF PERFORMANCE
INFORMATION USE IN COLLABORATIVE NETWORKS

by

Manabu Nakashima

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ANTECEDENTS AND CONSEQUENCES OF PERFORMANCE

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This study aims to explore antecedents and consequences of performance information use in collaborative networks, focusing on the effects of network members’ interaction patterns and relational characteristics on performance information use. Using a case of the Faraway County system of care wherein network participants engaged in collective decision making and service provisions to mentally ill children and youth, this study addresses three research questions:

**Research Question 1:** Is performance information used in collaborative networks?

**Research Question 2:** Is performance information used for learning purposes in collaborative networks?

**Research Question 3:** Does use of performance information facilitate network learning in collaborative networks?

Essays One and Two explore antecedents of performance information use in collaborative networks. Essay One addresses the first research question — is performance information used in collaborative networks? Essay Two addresses the second research question — is performance information used for learning purposes in collaborative networks? Essay Three explores consequences of performance information use, addressing the third research question — does performance information use facilitate network learning in collaborative networks? The three essays find five characteristics of performance information use in collaborative networks: (1) network members are heterogeneous in terms of performance information use, (2) interaction patterns and relational characteristics among network members affect performance information use, (3) different factors affect the use of different types of performance information, (4) using performance information contributes to the development of
shared understanding among network members, and (5) different types of performance information have different functions in collaborative networks. The findings provide academic implications for research on network management, as well as on performance information use. They also provide practical implications for promoting performance information use and its effects in collaborative networks.
DEDICATION

I dedicate my dissertation to my parents, Shin’ich and Kyoko Nakashima. Their continuous support and encouragement allowed me to complete this work.
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INTRODUCTION TO THREE ESSAYS

This study aims to explore antecedents and consequences of performance information use in collaborative networks. This introductory chapter briefly presents: (1) the research background, (2) the research questions and theoretical framework to address the questions, (3) the research setting, and (4) the outline of this study.

RESEARCH BACKGROUND

We are in the age of “a society of networks,” wherein goal-directed inter-organizational networks, composed of three or more organizations to collectively achieve a common goal, have become a prevalent organizational arrangement (Raab and Kenis 2009; also see Kilduff and Tsai 2003; Provan et al. 2007). Such goal-directed inter-organizational networks address complex problems and provide customized services or products, by integrating resources, information, expertise, and perspectives possessed by differently-endowed organizations. In public administration and policy research, they are known as “collaborative networks,” which are defined as “collections of government agencies, nonprofits, and for-profits that work together to provide public goods, services, or ‘value’ when a single public agency is unable to create the goods or services on its own and/or the private sector is unable or unwilling to provide the goods or services in the desired quantities” (Isett et al. 2011, p. i158). Collaborative networks have become an essential tool to implement policies and deliver services in such public policy areas as economic development, environmental protection, and health and human services (Agranoff 2007; Agranoff and McGuire 2003; Alter and Hage 1993; Bardach 1998; Feiock and Scholz 2010; Innes and Booher 2010; Koppenjan and Klijn 2004; Provan and Milward 1995). Agranoff
(2007) categorizes collaborative networks into four types – informational, developmental, outreach, and action networks. The information networks have the least extensive network arrangement in terms of network members’ joint efforts, and the action networks have the most. In the informational networks, members exchange and share information but do not take collective action. On the other hand, in the action networks, members engage in collective action by mutually adjusting their own goals, strategies, perceptions, and ways of working. The developmental and the outreach networks are between them. The developmental networks mainly aim to increase their members’ capacity. In the outreach networks, network members coordinate their plans and actions without big changes in their own goals, strategies, perceptions, and ways of working.

Collaborative advantage — “synergy that can be created through joint working” (Vangen and Huxham 2010, p. 163) — is the major strength of any types of collaborative networks. Through accessing, mobilizing, and integrating the broad range of resources, information, expertise, and perspectives within their member organizations, collaborative networks generate network-level performance – performance of a whole network, beyond that of any of their member organizations (Provan and Milward 1995, 2001). Network-level performance has become important for public administration and public policy because complex public problems are increasingly addressed by collaborative networks; whether the problems are solved depends on the network-level performance (Gray 2000; Kenis and Provan 2009; Provan and Milward 1995, 2001). For example, the well-being of mentally ill children and youth depends on comprehensive, integrated, and individualized services including mental health treatments, social services, education, and vocational services, rather than a single excellent service in any of the service areas. Figure I-1 explains why collaborative networks are well-suited to addressing
complex public problems. No single organization (represented by $O_1$, $O_2$, $O_3$, and $O_4$) can deal with a whole complex problem. Such a problem cannot be contained within one organization’s jurisdiction. Resources, information, expertise, and perspectives to address the problem are spread among several organizations, each responsible for addressing a part of the problem. A single organization, working alone to solve one part of a complex problem, does not produce satisfactory results. Rather, successful solutions to complex problems depend on collective action taken by multiple network members, resulting in network-level performance. The involvement, cooperation, and coordination of diverse actors help to identify various aspects of the problem, develop comprehensive and integrated solutions, and acquire and pool resources to implement those solutions.

Figure I-1. Rationale for Collaborative Networks (adopted from Hjern 1992, p.4)

While the involvement of diverse organizations does enhance the capacity of collaborative networks to address complex public problems, it also brings about negative consequences—namely difficulties of cooperation and coordination resulting from the differing
(sometimes, even conflicting) goals, strategies, perceptions, and ways of working among diverse network participants (Feiock and Scholz 2010; Gulati et al. 2012; Jones et al. 1997; Ospina and Saz-Carranza 2010). A cooperation problem is the failure to align network members’ interests with network-level goals, and to secure their commitment to the agreed-to network-level goals. A coordination problem is the failure to align network members’ activities and resources toward achieving the agreed-to network-level goals (Gulati et al. 2012). Since network members are interdependent and co-produce network-level outputs and outcomes, poor cooperation and coordination among them will cause these networks to produce unsatisfactory results. Successful collaboration requires network participants to invest their resources, time, and energy in relationship building, consensus building, and joint decision making (Bardach 1998; McGuire and Agranoff 2011; Scharpf 1988). Partly because these resources and time are too often unavailable to them, and partly due to cooperation and coordination issues, collaborative networks often do not provide the effective and efficient public services that were anticipated with the networks’ formation (Andrews and Entwistle 2010; Bryson et al. 2006; Huxham and Vangen 2005; O’Leary et al. 2015; Robins et al. 2011). Huxham and Vangen (2005) give a warning that “seeking collaborative advantage is a seriously resource-consuming activity so is only to be considered when the stakes are really worth pursuing” (p. 13).

Because of the performance challenges, it is recognized that network management\(^1\) is essential to produce satisfactory network-level outputs and outcomes (Edelonbos et al. 2011; Kelman et al. 2013; Kickert et al. 1997; Klijn, Steijn et al. 2010; Rhodes 1997). Research has found that network managerial activities such as networking (Meier and O’Toole 2001, 2003) and process management (e.g., “connecting” to (de)activate network members and “exploring” to

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\(^1\) Network management is defined as “the use of social ‘tools’ to steer social processes toward some set of goals or away from stagnation and ‘blockage’ through joint problem solving” (Rethemeyer and Hatmaker 2008, p.630).
create shared perceptions among network members) (Klijn, Steijn et al. 2010), contribute to improving network performance. Performance management, an important tool for network management (Agostino and Arnaboldi 2015; Bryson et al. 2006; Imperial 2004; Kelman et al. 2013; Koliba, Campbell et al. 2011; Koliba et al. 2010; Page 2003, 2004, 2008), is defined as “a system that generates performance information through strategic planning and performance measurement routines and that connects this information to decision venues, where, ideally, the information influences a range of possible decisions” (Moynihan 2008a, p. 5). That is, performance management generates performance information for use in improving performance through better decision making, resource allocation, and management. In addition, performance management increases accountability of collaborative networks where traditional accountability systems do not work (Bardach and Lesser 1996; Page 2004, 2008). It is not clear who should be responsible for failed policies or services provided by collaborative networks where implementation or service delivery is dependent on multiple actors’ activities (Van der Meer and Edelenbos 2006). That is, accountability is “lost in the cracks of horizontal and hybrid governance” (Bovens et al. 2008, p.240). Agranoff and McGuire (2001) note that “[w]e must be able to measure the outcomes and performance of networks in order to assess how accountable a particular network is to its stakeholders and for achievement of its stated goals” (p. 311).

Furthermore, performance management plays various roles in collaborative networks to improve network-level performance. Imperial (2004) identifies five functions of performance management in collaborative networks: (1) evaluation and accountability; (2) steering, coordinating, and priority setting; (3) as a motivational tool; (4) promoting and celebrating progress; and (5) enhanced governance and learning.
Implementing performance management is difficult even in single organizations due to complexity. No one actor can determine organizational goals against which performance is measured; produced performance information is ambiguous and incomplete to help improving organizational performance (Moynihan 2008a, 2008b; Radin 2006). Ignoring complexity results in failures of performance management. Radin (2006) gives a warning that “[d]espite the attractive quality of the rhetoric of the performance movement, one should not be surprised that its clarity and siren call mask a much more complex reality” (p. 235). Performance management in collaborative networks is even more challenging than in single organizations because complexity increases in network settings. Multiple members with different goals, strategies, perceptions, and ways of working, are involved and differently interpreting performance information (Frederickson and Frederickson 2006; Koliba et al. 2010; Moynihan et al. 2011; Radin 2006). Moynihan and his colleagues (2011) describe the challenge in implementing performance management in collaborative networks as follows:

There are a number of related factors that make governance more complex. As these factors increase, standard approaches to performance management become less easy to apply and more likely to experience failure or negative unanticipated consequences. Policy areas characterized by task complexity, multiple and possibly contradictory goals, disagreement about goals, and uncertainty about the link between action and outcomes run at odds with performance system that are designed to generate consensus around a manageable number of indicators or clearly hold actors responsible (pp. i151–i152).

Within such complexity, it is difficult to choose criteria by which to measure and evaluate network performance (Kenis and Provan 2009; McGuire and Agranoff 2011; Provan
and Milward 2001). As a result, many studies have been conducted on how to measure and evaluate network performance (e.g., Hertting and Vedung 2012; Koppenjan 2008; Mandell and Keast 2007, 2008; Provan and Milward 2001; Provan and Sydow 2008). It is a challenge for network participants to agree on performance measures because they have divergent goals, strategies, perceptions, and ways of working, and are interested in different aspects of network performance (Kenis and Provan 2009; Koliba, Mills et al. 2011; McGuire and Agranoff 2011; Provan and Milward 2001; Provan and Sydow 2008). However, there seems to be broad agreement among researchers that “network performance must be measured on multiple dimensions and multiple network levels” (McGuire and Agranoff 2011, p. 274). Provan and Milward (2001; also see Mandell and Keast 2008) argue that network performance should be evaluated at three different levels: community, network, and network participants. Regarding the dimensions of network performance, Provan and Sydow (2008) advocate using structural, process, and outcome indicators. Structural indicators measure patterns of connections among network members; process indicators capture intermediate outcomes such as learning, trust, and legitimacy; and outcome indicators are related to innovation, financial and non-financial performance (e.g., customer satisfaction), and network sustainability.

The importance of studying how to measure network performance is well recognized, with many studies on the issue conducted, as mentioned above. McGuire and Agranoff (2011) note that “[i]n the face of the challenges of agreeing on performance measures and empirically estimating network contributions to performance, determining the effectiveness and performance of networks has become the siren song of 21st century public management research” (p. 274). However, producing performance information is not the end itself. Even if network performance is successfully measured or evaluated, resulting performance information must be used if it is to
improve performance (Moynihan et al. 2011; Page 2004, 2008; also see Moynihan 2008a, 2008b; Van Dooren and Van de Walle 2008). Using performance information contributes to improving decision making about planning, strategy, and resource allocation, and adjusting implementation and management activities. Moynihan and his colleagues note that “[u]ntil data are interpreted and used, the promise of performance regimes to improve performance will not be met” (Moynihan et al. 2011, p. i149). In extant research, performance information use “might be characterized as ‘if you build it, they will come.’ It assumes that the availability and quality of performance data is not just a necessary condition for use but also a sufficient one” (Moynihan 2008a, p.5). However, performance information is not always used (Moynihan 2008a; Patton 1997; Van de Walle and Bovaird 2007; Van Dooren and Van de Walle 2008). The availability of performance information sometimes even negatively affects its use due to information overload (Melkers and Willoughby 2005). Understanding which factors influence performance information is a big question for performance management research (Moynihan and Pandey 2010). While studies regarding performance information use in single organizations have identified factors that lead to performance information use (e.g., Cousins and Leithwood 1986; Johnson et al. 2009; Kroll 2015a; Moynihan 2009), there is a dearth of studies on performance information use in collaborative networks (Agostino and Arnaboldi 2015; Appleton-Dyer et al. 2012; Imperial 2004; Moynihan et al. 2011).

This shortage of research is problematic; using performance information in collaborative networks is even more challenging than in single organizations, due to the more tangled complexity of networks. Multiple actors with different goals, strategies, perceptions, and ways of working interpret performance information differently and develop different strategies and solutions based on their singular interpretations. Thus, researchers need to identify the factors
that affect performance information use in collaborative networks in order to learn how to promote performance information use within them. Moreover, network management is different from managing a single organization (Agranoff and McGuire 2001, McGuire 2002, 2006; O’Toole 1997). Agranoff and McGuire (2001) note that “[t]he classical, mostly intraorganizational-inspired management perspective that has guided public administration for more than a century is simply inapplicable for multiorganizational, multigovernmental, and multisectoral forms of governing” (pp. 296–267). Therefore, the factors that affect performance management and performance information use in single organizations might not be applicable to collaborative networks.

In sum, performance information use in collaborative networks has not received sufficient attention in network management research, which has focused on measuring and evaluating network performance rather than using performance information; or from performance information use research, which has focused on factors explaining performance information use in single organizations rather than in network settings (Figure I-2). Imperial (2004) notes that “while many advocate the use of performance management techniques, it is unclear how they can be used to enhance collaborative processes in networks” (p.7).
RESEARCH OBJECTIVE AND THEORETICAL FRAMEWORK

2-1. Research objective

This study aims to explore performance information use in collaborative networks — which factors affect performance information use among network members and what effects result from using performance information — in order to fill the research gap identified above. It addresses three research questions:

Research Question 1: Is performance information used in collaborative networks?

Research Question 2: Is performance information used for learning purposes in collaborative networks?

Research Question 3: Does use of performance information facilitate network learning in collaborative networks?

Answering the first question helps researchers and practitioners judge whether performance management is an appropriate management tool for collaborative networks, since
performance information use is an important criterion by which the effectiveness of performance management is measured (Moynihan and Hawes 2012; Moynihan and Pandy 2010; Van Dooren 2008). As for the second question, collaborative networks are expected to use performance information for learning purposes — “actors collectively examine information, consider its significance, and decide how it will affect action” (Moynihan 2008a, p.167) — in order to have a holistic understanding of complex public problems and come up with innovative solutions for such problems (Head 2008; Hetting and Vedung 2012; Koppenjan and Klijn 2004; Mandell and Keast 2007; Van der Meer and Edelenbos 2006). Therefore, among various types of performance information use (Moynihan 2009) in collaborative networks, understanding whether performance information is used specifically for learning purposes is important. Finally, the third question is concerned with the effect of performance information use on collaborative networks. Its effect has been insufficiently studied even within single organizational settings (Bryson 2012; Kroll 2015a, 2015b; Moynihan 2009; Moynihan et al. 2011), and far less well examined in network settings. There are too few empirical studies on the effect of performance information use to have anything more than speculative hypotheses (Moynihan 2009). Furthermore, Moynihan and his colleagues (2011) note that “we lack definitive evidence about whether performance regimes ultimately improve public sector capacity and outcomes. . . We need to not just identify the causes of performance information use but also to systematically examine how the sustained use of performance data affects a variety of individual and organizational phenomena in governance” (p. i151). It is essential to investigate the effect of performance information use to judge whether implementing performance management in collaborative networks is worth the significant cost and effort.
2-2. Theoretical framework

To address these research questions, this study focuses on interaction patterns and relationships among collaborative network members: how interaction patterns and relationships affect members’ performance information use and how using performance information affects their relationships. The rationale is twofold. First, it is argued that research on performance information use in collaborative networks needs to pay attention to network complexity, because it causes a challenge in implementing performance management (Frederickson and Frederickson 2006; Koliba et al. 2010; Moynihan et al. 2011). Network complexity mainly results from the involvement of diverse actors and their interactions and relationships (Klijn and Koppenjan 2015; Koppenjan and Klijn 2004). Therefore, it is important to consider how interaction patterns and relational characteristics among network members are associated with performance information use, in order to paint an accurate picture of performance information use in collaborative networks.

Second, extant research on performance information use on collaborative networks suggests that interaction patterns and relational characteristics among members are associated with performance information use. Interaction patterns and relational characteristics among members are key elements of a network’s collaborative capacity, defined as “the ability of organizations to enter into, develop, and sustain inter-organizational systems in pursuit of collective outcomes” (Hocevar et al. 2006, p. 256). They influence levels of cooperation and coordination in collaborative networks. Interaction and communication among network members mitigate cooperation problems when actors “discuss the optimal joint strategy, extract promises from one another, and give verbal tongue-lashings when aggregate contributions fall below promised levels” (Ostrom 2000, p. 140). They also enhance coordination among network
members by helping them to develop shared goals and perceptions (Innes and Booher 2010). Relational characteristics — for instance, trust among network members — mitigate cooperation problems by making actors’ behaviors predictable and reducing concerns about opportunistic behaviors (Ansell and Gash 2008; Bardach 1998; Bryson et al. 2006; Edelenbos and Klijn 2007; Emerson et al. 2012; Gray 1989; Huxham and Vangen 2005; Klijn, Edelenbos et al. 2010; Podolny and Page 1998; Powell 1990). They enhance coordination among network members by promoting information and knowledge exchange, including both fine-grained (Uzzi 1996, 1997) and broad-scope information (Larson 1992; Zand 1972). It has been reported that collaborative capacity affects performance management and performance information use in collaborative networks (Appleton-Dyer et al. 2012; Imperial 2004; Page 2004, 2008; Zia et al. 2015). As key elements of collaborative capacity, it is expected that interaction patterns and relationships among network members affect performance information use. In addition, the extant research has found that performance information is used during members’ interactions and communication (Agostino and Arnaboldi 2015; Gibson and de Lancer Julnes 2010; Imperial 2004; Koliba, Campbell et al. 2011; Koliba et al. 2010; Van der Meer and Edelenbos 2006), and that their relational characteristics affect the use of performance information (Agostino and Arnaboldi 2015; Koliba, Campbell et al. 2011). Imperial (2004) notes that “interactive processes at the heart of collaboration also promote information sharing and even encourage the use of performance management systems to enhance accountability” (p.15). Given the findings of extant studies, it is essential to examine the effects of interaction patterns and relationships among network members on performance information use.

While the extant studies point out that interaction patterns and relationships among network members affect performance information use, by conceptualizing collaborative
networks metaphorically, they fail to clarify precisely how they are related. The network metaphor is helpful when comparing the network form of governance mechanism with other governance mechanisms, such as hierarchy and market; but it is not helpful when explaining heterogeneity within collaborative networks because within the metaphor, networks are “treated as undifferentiated forms, as if they all could be characterized in the same general way” (Provan and Kenis 2008, pp. 232–233). That is, collaborative networks are conceptualized as black boxes, without accounting for the heterogeneity among network members. They interact and develop relationships in individual ways, and use performance information differently. Using the network metaphor in research about network function blinds researchers to the interaction patterns and relationships among network members, making it impossible to understand how these key elements affect members’ performance information use and how using performance information affects their relationships.

Following a suggestion by Rethemeyer (2005) — “unless researchers employ network measures and methods, the theoretical promise of the network metaphor will never be fully realized” (p. 121) — this study uses “network perspective” to study antecedents and consequences of performance information use in collaborative networks, focusing on the effects of interaction patterns and relationships among network members. The most distinctive character of network perspective is its focus on relationships and patterns of relationships among actors, rather than examining actors in isolation (Borgatti et al. 2013; Borgatti and Foster 2003; Borgatti and Halgin 2011a; Brass et al. 2004; Kilduff and Brass 2010; Kilduff and Tsai 2003; Scott 2000; Scott and Carrington 2011; Wasserman and Faust 1994). A network is defined as “a set of actors connected by a set of ties” (Borgatti and Foster 2003, p. 992). The actors could be individuals, organizational sub-units, organizations, or nations. Ties could be any relationships, but there are
some universally observable relationship types, including “communication relations,” “sentiment relations” (e.g., trust), and “authority/power relations” (Knoke and Yang 2007).

The network perspective is based on three assumptions:

First, the social structure of any complex system consists of stable patterns of repeated interactions connecting social actors to one another. Second, these social relations are the primary explanatory units of analysis, rather than the attributes and characteristics of the individual actors. Third, the perceptions, attitudes, and actions of organizational actors are shaped by the larger structural networks within which they are embedded, and in turn their behaviors can change these networks’ structures (Knoke 2001, pp. 63–64).

The perspective is able to “transform a merely metaphorical understanding of the embeddedness of actors in networks of social relationships into a more precise and usable tool for social analysis” (Emirbayer and Goodwin 1994, p. 1446). The network perspective aims to clarify how networks, wherein actors are embedded, affect the actors’ beliefs, perceptions, attitudes, behaviors, performance, and so on (i.e., consequences of networks), as well as how the networks are formed (i.e., antecedents of networks) (Brass et al. 2004). The former is called a “network theory,” where networks are used as an independent variable, and the latter is called a “theory of networks” where networks are used as a dependent variable (Borgatti and Halgin 2011a).

The network perspective explains the consequences of networks (i.e., network theory) relying on two mechanisms, the “connectionist” and “structuralist” models (Borgatti and Foster 2003; also see Borgatti and Halgin 2011a; Borgatti and Lopez-Kidwell 2011). The connectionist model explains actors’ choices, or performance, focusing on how information or resources flow between or among connected actors. For instance, information flowing between directly
connected actors leads to similar medical practices (Coleman et al. 1966), business practices (Davis 1991), or philanthropic donations (Galaskiewicz and Wasserman 1989), due to learning and socialization effects between the connected actors. On the other hand, in the structuralist model, “two nodes will have similar outcomes (e.g., adopt the same point of view) because they occupy structurally similar positions, even if there is no tie connecting them” (Borgatti and Foster 2003, p. 1003). For instance, two medical doctors who are not directly connected adopt the same medical practices because they have similar patterns of ties: they occupy the same social position and face and adapt to similar social pressures (Burt 1987). Two firms having similar patterns of connections with financial institutions make political contributions to similar congressional candidates even if they are not directly connected (Mizruchi 1989).

Research on antecedents of networks has found many factors that affect network formation, including actors’ characteristics (e.g., similar actors make a connection), their other relationships (e.g., mutually dependent actors form a strategic alliance), and structural effects (e.g., two actors connected with the same third party tend to make a connection themselves) (Brass et al. 2004; Gulati 1998). In comparison to the network theory, the theory of networks has been less well developed (Borgatti and Foster 2003). Borgatti and Foster (2003) list two reasons. First, as a young theoretical perspective, the network perspective needed to prove its importance by showing that networks have effects on important outcome variables. Until such effects are established, little attention is paid to how networks are formed. Once the effects are legitimized, then the antecedents of networks can become a legitimate focus of academic inquiry. Another reason is due to an academic heritage wherein “networks are seen as defining the actor’s environment or context for action and providing opportunities and constraints on behavior. Hence, studies that examine the consequences of networks are typically consistent with the
The network perspective has two levels of analysis: whole network and egocentric (Kilduff and Tsai 2003; Provan et al. 2007). Whole network analysis is concerned with the presence or absence of ties among all actors belonging to a social system such as small groups, organizational units, organizations, and inter-organizational collaborations. On the other hand, egocentric analysis is about ties between a focal actor and that actor’s connections. Since network-level performance matters more than organization-level performance in addressing complex public problems (Gray 2000; Kenis and Provan 2009; Provan and Milward 1995, 2001), whole network analysis is important for public administration and policy research. By analyzing the presence and absence of connections in collaborative networks, whole network analysis is able to provide hints of how to design and manage collaborative networks. Existing studies on whole networks show consequences of networks: for instance, what patterns of network structure lead to providing effective public services (Provan and Milward 1995; Provan and Sebastian 1998); adopting evidence-based practices (Provan et al. 2013); and establishing good social standings (Provan et al. 2009). It also shows antecedents of network formation: for instance, actors’ similarities (Gerber et al. 2013; Henry et al. 2011); their other relationships such as resource dependency (Park and Rethemeyer 2014); and structural effects (Berardo and Scholz 2010; Huang 2014).

Figure I-3 shows a theoretical framework, based on the network perspective, for addressing the three research questions. The level of analysis in this study is whole network level. In this framework: (1) interaction patterns and relationships among network members affect performance information use, which is captured as network ties, since performance information is used during interactions and communication among network members; (2) the
network ties of performance information use affect shared understanding among network members, which is also captured as network ties in that pairs of network members are considered to have ties of different strength depending on the level of shared understanding.

**Figure I-3 Theoretical Framework for Antecedents and Consequences of Performance Information Use in Collaborative Networks**

RESEARCH SETTING AND DATA COLLECTION

3-1. Research setting

This study derived its data from a case of a “system of care,” in particular, an initiative administrated by the Center for Mental Health Services (CMHS) of the Substance Abuse and Mental Health Services Administration in a county in a northeast state in the U.S., given the pseudonym Faraway County. The system of care approach is a key strategy to providing mental health services to children and youth in the U.S. (Hodges et al. 2010). The approach developed in response to fragmented services to mentally ill children and youth, who often need multiple types of services from multiple organizations (cf., Agranoff 1991). The approach is originally defined as “a comprehensive spectrum of mental health and other necessary services which are
organized into a coordinated network to meet the multiple and changing needs of severely emotionally disturbed children and adolescents” (Stroul and Friedman 1986, p. 3). While the definition has changed over time (Hodge et al. 2010), the approach’s core values and guiding principles have not changed (Friedman 2010). The core values are to provide: (1) child-centered and family-focused, (2) community-based, and (3) culturally- and linguistically-competent services. The guiding principles are: (1) comprehensiveness, (2) individualization, (3) least restrictive setting, (4) family orientation, (5) service integration, (6) case management, (6) early identification, (8) smooth transition, (9) rights protection and advocacy, and (10) nondiscrimination (Stroul and Friedman 1986).

CMHS implements a grant program, known as Children’s Mental Health Initiative (CMHI), to promulgate the system of care approach. Faraway County was a recipient of the CMHI grant. Systems of care funded by the CMHI grant have a responsibility to translate the core values and guiding principles of the system of care approach into actions that fit the social, economic, and political contexts of their community, to best serve their clients (Stroul et al. 2008). That is, the Faraway County system of care was an “action network” (Agranoff 2007) responsible for service provisions and also decision making regarding which populations were served, which services were prioritized, which intervention strategies were prioritized, and so on. Its responsibility was quite similar to what Bardach and Lesser (1996) describe:

A collaborative is not simply a service delivery network; it is also a community that must make choices about which services to deliver – or to put it more generally and also more precisely, about which individuals, which families, which neighborhoods, which problems, which types of service, and which philosophies of intervention deserve priority. Federal and state categorical grant funding of local services often prescribes, in
rigid and confining detail, what services are to be provided by what kinds of providers to recipients with what sorts of characteristics. Nevertheless, even within these boundaries, providers often have room to choose their priorities and, under some conditions, to create new priorities that none of the agencies had ever considered when they worked independently. How they do so depends both on political bargaining and on a more disinterested dialogue concerning the public interest (p. 201).

As shown in Figure I-4, to realize its core values and guiding principles, systems of care span multiple service areas, and the effectiveness of one service area is affected by activities in other areas. For example, mentally ill children and youth need more than mental health treatments to be well served; they also need such services as education and vocational training to live as independently as possible within their community. Moreover, the involvement of multiple organizations is important for systems of care, where referrals could come from various sources because children and youth often cannot clarify their own needs, and their needs could be identified by various service providers (Woodard and Doreian 1998). To provide comprehensive, integrated, and individualized services, multiple organizations need to collectively determine (1) population to be served, (2) outputs and outcomes to be achieved, (3) services to be provided, (4) how to organize the services, (5) administrative system to support the services, and (6) how to fund the services (Pires et al. 2008). In short, “[w]orking collaboratively is believed to be a key ingredient and driving force in developing systems of care to serve children with serious emotional disturbance and their families” (Hodges et al. 1999, p. 21).
However, it is hard for multiple network members with divergent goals, strategies, perceptions, and ways of working to effectively collaborate. For instance, whereas the mental health department focuses on providing treatments to mentally ill children and youth, the probation department and family court focus on protecting public safety. Family court might prefer that mentally ill children and youth are treated in restrictive settings rather than receive the community-based care that mental health department prefers, because the family court’s priority of minimizing threats to public safety dictates that it seeks to ensure these children and youth do not commit crimes in their community. Even organizations whose main concern is taking care of individual patients have different orientations on how best serve to those clients. The mental health department aims to increase the time that mentally ill children and youth spend in their community, and especially with family. On the other hand, the social services department
focuses on protecting them from their family when necessary. Even when network members have congruent goals, they might have difficulty working together due to organizational turf: “the domain of problems, opportunities and actions over which an agency exercises legitimate authority” (Bardach 1998, p. 164). Organizations protect their turf rather than work together in order to secure their autonomy (Bardach 1998; Thomas 2003). Romzek et al. (2014) document such a turf problem:

> Our shared goal is to help these kids be successful in school. Help them be successful in life. And that was, to me, that was a shared goal. And I was flat-out told that that was not a shared goal. That it was their responsibility to work with those kids during the day, not ours. And that our responsibility was to work with them after school and in the evenings and work with the parents. We are able to get in a couple of the schools. But really, we’re locked out of that district for the most part. And we really see the detrimental effect that it has on children . . . So that’s a case that’s very territorial (p. 828).

Due to such problems, it is difficult for system of care members to agree on which populations to serve, which services to prioritize, which intervention strategies to prioritize, what levels of performance to expect, and so on. To overcome such difficulties and successfully implement the system of care approach within its local context, Faraway County had a collective decision-making body responsible for system-level issues such as strategic planning, budget allocation, service delivery, and evaluation. This decision-making body had a monthly meeting that was open to all residents in the county. Besides the decision-making body, working groups were formed to engage in specific issues such as strategic planning, social marketing, and
The evaluation.\textsuperscript{2} The Faraway County system of care operations was managed and coordinated by a network administrative organization (NAO), which consisted of a full-time director and several staff members. Therefore, the Faraway County system of care was characterized as the “NAO” model wherein “a separate administrative entity is set up specifically to govern the network and its activities” (Provan and Kenis 2008, p. 236).

Systems of care funded by the CMHI grant are required to have “local evaluation,” which is a dedicated evaluation staff to monitor and evaluate performance. They are also required to participate in so-called “national evaluation.” At the time of this research, the main component of local evaluation activities in the Faraway County system of care was to monitor outputs and outcomes of its services based on the logic model developed at the inception of the grant period.\textsuperscript{3} In addition to the performance monitoring based on the logic model, the Faraway County system of care conducted evaluation studies focused on specific issues such as culturally competent service delivery, operational-level interagency collaboration, and system-level interagency collaboration. Local evaluations at Faraway County provided information on intake quality, service-quality improvement, child- and family-level outputs and outcomes, inter-organizational relationships, and so on. Regarding the national evaluation, CMHS and its contracted evaluation agent visited Faraway County to evaluate the extent to which the Faraway County system of care embraced the core values and guiding principles of the system of care approach. The site visit evaluations were conducted four times during the grant period. Also, CMHS and its contracted

\footnote{There were nine work groups at the time of data collection in 2013.}

\footnote{The logic model, also known as outcome sequence charts: “[e]very program has implicit hypotheses about what actions will produce what results. The charts attempt to identify these hypotheses by showing the outputs, intermediate outcomes, and end outcomes expected to flow from program activities” (Hatry 1999, p. 48).}
evaluation agent periodically provided aggregated data about the demographic information of children and families receiving services, their treatments, and their outcomes in the county. The data made it possible to compare Faraway County performance with other communities.

Whether performance information is produced internally or externally distinguishes characteristics of performance information (Torres et al. 1996). Internal performance information is produced by evaluators who are hired by the organization being evaluated; external performance information is produced by evaluators who are not hired by the organization being evaluated. Internal performance information is more relevant than external performance information because evaluators are likely to have more contextual knowledge about organizations and programs and thus they know what kinds of information are needed, who uses the produced information, how the information is used, and how the information can be interpreted (Torres et al. 1996). On the other hand, external evaluators act more independently than can internal evaluators. Because of their independence, external evaluators are better positioned to provide impartial information (Torres et al. 1996). Torres et al. (1996) argue that “[o]ne way to maximize the benefits and minimize the liabilities of both internal and external evaluation is to establish an arrangement that essentially combines the two positions. This can be done by external evaluators maintaining long-term relationships with organizations" (p. 58), which characterized the local evaluation of the Faraway County system of care.

Faraway County’s system of care collaborative network was chosen for this study because system of care is a typical collaborative network in that network members are interdependent in planning and providing a public service that cannot be provided by single
organizations. The Faraway County system of care, in particular, was an instrumental case\(^4\) (cf., Stake 1998) in observing performance information use among network members. The system of care approach emphasizes the importance of performance management in producing performance information through evaluation and measurement, and in using the produced information to make data-based decisions for effective resource allocation and service provision (Friedman and Israel 2008; Stroul et al. 2008). The Faraway County system of care was an exemplar in its performance information use. A national evaluation report specifically notes that a strength of the Faraway County system of care was that its decision making was based on performance information.

3-2. Data collection

The data for this study were collected using a survey and interviews. Twenty-four actors involved in the decision-making processes at the Faraway County system of care were selected as survey participants based on “nominalist” and “realist” approaches to network boundary specification: researchers set criteria about and define who should be included in a network based on their standpoint in the nominalist approach; network members themselves define who is involved in their network in the realist approach (Laumann et al. 1983). First, using the member list of its formal decision-making body,\(^5\) 47 actors were identified (i.e., nominalist approach).

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\(^4\) An instrumental case is chosen to facilitate understanding of a particular phenomenon – antecedents and consequences of performance information use in collaborative networks in this study – rather than for the full scope of the case (Stake 1998).

\(^5\) The body did not exist at the time of data collection in 2013. It was eliminated because its functions overlapped with the decision-making body responsible for system-level issues.
Second, some actors were added to the list, and some actors were removed, based on the information from five informants who were in a position to observe the Faraway County system of care as a whole\(^6\) (i.e., realist approach). In addition, at the end of the survey, the participants were asked to list any system of care partners not included in the survey but actively involved in the Faraway County system of care. This procedure, though, did not increase the number of the system of care partners surveyed.

The data was collected using an online survey from August to October 2013. The survey was sent to 27 individuals in the 24 network member organizations.\(^7\) Most survey participants were the highest administrator responsible for services to children and youth or administrators who represented their organization as participants in the network’s decision-making processes. They were selected as survey respondents because it was expected that how they used performance information could capture performance information use during interactions and communication among network members well. The rationale is twofold: (1) since they represented their organization to participate in decision-making processes in the Faraway County system of care, it was expected that performance information was generally used during interactions and communication among them; and (2) since it is known that organizational leaders affect performance information use of their subordinates (Dull 2009; Moynihan and Ingraham 2004), their subordinates use performance information in a similar manner to them even when their subordinates participate in the decision-making processes. After follow-ups

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\(^6\) The five informants were: commissioner of the Faraway County system of care, two NAO staff members, and two local evaluators.

\(^7\) The survey was sent to four staff members of the NAO because each of them was involved in the decision-making processes in the Faraway County system of care.
using email, postal mail, and phone, 24 individuals completed the survey (88.89% response rate), representing 21 network members (87.50% response rate).

In addition to the survey data, eleven semi-structured interviews were conducted with network members and a local evaluator. Network members were grouped into four categories based on their levels of performance information use\(^8\): (1) active performance information user (three members), (2) moderate performance information user (three members), (3) less active performance information user (four members), and (4) non-performance information user (11 members). At least two network members from each group were interviewed: two active performance information users, two moderate performance information users, two less active performance information users, and four non-performance information users. Each interview lasted approximately 30 to 60 minutes.\(^9\) The goal of the interviews was to complement survey data with qualitative data in order to more deeply understand antecedents and consequences of performance information use. Typical interview questions were: on what occasions did you typically use evaluation results in communication with the system of care partners; did using evaluation results help you discuss problems and their solutions with the system of care partners; did using evaluation results in communication with your system of care partners lead to good work or collaboration; did using the data from evaluation reports affect your understanding of the achievements and challenges of the system of care; and, did using data from evaluation reports help you to share your understanding of the achievements and challenges with the system of care

\(^8\) The four groups were identified based on blockmodeling using CONCOR algorithm. I used UCINET (Borgatti et al. 2002), a social network analytical program, to perform blockmodeling.

\(^9\) A representative of a network member did not find time for an interview. I sent to him my questions via email, and he answered them via email.
partners? All the interviews were recorded and transcribed except for one conducted via telephone.10

OUTLINE

Focusing on the effects of interaction patterns and relational characteristics among network members on performance information use, this study addresses three research questions, above, to understand antecedents and consequences of performance information use in collaborative networks. Essays One and Two explore antecedents of performance information use in collaborative networks. Essay One addresses the first research question — is performance information used in collaborative networks? Essay Two addresses the second research question — is performance information used for learning purposes in collaborative networks? Essay Three explores consequences of performance information use, addressing the third research question — does performance information use facilitate network learning in collaborative networks? Finally, the concluding chapter summarizes and integrates findings from the three essays, offers academic and practical implications of this study, articulates limitations of this study, and offers possibilities for future research.

10 Regarding the interview conducted via phone, I sent a summary of the interview to the interviewee, and she confirmed the summary.
ESSAY ONE

Performance information use in collaborative networks: Which network members use it, and why?

ABSTRACT

The purpose of this study is to explore factors that affect performance information use in collaborative networks, focusing on the effects of interaction patterns and relational characteristics among network members. Collaborative networks provide an advantage in addressing complex public problems. However, cooperation and coordination problems within these networks can result in inefficient and ineffective public services. Since collaborative networks face significant performance challenges, measuring and evaluating collaborative networks’ performance, and using the resulting data, are essential to improving their outcomes. However, performance information use in collaborative networks has not been fully explored. This study, using a case from a health and human service network, examines those factors that explain performance information use among members in the collaborative network. Results, obtained using social network analysis, show that (1) some network members actively use performance information with many members, and others do not; (2) such heterogeneity among network members in terms of performance information use is related to with whom they communicate, what positions they occupy, and what relationship they develop; and (3) the association has some similarities and differences between different types of performance information.
Evaluation is an organizational problem . . . The rejection of evaluation is done largely by the organizations that ask for it. To create an organization that evaluates its own activities evidently requires an organizational response. If evaluation is not done at all, if it is done but not used, if used but twisted out of shape, the place to look first is not the technical apparatus but the organization (Wildavsky 1972, p. 518).

INTRODUCTION

Network forms of organization (Jones et al. 1997; Podolny and Page 1998; Powell 1990) are increasingly selected to implement policies and deliver services in such public policy areas as economic development, environmental protection, and health and human services (Agranoff 2007; Agranoff and McGuire 2003; Alter and Hage 1993; Bardach 1998; Feiock and Scholz 2010; Innes and Booher 2010; Koppenjan and Klijn 2004; Provan and Milward 1995). These networks, formed among three or more organizations, collectively work toward a common goal that cannot be achieved, or well-achieved, by any one of them (Kilduff and Tsai 2003; Provan et al. 2007). In public administration and policy research, these goal-directed groups are known as “collaborative networks,” which are defined as “collections of government agencies, nonprofits, and for-profits that work together to provide public goods, services, or ‘value’ when a single public agency is unable to create the goods or services on its own and/or the private sector is unable or unwilling to provide the goods or services in the desired quantities” (Isett et al. 2011, p. i158).

Collaborative advantage is the major strength of collaborative networks, “synergy that can be created through joint working” (Vangen and Huxham 2010, p. 163). Collaborative networks gain an advantage in addressing complex public problems by accessing, mobilizing,
and integrating the broad range of resources, information, expertise, and perspectives possessed by differently-endowed organizations (Huxham and Vangen 2005).

While the involvement of diverse organizations does enhance the capacity of collaborative networks to address complex public problems, at the same time, it has negative consequences — namely cooperation and coordination problems resulting from the differing (or even conflicting) goals, strategies, perceptions, and ways of working among diverse network participants (Feiock and Scholz 2010; Gulati et al. 2012; Jones et al. 1997; Ospina and Saz-Carranza 2010). By definition, collaborative network members are interdependent and tasked to co-produce outputs and outcomes; without good cooperation and coordination among its participants, a collaborative network cannot produce satisfactory results. Successful collaboration requires network participants to invest their resources, time, and energy in relationship and consensus building and joint decision making (Bardach 1998; McGuire and Agranoff 2011; Scharpf 1988). Partly due to the basic cooperation and coordination issues, and partly because resources and time to resolve those issues are often unavailable or insufficient, collaborative networks often fall short of providing the effective and efficient public services that were anticipated in their formation (Andrews and Entwistle 2010; Bryson et al. 2006; Huxham and Vangen 2005; O’Leary et al. 2015; Robins et al. 2011).

With such inherent performance challenges, researchers recognize that measuring and evaluating performance is essential to improving performance in collaborative networks (Kenis and Provan 2009; Klijn 2005; McGuire and Agranoff 2011; Provan and Milward 2001; Provan and Sydow 2008). Some emphasize the importance of using the resulting performance
information\textsuperscript{11} to help improve collaborative networks’ performance: in their view, it is not measuring or evaluating performance per se, but rather, performance information use that leads to performance improvement (Moynihan et al. 2011; Page 2004, 2008; also see Moynihan 2008a, 2008b; Van Dooren and Van de Walle 2008). Using performance information contributes to performance improvement by helping collaborative network participants to make better decision and allocate resources in a more targeted way, such as by expanding effective programs, eliminating ineffective programs, and adjusting strategies and operations to achieve program goals efficiently (Moynihan 2008a, 2008b; Wholey 1986). While it has been assumed that performance information, once generated, would be used by organizations, research has found that it is not always so (Moynihan 2008a, 2008b; Patton 1997; Van de Walle and Bovaird 2007; Van Dooren and Van de Walle 2008). Studies regarding performance information use in single organizations have identified factors that lead to performance information use (e.g., Cousins and Leithwood 1986; Johnson et al. 2009; Kroll 2015a; Moynihan 2009), but there is a dearth of studies on performance information use in collaborative networks (Agostino and Arnaboldi 2015; Appleton-Dyer et al. 2012; Imperial 2004; Moynihan et al. 2011).

This shortage of research on performance information use in collaborative networks is problematic. Since using performance information in network settings is more challenging than in single organizations due to complexity (Koliba et al. 2010; Moynihan et al. 2011), research

\textsuperscript{11} Performance information is defined as “systematic information describing the outputs and outcomes of public programs and organizations – whether intended or otherwise – generated by systems and processes intended to produce such information.” (Pollitt 2006, p.39). Performance information includes information produced by evaluation and performance measurement (Pollitt 2006). Information produced by evaluation and performance measurement faces a similar challenge of not being used (Julnes 2007).
needs to identify factors that affect performance information use in collaborative networks to figure out how to promote performance information use. The complexity arises from the involvement of, and interactions among, multiple actors with diverse goals, strategies, perceptions, and ways of working, and their relational characteristics such as mutual dependence and trust (or lack thereof) (Klijn and Koppenjan 2015; Koppenjan and Klijn 2004). For instance, network members with different goals and perceptions tend to have different interpretations about performance information and develop different strategies and solutions based on their interpretations (Bekgaard and Serrizlew 2015; Kenis and Provan 2009; Moynihan 2008a, 2008b; Valvira 2002). Network members may also change their goals and perceptions during interactions (Klijn and Teisman 1997; Koppenjan 2008), which further affects their use and interpretation of performance information.

To bridge the gap left by this serious lack of research on performance information use in collaborative networks, this study explores the factors leading to performance information use in collaborative networks, focusing on the effects of interactions and relational characteristics among network members. As mentioned above, interactions and relational characteristics among network members lead to complexity which affects performance information use. At the same time, collaborative capacities, such as interactions and positive relationships among network members, are essential in general for networks to function well (Ansell and Gash 2008; Bryson et al. 2006; Emerson et al. 2012; Gray 1989; Huxham and Vangen 2005; Jones et al. 1997; Podolny and Page 1998; Powell 1990), and specifically for successful implementation of performance management (Appleton-Dyer et al. 2012; Imperial 2004; Page 2004, 2008; Zia et al. 2015). Imperial (2004) notes that “interactive processes at the heart of collaboration also promote information sharing and even encourage the use of performance management systems to enhance
Identifying the factors that lead to performance information use in collaborative networks has both academic and practical implications. Academically, it responds to the big question raised in performance management research by Moynihan and Pandey (2010): why is performance information used? Understanding this grows even more significant as collaborative networks become an increasingly important context for decisions and actions in public affairs. Performance management research should reflect a key aspect of governance (Hertting and Vedung 2012; Moynihan 2009; Pandy 2015). Identifying factors that lead to networks’ use of performance information also contributes to network management research by helping to demonstrate how and to what extent performance management works in collaborative networks, since performance information is an important criterion to judge the effectiveness of performance management (Moynihan and Hawes 2012; Moynihan and Pandy 2010; Van Dooren 2008). As for practical implications, the identified factors give a hint to network administrators on how to enhance performance information use among network participants and how to design and implement a performance management system.

The remainder of this paper is structured as follows: The next section will review the present studies on performance information use in networks. In Section Three, a theoretical framework and hypotheses will be presented. The Method section will present the data, measures, and analytical method, and be followed by the Results section. The final section will outline implications drawn from this research.
LITERATURE REVIEW

2-1. Characterizing performance information use in collaborative networks

The limited number of studies that have examined performance information use in collaborative networks show that performance information is exchanged and interpreted during interactions and communication among network members (Agostino and Arnaboldi 2015; Gibson and de Lancer Julnes 2010; Imperial 2004; Koliba, Campbell et al. 2011; Koliba et al. 2010; Van der Meer and Edelenbos 2006). Performance information use in network settings is characterized as “collective sense making” among network members, interpreting information differently in accordance with their goals, strategies, perceptions, and ways of working (Van der Meer and Edelenbos 2006; also see Moynihan 2008a, 2008b).

Van de Walle and Van Dooren (2008) differentiate between “loose coupling” and “tight coupling” of performance information use. In the loose coupling of performance information use, performance information is considered to be ambiguous and subjective, and the link between performance information and decision making is mediated by exchange of, discussion about, and interpretation of performance information. The interactive dialogue model of performance information proposed by Moynihan (2008a, 2008b) captures well the loose coupling of performance information use. The model conceptualizes performance information use as follows:

Information is exchanged between multiple parties, suggesting the potential for multiple interpretations of information. Information is not static, but is created and presented to have an impact on another actor, who may in turn respond with his or her own interpretation of events. The meaning of information for different actors is established in the exchange. Interactive dialogue therefore implies the ambiguity and subjectivity in the
construction of meaning. In the same ways that some interactive dialogues lead to agreement, and some crystallize conflict, the exchange of performance information can sometimes lead to greater agreement and coordinated action between parties and sometimes do little more than reflect the different positions of the actors involved (Moynihan 2008a, pp. 95–96).

The tight coupling of performance information use is the so-called “instrumental use,” wherein performance information is considered to be conclusive and neutral, and performance information and decision making are closely linked so that decisions (e.g., expanding and terminating programs) are mechanically made on the basis of performance information. Weiss (1979) describes instrumental use: “[a] problem exists and a decision has to be made, information or understanding is lacking either to generate a solution to the problem or to select among alternative solutions, research provides the missing knowledge” (p. 427). While the link between information and decision making is weak in general, the instrumental use of performance information rarely occurs in complex and ambiguous settings where performance information can be differently interpreted (Noordegraaf and Abma 2003; Van Dooren 2011). Accordingly, the instrumental use of performance information is unlikely to occur in collaborative networks where various members with different goals, strategies, perceptions, and

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12 Feldman and March (1981) argue that “most organizations and individuals often collect more information than they use or can reasonably expect to use in the making of decisions. At the same time, they appear to be constantly needing or requesting more information, or complaining about inadequacies in information” (p.174). Research has found that the link between decisions and various types of information is mediated by interpretation of information (e.g., Sabatier and Jenkins-Smith 1993; Shulock 1999; Weiss 1979; White 1994).
ways of working are involved and make decision based on consensus (Teisman 2000). The reason is twofold. First, network members with different (or even conflicting) goals, strategies, perceptions, and ways of workings are likely to differently interpret performance information (Moynihan 2008a, 2008b). Second, in order to have some impact on decision making in collaborative networks, performance information must be used in interactions and communication among network members. Due to their interdependence, all network members affect decision making in collaborative networks; decision making in collaborative networks is most often based on consensus, reached through interactions and communication among network members by taking into account and accommodating each member’s goals, strategies, perceptions, and ways of working, rather than on one network member’s unilateral choice. Then, the link in collaborative networks between performance information and decision making is most often mediated by interactions and communication among network members whereby they bargain, persuade, discuss, and learn from one another in order to build consensus.

Therefore, in line with the extant studies, this study focuses on performance information use during interactions and communication among network members. Using performance information during communication contributes to network performance improvement by enriching communication among network members, in that it focuses them on identifying problems, finding solutions, and evaluating and implementing solutions (Mausolff 2004). Moynihan (2008b) notes that “[p]erformance data highlights the relative success or failure of a

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However, network members do not necessarily have equal power to affect decision making (Park and Rethemeyer 2014: Rethemeyer 2007; Rethemeyer and Hatmaker 2008). Network members with valuable resources that are less available elsewhere have power over other members without such resources (Emerson 1962; Pfeffer and Salancik 2003).
unit of process, but only a dialogue can help identify and disseminate the reasons why success occurs. . . Dialogue allows participants to examine their own thinking, look at old problems in new ways by experimenting with multiple frames, and to create common meaning” (p. 37).

2-2. Factors affecting performance information use in collaborative networks

What factors affect performance information use during interactions and communication among network members? It is argued that performance information use in collaborative networks is affected by the complexity of networks (Moynihan et al. 2011), which results from the involvement of diverse actors, and their interactions and relationships (Klijn and Koppenjan 2015; Koppenjan and Klijn 2004). Indeed, extant research has found that performance information use among network members is affected by interactions (Imperial 2004), and by relational characteristics, such as common knowledge (Koliba, Campbell et al. 2011) and power imbalance (Agostino and Arnaboldi 2015).

These studies, valuable in that they empirically examine performance information use in the understudied area of collaborative networks, do not clarify how performance information use is associated with interactions or relational characteristics among network members. For instance, while Koliba, Campbell, and Zia (2011) suggest that performance information is used among the network members with a common knowledge base, we are uncertain how they are related without (1) uncovering the patterns of performance information use along with the patterns of shared knowledge among network members, and (2) investigating their association. Similarly, while Imperial (2004) argues that performance information is used during interactions among network members, he examines neither the patterns of performance information use nor the patterns of interactions among network members.
These studies conceptualize collaborative networks metaphorically, as “undifferentiated forms, as if they all could be characterized in the same general way” (Provan and Kenis 2008, pp. 232–233). That is, collaborative networks are treated conceptually as a black box, without accounting for the heterogeneity among network members. Using the network metaphor impedes discovery of which network members use performance information and why, and hinders the development of strategies to promote performance information use in collaborative networks, because research has suggested, although not empirically explored yet, that not all network members use performance information in the same way (Agostino and Arnaboldi 2015; Imperial 2004; Koliba 2014; Koliba, Campbell et al. 2011). Koliba and his colleagues acknowledge the problem in their study, pointing out that “[a]lthough the studied networks employed similar mental models concerning the causes and consequences of traffic congestion, just how and to what extent congestion data were used to inform actual policy, programmatic, and project decision-making remain to be seen” (Koliba, Campbell et al. 2011, pp. 542–543). To understand the basis of performance information use in collaborative networks, it is important to ask the question of how interaction patterns and relational characteristics among network members are associated with performance information use.

THEORETICAL FRAMEWORK AND RESEARCH HYPOTHESES

This study relies on network perspective and resource dependence theory to address the research gap highlighted in the previous section. The network perspective and the resource dependence theory are not considered competing theories in this paper. Rather, combining them helps to uncover how interaction patterns and relational characteristics among network members are associated with performance information use. The theories are complementary in that the former
sheds light on how interactions and relationships influence network members’ behavior (i.e., performance information use in this study), and the latter sheds light on how they actively influence and manipulate their interactions and relationships by using performance information. The two theories, compatible in their basic elements — conceptualizations of actor and network (Cook and Whitmeyer 1992) — have been combined to study inter-organizational networks (e.g., Berardo 2010; Gulati 1995a; Gulati and Gargiulo 1999; Park and Rethemeyer 2014; Provan 1993; Rethemeyer 2007).

3-1. Network perspective

3-1-1. Social contagion theory

The most distinctive characteristic of network perspective is its focus on relationships and the patterns of relationships among actors (Borgatti et al. 2013; Borgatti and Foster 2003; Borgatti and Halgin 2011a; Brass et al. 2004; Kilduff and Brass 2010; Scott 2000; Scott and Carrington 2011; Wasserman and Faust 1994). The central argument of the perspective is that “actors are embedded within networks of interconnected relationships that provide opportunities for and constraints on behavior” (Brass et al. 2004, p. 795). Social contagion theory (Monge and Contractor 2003; Valente 1995), also known as social influence theory (Friedkin 1998) in the network perspective, explains how the networks in which actors are embedded influence the actors’ behaviors, attitudes, perceptions, beliefs, and so on. Actors are especially influenced by socially proximate others in their networks. Extant research has found that social contagion theory explains such network effects on organizational-level as well as individual-level behaviors (e.g., Burt 1987; Coleman et al. 1966; Davis 1991; Davis and Greve 1997; Galaskiewicz and Burt 1991; Galaskiewicz and Wasserman 1989; Haunschild 1993; Mizruchi
Social contagion theory has suggested two mechanisms wherein networks affect actors: cohesion and structural equivalence mechanisms (Burt 1987; Friedkin 1984; Marsden and Friedkin 1993; Mizruchi 1993).

In the cohesion mechanism, social proximity is defined by the direct ties through which information flows between actors (Friedkin 1984; Marsden and Friedkin 1993; Mizruchi 1993). In the cohesion mechanism, information flowing between connected actors is the source of social influence, leading to the actors holding similar beliefs, perceptions, attitudes, and behaviors because of learning and socialization effects (Borgatti and Foster 2003; Borgatti and Halgin 2011a; Burt 1987; Friedkin 1984; Marsden and Friedkin 1993; Mizruchi 1993). Since ties between actors can be viewed as pipes through which information flows, the cohesion mechanism works for directly connected actors (Mizruchi 1993), especially when their connection is strengthened by frequent and high-quality information flow. Network members would recognize the importance of using performance information, and learn how to effectively use it, by observing and learning from the directly-connected partners. Thus, it is expected that:

**Hypothesis 1: When one member of a frequently communicating pair of actors uses performance information during communication, the other in the pair is likely, in return, to use performance information with the first actor.**

Actors who have similar patterns of relationships within a network are considered to be structurally equivalent (Borgatti and Everett 1992; Borgatti et al. 2013; Scott 2000; Wasserman and Faust 1994). In the structural equivalence mechanism, social proximity is defined as the extent to which actors have similar patterns of connections in their networks. Structurally equivalent others become a frame of reference when actors determine their behaviors because
structurally equivalent others are in the same position or play the same role within their networks (Leenders 2002). In the structural equivalence mechanism, actors in the same position are likely to develop similar behaviors because those who occupy the same position face and adapt to similar social pressures (Borgatti and Foster 2003; Borgatti and Halgin 2011a; Burt 1987; Friedkin 1984; Marsden and Friedkin 1993; Mizruchi 1993). Burt (1987) emphasizes competition among actors as the mechanism of social contagion via structural equivalence. Since structurally equivalent actors play the same role and are interchangeable in the perspective of others in the network, they are forced to adopt the attractive behaviors of others in the same position so that they do not lose in competition with those in the same position. The current pressure to use performance information is strong since its importance is emphasized more than ever (Van Dooren 2008). Network members, therefore, are likely to include performance information in communication when others in the same position use it, so as to adapt to the same social pressure and to seem as competent as or more competent than others in equivalent positions. Following the structural equivalence mechanism, it is expected that:

**Hypothesis 2: Structurally equivalent network members use performance information similarly.**

3-1-2. Homophily

Homophily is the principle that is characterized as “birds of a feather flock together” (McPherson et al. 2001, p. 417). Homophily is a ubiquitous mechanism in network settings, whether they are networks of individuals or organizations (e.g., Atouba and Shumate 2015; Gerber et al. 2013; Henry et al. 2011; Ibarra 1992; Marsden 1987, 1988). While similarities between organizations result from various organizational characteristics such as size, status, and type, this paper focuses
on the extent to which network members share their goals, since achieving common goals is a defining character of collaborative networks (cf., Kilduff and Tsai 2003; Provan et al. 2007). Disagreement about goals poses a challenge for performance management systems (Moynihan et al. 2011). When a pair of network members have divergent goals, they are likely to interpret performance information differently (Moynihan 2008a, 2008b; Radin 2006). Moreover, communication is easier between homophilous actors than heterophilous ones (birds of different feathers) (Brass 1995, Roger 2003). As a result, it is harder for them to communicate and collectively make sense of performance information, and they would have to devote time and energy to develop a shared understanding of performance information. On the other hand, when a pair of network members have similar goals, it is less difficult for them to communicate and collectively make sense of performance information. In addition, actors with clear goals easily identify information that is relevant for them and can avoid information overload (Davis and Stazyk forthcoming; Moynihan et al. 2012b; Moynihan and Kroll 2016). Thus, a pair of actors with similar goals can easily identify relevant performance information and use it to understand how well they are doing and what they should do going forward. Thus, it is expected that:

**Hypothesis 3:** When a pair of network members share the same goals, they are likely to use performance information during communication.

Social contagion theory is an environmentally deterministic argument in that actors are constrained by, and reactive to, effects from the network in which they are embedded (Borgatti and Foster 2003). The principle of homophily emphasizes that actors’ behaviors in building social relationships is constrained by an existing relational characteristic: similarity with others. These two constructs fail to capture that the actors actively and strategically affect their own
social relationships. Social contagion theory and homophily are insufficient to explain performance information use in collaborative networks, in that network members may use performance information in political and strategic ways, persuading others, advocating their own interests, and justifying their own perspectives (Moynihan 2008a, 2008b). With these forces ubiquitous in collaborative networks (Agranoff and McGuire 2001; Klijn and Koppenjan 2000), ignoring such political and strategic influences is problematic. Resource dependence theory captures the political and strategic aspects of performance information use, and is used herein to complement the social contagion and the homophily theories.

3-2. Resource dependence theory

Resource dependence among actors is a precondition for collaborative networks: actors participate in collaborative networks to achieve goals that they cannot achieve by themselves (Kickert et al. 1997; Klijn and Koppenjan 2015; Park and Rethemeyer 2014; Rethemeyer 2007; Rethemeyer and Hatmaker; also see Pfeffer and Salancik 2003); and network actors exchange a variety of resources, which result in power differences among network members (Park and Rethemeyer 2014; Rethemeyer 2007; Rethemeyer and Hatmaker 2008). Resource dependence theory assumes that organizations must depend on other organizations that provide necessary resources, because organizations cannot internally generate all the necessary resources to maintain themselves (Pfeffer and Salancik 2003). However, resource-providing organizations are not always dependable because they might withhold their resources, causing uncertainties for resource-dependent organizations. Also, resource dependence allows resource-providing organizations to influence and control resource-receiving organizations because resource dependence is inversely related to power (Emerson 1962; Pfeffer and Salancik 2003). That is,
resource dependence allows resource-providing organizations to have power over resource-receiving organizations. Therefore, in order to manage the influence and uncertainty coming from resource-providing organizations, resource-receiving organizations try to restructure their dependence on resource-providing organizations using a variety of tactics such as reducing resource value, searching alternative resource providers, forming coalitions, and so on (Park and Rethemeyer 2014; Pfeffer and Salancik 2003).

Resource dependence between organizations is categorized into two types: power imbalance and mutual dependence (Casciaro and Piskorski 2005; Emerson 1962; Gulati and Sytch 2007). Power imbalance is explained as the power differential between two actors; and mutual dependence is explained as the total amount of dependence between two actors (Casciaro and Piskorski 2005). In imbalanced power situations, resource-receiving actors are motivated to restructure their dependence on resource-providing organizations so as to mitigate uncertainties and avoid undue influence from resource-providing organizations. Since performance information can be a tool to convince others to believe, think, or act as one prefers (Moynihan 2008a, 2008b), performance information is used to evoke cooperation from network members with valuable resources. Agostino and Arnaboldi (2015) found that less powerful actors use performance information to have their perspectives heard, support their arguments, and persuade others.

In mutually dependent situations, a pair of organizations are likely to be in long negotiation processes because both of them rely on the other for valuable resources that are not available elsewhere (Casciaro and Piskorski 2005). Therefore, mutually dependent partners are strongly motivated to use performance information to induce cooperation from each other in the same way as in the imbalanced power situations mentioned above. Moreover, mutual
dependence contributes to the development of relational orientation between actors whereby they are less likely to pursue their interests at the expense of their partners and they are more likely to exchange high-quality and broad-scope information to support their cooperation and coordination (Gulati and Sytch 2007). Actors understand what information the other needs, are willing to provide the needed information, and are less likely to withhold information due to fear of opportunistic behaviors. Following this argument, it is expected that:

**Hypothesis 4-1:** Less influential network members are likely to use performance information with more influential members.

**Hypothesis 4-2:** Mutually dependent network members are likely to use performance information with each other.

**METHOD**

4-1. Research setting

To test the above hypotheses, this study uses a case of a “system of care,” an initiative administrated by the Center for Mental Health Services (CMHS) of the Substance Abuse and Mental Health Services Administration in a county in a northeast state with the pseudonym “Faraway County.” The system of care approach is a key strategy for providing mental health services to children and youth in the U.S. (Hodges et al. 2010). The approach was originally defined as “a comprehensive spectrum of mental health and other necessary services which are organized into a coordinated network to meet the multiple and changing needs of severely emotionally disturbed children and adolescents” (Stroul and Friedman 1986, p. 3). While the definition has changed over time (Hodge et al. 2010), system of care core values and guiding principles have remained constant (Friedman 2010). The core values are to provide (1) child-
centered and family-focused, (2) community-based, and (3) culturally- and linguistically-competent services; and the guiding principles are (1) comprehensiveness, (2) individualization, (3) least restrictive setting, (4) family orientation, (5) service integration, (6) case management, (7) early identification, (8) smooth transition, (9) right protection and advocacy, and (10) nondiscrimination (Stroul and Friedman 1986).

CMHS implements a grant program, known as Children’s Mental Health Initiative (CMHI), to promulgate the system of care approach. Faraway County was one recipient of the CMHI grant. Systems of care funded by the CMHI grant have a responsibility to translate the core values and guiding principles of the system of care approach in a way that fit the social, economic, and political contexts of their communities to best serve their clients (Stroul et al. 2008). To realize the core values and guiding principles, systems of care span multiple service areas such as mental health, educational, vocational, juvenile justice, and social services; the effectiveness of one service area is affected by activities in other areas. To provide comprehensive, integrated, and individualized services, multiple organizations need to collectively determine (1) the population to be served, (2) outputs and outcomes to be achieved, (3) services to be provided, (4) how to organize the services, (5) administrative system to support the services, and (5) how to fund the services (Pires et al. 2008). That is, “[w]orking collaboratively is believed to be a key ingredient and driving force in developing systems of care to serve children with serious emotional disturbance and their families” (Hodges et al. 1999, p. 21).

To facilitate such joint efforts, Faraway County had a decision-making body responsible for system-level issues such strategic planning, budget allocation, service delivery, and evaluation. This decision-making body had a monthly meeting that was open to all residents in
the county. Besides the decision-making body, working groups were formed to engage in specific issues such as strategic planning, social marketing, and evaluation.\textsuperscript{14} The Faraway County system of care operations were managed and coordinated by a network administrative organization (NAO). Therefore, the governance of Faraway County system of care was characterized as the “NAO” model wherein “a separate administrative entity is set up specifically to govern the network and its activities” (Provan and Kenis 2008, p. 236).

Systems of care funded by the CMHI grant are required to have “local evaluation,” which is a dedicated evaluation staff to monitor and evaluate performance. They are also required to participate in so-called “national evaluation.” The main component of local evaluation activities in the Faraway County system of care was to monitor outputs and outcomes of its services based on the logic model\textsuperscript{15} developed at the inception of the grant period. In addition to the performance monitoring based on the logic model, the Faraway County system of care conducted evaluation studies focused on specific issues such as culturally-competent service delivery, operational-level interagency collaboration, and system-level interagency collaboration. Local evaluations at Faraway County provided information on intake quality, service-quality improvement, child- and family-level outputs and outcomes, inter-organizational relationships, and so on. Regarding the national evaluation, CMHS and its contracted evaluation agent visited Faraway County to evaluate the extent to which the Faraway County system of care embraced the core values and guiding principles of the system of care approach. The site-visit evaluation

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\textsuperscript{14} There were nine work groups at the time of data collection in 2013.

\textsuperscript{15} The logic model, also known as outcome sequence charts: “[e]very program has implicit hypotheses about what actions will produce what results. The charts attempt to identify these hypotheses by showing the outputs, intermediate outcomes, and end outcomes expected to flow from program activities” (Hatry 1999, p.48).
was conducted four times during the grant period. Also, CMHS and its contracted evaluation agent periodically provided aggregated data about the demographic information of children and families receiving services, their treatments, and their outcomes in the county. The data made it possible to compare Faraway County performance with other communities.

The Faraway County system of care collaborative network was chosen for this study because (1) system of care is a typical collaborative network in that network members are interdependent in providing a public service that cannot be provided by a single organization, and (2) the Faraway County system of care, in particular, was an instrumental case16 (cf., Stake 1998) in observing performance information use among network members. The system of care approach emphasizes the importance of performance management (Friedman and Israel 2008; Stroul et al. 2008). The Faraway County system of care was an exemplar in its performance information use. A national evaluation report specifically notes that a strength of Faraway County system of care was that its decision making was based on performance information.

4-2. Data

Twenty-four actors involved in the decision-making processes at the Faraway County system of care were selected as survey participants based on “nominalist” and “realist” approaches to network boundary specification: researchers set criteria about and define who should be included in a network based on their standpoint in the nominalist approach; network members themselves define who is involved in their network in the realist approach (Laumann et al. 1983).

16 An instrumental case study aims to facilitate understanding of a particular phenomenon – association between interaction patterns and relational characteristics among network members and performance information use in this study – rather than to be interested in the case itself.
First, using the member list of a formal decision-making body, 17 47 actors were identified (i.e., nominalist approach). Second, some actors were added to the list, and some actors were removed from it based on the information from five informants who were in a position to observe the Faraway County system of care as a whole 18 (i.e., realist approach). In addition, at the end of the survey, the survey participants were asked to list any system of care members not included in the survey but actively involved in the Faraway County system of care. However, this procedure did not increase the number of the system of care partners surveyed.

The data was collected using an online survey from August to October 2013. The survey was sent to 27 individuals in the 24 network member organizations. 19 Most survey participants were the highest administrator responsible for services to children and youth or administrators who represented their organization to participate in decision-making processes in the Faraway County system of care. After follow-ups using email, postal mail, and phone, 24 individuals completed the survey (88.89% response rate), representing 21 network members (87.50% response rate).

The dataset used in this paper consists of 21 network members. The dataset includes nine government organizations, five non-profit organizations, three public schools/school districts, two community-based groups, one network administrative organization, and one legislator. On

17 The body did not exist at the time of data collection in 2013. It was eliminated because its functions overlapped with the decision-making body responsible for system-level issues.

18 The five informants were: commissioner of the Faraway County system of care, two NAO staff members, and two local evaluators.

19 The survey was sent to four staff members of the NAO because each of them was involved in the decision-making processes in the Faraway County system of care.
average, they had about four employees (4.16), working at least half time or more, on services or programs for the Faraway County system of care. Most of the member organizations (76.19%) were responsible for more than a $500,000 budget related to services or programs for children; most of them (71.43%) had been involved in the Faraway County system of care for more than 48 months.

In addition to the survey data, semi-structured interviews were conducted with the network members and a local evaluator. Network members were categorized in four groups in terms of performance information use.\(^{20}\) The groups represent different levels of performance information use: (1) active performance information user (3 members), (2) moderate performance information user (3 members), (3) less active performance information user (four members), and (4) non-performance information user (11 members). At least two network members from each group were interviewed; as a result, in addition to a local evaluator, 10 network members were interviewed: two active performance information users, two moderate performance information users, two less active performance information users, and four non-performance information users. Each interview lasted approximately 30 to 60 minutes.\(^{21}\) The goal of the interviews was to complement the survey data in order to understand why network members use performance information. Typical interview questions included: on what occasions did you typically use evaluation results in communication with the system of care partners; why did you use evaluation results in communication with the partners in such occasions? All the

\(^{20}\) The four groups were identified based on blockmodeling using CONCOR algorithm. I used UCINET (Borgatti et al. 2002), a social network analytical program, to perform blockmodeling.

\(^{21}\) A representative of a network member did not find time for an interview. I sent to him my questions via email, and he answered them via email.
interviews were recorded and transcribed except for one conducted via phone. The coding of the interview data for this study focused on why network members use performance information.

4-3. Measures

4-3-1. Dependent variables

(1) Local performance information use and (2) National performance information use. The Faraway County system of care network members were asked whether they use the information provided by local and national evaluation reports in communication with each partner when discussing system-level issues. Performance information use among the network members can be asymmetrical. That is, partner $i$ using performance information in communication with partner $j$ does not necessarily mean that partner $j$ uses performance information in communication with partner $i$. Each of the measures is an asymmetrical $21 \times 21$ matrix with binary values (0 or 1). The value “1” in a cell $(i, j)$ in local performance information use indicates that partner $i$ uses local performance information in communication with partner $j$ when they discuss system-level issues of the Faraway County system of care. Similarly, the value “1” in a cell $(i, j)$ in national performance information use indicates that partner $i$ uses national performance information in communication with partner $j$ when they discuss system-level issues of the Faraway County system of care.

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22 Regarding the interview conducted via phone, I sent a summary of the interview to the interviewee, and she confirmed the summary.
4-3-2. Variables to test hypotheses

**Alter’s performance information use.** Hypothesis 1 predicts that when partner \( j \) in a frequently communicating pair of actors uses performance information in communication with partner \( i \), partner \( i \) is likely to use performance information with the first actor in return. The “alter’s performance information use” measure is used to test Hypothesis 1. As for the local performance information use, the measure was created using two matrices: (1) the “local performance information use” matrix described above and (2) a “frequent communication” matrix (a symmetrical 21 x 21 matrix) in which a pair of network participants received a value “1” if they communicated at least 2-3 times a month. Corresponding cells of the two matrices were multiplied to create a matrix, “performance information use in frequently communicating pairs.” Then, the produced matrix was transposed. By transposing the matrix, the direction of local performance information use was changed so that a value “1” in the transposed matrix indicates that partner \( j \) in a frequently communicating pair uses local performance information in communication with partner \( i \). The “alter’s national performance information use” measure was created following the same procedure except for using the “national performance information use” matrix, instead of the “local performance information use” matrix.

**Structural equivalence.** Hypothesis 2 predicts that structurally equivalent network members use performance information similarly. The “structural equivalence” measure is used to test Hypothesis 2. As for the local performance information use, the measure was created as follows. Using a correlation algorithm, structural equivalence was computed from the “regular communication” matrix (a symmetrical 21 x 21 matrix) in which a pair of network participants

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23 “Ego” is any focal partner \( i \); “alter” is any partner \( j \) connecting to ego.

24 I used UCINET to perform this algorithm.
received a value ‘1’ if they had communication at least once a month. The produced structural equivalent score for each pair of members (a symmetrical 21 x 21 matrix) was row-normalized so that each focal member received the same amount of influence from its alters in total (Leenders 2002). The normalized structural equivalent score for pairs of members (a 21 x 21 matrix) was multiplied by network members’ outdegree\(^2\) of local performance information use (21 x 1 vector). As a result, the “structural equivalence” variable represents the extent to which structurally equivalent others use local performance information. As for the “structural equivalence” variable for national performance information use, it was created following the same procedure except for using the “outdegree of national performance information use” vector instead of the “outdegree of local performance information use” vector.

**Homophily.** Hypothesis 3 predicts that when a pair of network members share their goals, they are likely to use performance information during communication. The network participants were asked to what extent seven goals of Faraway County system of care were central to the core mission of their organization. The seven goals were adopted from the strategic planning document of the Faraway County system of care.\(^2\) The response scale consisted of

\[^2\] Outdegree is the number of outgoing ties that a focal actor has. Outdegree here captures how many partners a focal member uses performance information in communication.

\[^2\] The seven goals are: (1) everyone works together to plan for one child and family at a time, (2) families, youth, and professionals work together as equal partners, (3) help is available and accessible when and where families and youth need it, (4) all communities and cultures in [Faraway] County have access to services, and a voice, in our system of care, (5) services and support are provided in an effective continuum of care, (6) youth with challenges and their families are valued members of our communities, and (7) community transformation will last after grant funding ends.
seven categories from one (not at all central) to seven (extremely central). The Euclidian distance of the seven goals was computed for each pair of network members. This measure is a symmetrical 21 x 21 matrix. The larger the value in a cell \((i, j)\), the more dissimilar a pair of network members’ goals are.

**Power imbalance.** Hypothesis 4-1 predicts that less influential network members are likely to use performance information with more influential members. The “power imbalance” variable is used to test Hypothesis 4-1. The network members were asked to rate each partner (including themselves) in terms of their overall influence over the Faraway County system of care on a scale from one (not influential) to five (extremely influential).\(^{27}\) The response matrix was transformed to a symmetrical 21x 21 matrix as follows. First, imbalanced power pairs were identified by finding pairs that satisfied two conditions: (1) partner \(i\) gave higher rating to partner \(j\) than itself and (2) partner \(j\) gave lower rating to partner \(i\) than itself. Then, average score was computed from the absolute values of (1) difference between partner \(i\)'s rating for \(j\) and itself and (2) difference between partner \(j\)'s rating for \(i\) and itself. The larger the value in a cell \((i, j)\) of the “power imbalance” variable, the more partner \(j\) has power over partner \(i\).

**Mutual dependence.** Hypothesis 4-2 predicts that mutually dependent network members are likely to use performance information each other. This variable was created using the same data that was used to create the “power imbalance” variable. A symmetrical 21 x 21 matrix was created by adding the score partner \(i\) gave to partner \(j\) and the score partner \(j\) gave to partner \(i\),\(^{28}\)

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\(^{27}\) In addition to the choices from one (not at all influential) to five (extremely influential), the respondents had the choice to answer six (I don’t know) to this question.

\(^{28}\) When partner \(i\) chose to answer six (I don’t know) for partner \(j\), average score of partner \(i\)'s ratings for its alters is used as a replacement.
following the conceptualization of mutual dependence by Casciaro and Piskorski (2005),
defining mutual dependence as the total amount of dependence between two actors.

4-3-3. Control variables

This study uses six variables to control other potential factors that are associated with
performance information use in collaborative networks: (1) perceived merit of performance
information, (2) experience of performance information use, (3) meeting attendance, (4)
organizational resource, (5) organization type, and (6) length of involvement.

Perceived merit of performance information. The network participants were asked to
what extent each of local and national evaluations was useful with respect to five items, which
were adopted from Taylor (2011) and modified to fit this study. The response scale consisted of
seven categories from one (not at all useful) to seven (extremely useful). To construct an overall
measure of each of “perceived merit of local performance information” and “perceived merit of
national performance information” for each member, I computed a factor score for each variable.
Factor analyses showed that all the five items load highly on one dimension (eigenvalue: 4.652;
explained variance: 0.914%) as for local performance information; (eigenvalue: 4.830; explained
variance: 0.961%) as for national performance information.

Experience of performance information use. The network participants were asked
about their general use of performance information within their organization with respect to four

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29 The five items are: (1) providing the right information to the right people at the right time, (2) bringing more
advantages than disadvantages to [Faraway] County system of care, (3) improving decision making of [Faraway]
County system of care, (4) improving performance of [Faraway] County system of care, and (5) improving
accountability of [Faraway] County system of care.
items, which were adopted from (Taylor 2011) and modified to fit this study. The response scale consisted of seven categories from one (never) to seven (almost always). To construct an overall measure of “performance information use experience” for each member, I computed a factor score. Factor analysis showed that all the four items load highly on one dimension (eigenvalue: 3.510; explained variance: 0.837%).

Meeting attendance. The network participants were asked how often they attended the partnership meetings in which performance information was presented and discussed. The response scale consisted of seven categories from one (never) to seven (almost always).

Organizational resource. Network participants were asked how many employees worked at least half time or more on services or programs related to the Faraway County system of care.

Organization type. This measure is a symmetrical 21x21 matrix with binary values (0 or 1). The value “1” in a cell \((i, j)\) represents that a pair of network members is in the same type of organization (e.g., public agency, non-profit organization).

Length of involvement. The response scale consisted of five categories: one (zero-12 months), two (13-24 months), three (25-36 months), four (37-48 months), and five (more than 48 months).

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30 The four items are: (1) to reach a decision in my organizations in conjunction with other information (e.g., expert advice), (2) to prompt further questions or inquiries, (3) to support decisions reached by other means (e.g., experiences), and (4) to correct a decision reached by other means when the performance information conflicts with that decision.
4-3-4. Structural variables

Four network structure variables are used, which are often present in network relationships: edge, reciprocity, indegree distribution (popularity), and transitive closure. Figure 1-1 presents a visualization of the structural variables. Edge and reciprocity are the most basic network parameters; and, indegree distribution and transitive closure should be accounted for because networks usually have uneven degree distribution resulting from the “Matthew effect” (the rich get richer and the poor get poorer) and highly clustered parts resulting from transitivity (Harris 2014; Pallotti et al. 2013).

Edge. This measure captures the actors’ basic tendency to make connections. In this study, this measure captures the network members’ basic tendency to use performance information in communication with other members.

Reciprocity. This measure captures the extent to which a pair of network members has a mutual tie. In this study, if partner $i$ uses performance information in communication with partner $j$, then partner $j$ tends to use performance information in communication with partner $i$.

Popularity. This measure captures the extent to which some network members have many incoming ties. In this study, this measure reflects that many members use performance information in communication with a focal actor, partner $i$.

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31 Indegree is the number of incoming ties that a focal actor receives. Indegree here captures how many members use performance information in communication with a focal member.

32 While I experimented with other structural variables in analyses, they did not provide a good fit here.

33 This measure is different from the “alter’s performance information use” measure in that the “alter’s performance information use” measure captures reciprocity only in frequently communicating pairs of network members.
Transitive closure.\textsuperscript{34} This measure captures the tendency for a “friend-of-a-friend to be a friend.” A pair of directly connected network members tends to have multiple shared partners. In this study, this measure captures a pattern of performance information use: if partner $i$ uses performance information in communication with partner $j$ and partner $j$ uses performance information in communication with partner $k$, then partner $i$ uses performance information in communication with partner $k$.

Figure 1-1 Visualization of Structural Variables (adopted from Pallotti et al. 2013, pp. 1669–1670)

4-4. Analytical method

To analyze the dataset, the Exponential Random Graph Modeling (ERGM) was used, which was implemented in a social network analysis program, “statnet” (Handcock et al. 2003). A

\textsuperscript{34} The operationalization of transitive closure in this study is called “geometrically weighted edgewise shared partner (GWESP)” (Harris 2014; Hunter 2007) or “alternating k-triangle” (Snijders et al. 2006). GWESP was used because it “does not simply represent triangulation in the network but additionally is a measure of the extent to which triangles themselves group together in larger higher order ‘clumps’ in the network” (Robins et al. 2007, p.200). The failure to account for such clumps results in unsatisfactory network modeling (Robins et al. 2007).
traditional regression analysis does not suit this dataset analysis well because the observations in
the dataset are not independent, which violates a basic assumption for the regression analysis.
ERGM is a statistical model for network data to estimate the effect of independent variables on
the probability of ties among actors (e.g., ties of performance information use among the
network members in this study), without assuming that observations are independent. ERGM
allows us to understand the relative effect of each independent variable such as attributes of
network participants, other relationships between members (e.g., power imbalance, mutual
dependence), and/or network “configurations” (e.g., edge, reciprocity, popularity, transitive
closure) on the observed patterns of ties (Harris 2014; Lusher et al. 2013; Robins et al. 2007;
Shumate and Palazzolo 2010). To better understand performance information use among
network members, it is essential to capture the presence or absence of ties (i.e., using or not
using performance information during communication) because it is implied but is not
empirically examined that network members are heterogeneous in terms of performance
information use (Agostino and Arnaboldi 2015; Imperial 2004; Koliba 2014; Koliba, Campbell
et al. 2011; Koliba et al. 2010). Another advantage of using ERGM is that it helps us understand
why network members use performance information by explaining the relative effect of each
independent variable.

ERGM estimates the effect of independent variables on the probability of ties among
actors as follows (Harris 2014; Lusher et al. 2013, Robins et al. 2007; Shumate and Palazzolo
2010). ERGM simulates a distribution of random networks based on modeled independent
variables and revises their parameter values by comparing the distribution with the observed
network until the observed network is satisfactorily replicated. When the observed network is
satisfactorily replicated based on the modeled independent variables, the model is considered to
“converge” to provide a reliable parameter value of the independent variables. ERGM provides statistics (i.e., parameter value and standard effort) to evaluate whether each independent variable is more frequently associated with the presence or absence of ties in the observed networks than what would occur by chance, using Markov Chain Monte Carlo maximum likelihood estimation (MCMCMLE) (for details on the MCMCMLE technique, see Hunter and Handcock 2006; Snijders 2002). Positive and significant coefficients represent that the independent variable is more frequently associated with the presence of ties than would be expected by chance alone; on the other hand, negative and significant coefficients represent that the independent variable is more frequently associated with the absence of ties than would be expected by chance alone. Similarly, as with logistic regression, we can compute an odds ratio of parameter values of independent variables to assess their effect size (Harris 2014).

RESULTS

5-1. Descriptive and graphical results

Each of the local and national performance use patterns among the Faraway County system of care members were first analyzed descriptively and visually, using “UCINET” (Borgatti et al. 2002) and “NetDraw” (Borgatti 2002). Figures 1-2(a) and 1-2(b) visualize each of the local and national performance information use patterns, respectively. Each node represents a Faraway County system of care member; a tie between a pair of the nodes represents that one in the pair uses local performance information in communication with the other in Figure 1-2(a), and that one in the pair uses national performance information in communication with the other in the Figure 1-2(b); the node shape shows the network member’s type (e.g., public agency, non-profit
organization); node size represents the network member’s power. The network plots show overall characteristics of performance information use: (1) ties of local performance information use are denser than those of national performance information use, suggesting that local performance information is more broadly used than national performance information among network members; (2) ties are clustered around some network members in both local and national performance information, suggesting that some network members actively use performance information more than others; and (3) powerful network members tend to have more ties than less powerful members in the both local and national performance information, indicating that Hypothesis 4-1 might not be supported.

Figure 1-2(a) Local Performance Information Use among the Faraway County System of Care Members

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35 Network member’s power here is the average score of each alter’s rating to a focal network member.
The density of the local performance information use ties (Figure 1-2(a)) is 0.212, which means that 89 ties exist out of 420 possible ties among the 21 partners. On average, each partner uses local performance information with 4.238 partners. On the other hand, the density of the national performance information use ties (Figure 1-2(b)) is 0.140, which means that 59 ties exist out of 420 possible ties among the 21 partners. On average, each partner uses national performance information with 2.810 partners. This result is consistent with Rich and Oh (2000), in that locally-produced information is more likely to be used than externally-produced information because local information is or is perceived to be more relevant and reliable than external information. In other words, there is bias against externally-produced information called the “not-invented-here” syndrome (Katz and Allen 1982).
Table 1-1 shows that partners D, H, and S use local performance information in communication with more than 10 partners while eight members do not have any outgoing ties of local performance information use; similarly, partners D and H use national performance information in communication with 10 or more partners while 13 members do not have any outgoing ties of national performance information use. Table 1-1 also shows that all the network members have at least one incoming tie of local performance information use while the number of incoming ties varies among the network members; similarly, all the network members have at least one incoming tie of national performance information use except for J, while the number of incoming ties varies among the network members.

Figure 1-2(a) and 1-2(b), and Table 1-1 suggest the similarity between local and national performance information use. For instance, the same members such as partners D, H, and S have many outgoing and incoming ties of both local and national performance information use. Indeed, the correlation between the “local performance information use” and “national performance information” variables is 0.713 (1% level of significance),\(^\text{36}\) which suggests when a member uses local performance information in communication with other members, the member is more likely to use national performance information as well. At the same time, when a network member does not use local performance information, the member tends not to use national performance information, either. The result confirms that network members are heterogeneous in terms of performance information use, which is suggested by existing studies (e.g., Agostino and Arnaboldi 2015; Imperial 2004; Koliba 2014; Koliba, Campbell et al. 2011; Koliba et al. 2010).

\(^{36}\) The correlation between the two matrices of performance information use was computed using Quadratic Assignment Procedure (QAP) implemented in UCINET.
<table>
<thead>
<tr>
<th></th>
<th>Local performance information use</th>
<th>National performance information use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outdegree</td>
<td>Indegree</td>
</tr>
<tr>
<td>A</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>19</td>
<td>9</td>
</tr>
<tr>
<td>E</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>G</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>H</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>I</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>J</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>K</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>L</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>M</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>N</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>O</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>P</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Q</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>R</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>S</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>T</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>U</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Descriptive social network analysis and network visualization are useful for forming an objective and systematic understanding of network relationships (Cross et al. 2002; Provan et al. 2005). However, they do not explain what factors or social processes lead to the observed patterns of connections among network participants, because the description cannot simultaneously separate multiple social processes that lead to the observed patterns of connections (Contractor et al. 2006; Harris 2014; Lusher et al. 2013, Robins et al. 2007; Shumate and Palazzolo 2010). To understand what factors lead to performance information use among the system of care members, we turn to the discussion of the ERGM results. The ERGM results of both local and national performance information use are reliable and robust. The goodness of fit plots (Figures 1-3(a) and 1-3(b)) show that the observed networks match simulated networks in terms of outdegree distribution, dyad-wise-shared partners, geodesic distance, and triad census. The black lines represent the observed networks and the gray lines represent 95% confidence intervals. In the models, almost all the black lines are within the gray lines, suggesting that the observed patterns of both local and national performance information use ties are reasonably replicated based on the modeled independent variables.

Hunter and his colleagues (2008) recommend to use these network configurations to examine the goodness of fit of network models.
Figure 1-3(a) Goodness of Fit Plot: Local Performance Information Use

Figure 1-3(b) Goodness of Fit Plot: National Performance Information Use
5-2. ERGM results: Local performance information use

Hypothesis 1 predicts that when one member of a frequently communicating pair of actors uses performance information during communication, the other in the pair is likely to use performance information with the first actor in return. As demonstrated by Table 1-2, the hypothesis is supported based on the positive and significant coefficient on the “alter’s performance information use” variable (1% level of significance). The result suggests that local performance information use is likely to be reciprocated in frequently communicating pairs in collaborative networks. The odds ratio of parameter values of independent variables can be used to assess their effect size (Harris 2014). The odds ratio of the “alter’s performance information use” variable is 12.730, which indicates that a network member has a 12.730 higher chance of using local performance information in communication with its frequently interacting alter when the alter includes local performance information in communication with the network member, compared with the case when the alter does not.

Hypothesis 4-2 predicts that mutually dependent network members are likely to use performance information with each other. As shown by Table 1-2, this hypothesis is supported based on the positive and significant coefficient on the “mutual dependence” variable (1% level of significance). The odds ratio is 2.212, which indicates that a pair of network members have a 2.212 higher chance of using local performance information in communication when their level of mutual dependence increases by one unit.

However, Hypothesis 2 (structurally equivalent members use performance information similarly), Hypothesis 3 (goal homophily affects performance information use), and Hypothesis 4-1 (less influential actors are likely to use performance information in communication with more influential members) are not supported regarding local performance information use.
In addition to the hypothesized variables, the “merit of local performance information,” “organizational resource,” and “length of involvement” variables are positively and significantly associated with local performance information use. Regarding the structural variables, the negative and significant “edges” variable suggests that the network members tend not to use local performance information, which is consistent with the descriptive network analysis result that the density of local performance information use ties is relatively low (0.212). Local performance information use is less likely to be reciprocated, controlling other variables. Since the “alter’s performance information use” variable captures reciprocity in frequently communicating pairs, the negative and significant “reciprocity” variable suggests that local performance information use is less likely to be reciprocated in infrequently communicating pairs. Consistent with the network plot of local performance information use (Figure 1-2(a)), the positive and significant “popularity” and “transitive closure” variables suggest that ties of local performance information use are clustered around some network members with high indegree, forming a “core-periphery” structure (Snijders et al. 2006), which is composed of two types of nodes: “core nodes, which are connected to each other and to others, and periphery nodes, which are connected only to core nodes” (Borgatti et al. 2013, p.161).

5-3. ERGM results: National performance information use

In line with local performance information, Hypothesis 1 (when one in a frequently communicating pair of actors uses performance information, the other is likely to use performance information with the first actor in return) and Hypothesis 4-2 (mutually dependent network members are likely to use performance information with each other) are supported for national performance information as well. The odds ratio of the “alter’s performance information
use” variable is 84.945, which indicates that a network member has an 84.945 higher chance to use national performance information in communication with its frequently interacting alter when the alter includes national performance information in communication with the network member, comparing with the case that the alter does not. As for the “mutual dependence” variable, its odds ratio is 2.002, indicating that a pair of network members have a 2.002 higher chance to use national performance information in communication when their level of mutual dependence increases by one unit. At the same time, Hypothesis 3 (goal homophily affects performance information use) and Hypothesis 4-1 (less influential actors are likely to use performance information in communication with more influential members) are not supported for national performance in line with the local performance information results.

While Hypothesis 2 (structurally equivalent network members use performance information similarly) is not supported for local performance information, the hypothesis is supported for national performance information based on the positive and significant coefficient on the “structural equivalence” variable (1% level of significance). The result suggests that when structurally equivalent members use national performance information with many partners, other members in the same position tend to use national performance information with many members as well. The odds ratio is 2.024, which indicates that a network member has a 2.024 higher chance to use national performance information in communication with the system of care partners when the “structural equivalence” variable increases by one unit.

In addition to the hypothesized variables, the “meeting attendance” and “organizational resource” variables are positively and significantly associated with national performance information use. The structural variables show the similar pattern as those of local performance information, suggesting that (1) network members tend not to use national performance
information, (2) national performance information use is less likely to be reciprocated in infrequently communicating pairs, and (3) ties of national performance information use form a core-periphery structure.
Table 1-2 Factors Affecting Performance Information Use

<table>
<thead>
<tr>
<th></th>
<th>Local performance information</th>
<th>National performance information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alter’s Performance Information Use</td>
<td>2.544*** (.912)</td>
<td>4.422*** (1.350)</td>
</tr>
<tr>
<td>Structural Equivalence</td>
<td>-.129 (.091)</td>
<td>.705*** (.263)</td>
</tr>
<tr>
<td>Homophily</td>
<td>.050 (.044)</td>
<td>-.040 (0.055)</td>
</tr>
<tr>
<td>Power Imbalance</td>
<td>.354 (.317)</td>
<td>-.764 (1.098)</td>
</tr>
<tr>
<td>Mutual Dependence</td>
<td>.794*** (.168)</td>
<td>.694*** (.190)</td>
</tr>
<tr>
<td>Perceived Merit of Performance Information</td>
<td>.335*** (.121)</td>
<td>.112 (.197)</td>
</tr>
<tr>
<td>Meeting Attendance</td>
<td>-.037 (.080)</td>
<td>.254* (0.138)</td>
</tr>
<tr>
<td>Experience of Performance Information Use</td>
<td>.174 (.115)</td>
<td>-.030 (0.177)</td>
</tr>
<tr>
<td>Organizational Resource</td>
<td>.073** (.031)</td>
<td>.083** (.041)</td>
</tr>
<tr>
<td>Same Organization Type</td>
<td>-.147 (.333)</td>
<td>.316 (.429)</td>
</tr>
<tr>
<td>Length of Involvement</td>
<td>.272* (.164)</td>
<td>.143 (.197)</td>
</tr>
<tr>
<td>Edges</td>
<td>-15.078*** (2.457)</td>
<td>-16.023*** (2.784)</td>
</tr>
<tr>
<td>Reciprocity</td>
<td>-1.115* (.599)</td>
<td>-1.674** (.823)</td>
</tr>
<tr>
<td>Popularity</td>
<td>7.390*** (1.997)</td>
<td>4.093*** (1.191)</td>
</tr>
<tr>
<td>Transitive Closure</td>
<td>1.830*** (.280)</td>
<td>1.499*** (.331)</td>
</tr>
</tbody>
</table>

Note: *=p < .1, **=p < .05, ***=p < .001
DISCUSSION AND CONCLUSIONS

The purpose of this paper was to explore the factors leading to performance information use among network members in collaborative networks. The existing studies on performance information use in collaborative networks have pointed out that interactions and relational characteristics among network members affect performance information use. However, they have not fully explained how interactions and relational characteristics among network members affect performance information use in collaborative networks, by leaving collaborative networks conceptually as a black box. The results of this study show that (1) there are active and passive network members in terms of using performance information, (2) such heterogeneity is associated with their interaction patterns and relational characteristics, and (3) the association has some similarities and differences between local and national performance information.

This study finds that some factors are similarly associated with both of local and national performance information use. First, both local and national performance information are more likely to be used reciprocally in frequently communicating pairs of network members. The results are consistent with the prediction based on the cohesion mechanism in the network perspective — the flow of information between connected actors leads to similar beliefs, perceptions, attitudes, and behaviors due to learning and socialization effects (Borgatti and Foster 2003; Borgatti and Halgin 2011a; Burt 1987; Friedkin 1984; Marsden and Friedkin 1993; Mizruchi 1993). Interviews with network members provide an insight about why performance information is likely to be reciprocally used in frequently communicating pairs. The interview data imply that some network members recognize the importance and appropriateness of using performance information during communication about the Faraway County system of care, and
such perception could be shared during interactions among network members. A network member emphasized the importance of using performance information:

The data are extremely important to us, it's what tells us that we have challenges... So, we reflect it back and say, “look this is how many people came to us for services, this is how long they stayed, this is one of the reason why they left, and this is how many people achieved.” So, it is really important for us to look at data to guide our work.

Another network member’s comment represents that she perceived using performance information as an appropriate behavior in the collaborative network:

We had a meeting yesterday with a portion of the school district about doing a satellite clinic in their schools. It was so pleasing for me to sit at the table and hear. I'm quoting national statistics, the clinic director is quoting statistics about how you can have school success and less truancy. And, that’s what makes your argument.

Such perceptions and corresponding behaviors spread through interactions among network members. A network member, when asked why using performance information, answered: “I don't know specifically why, I think it's just good synergy, good work. Like, if you have good partners, you want to be the best of yourself, right?”

Another finding is that both local and national performance information is likely to be used in communication between mutually dependent network members. The influential network members over the collaboration are responsible to produce positive results. To produce positive results, it is essential to induce cooperation from other influential, but less involved, members. Performance information can be used as a tool to induce cooperation from uncooperative
members by convincing them to believe, think, or act as expected (Moynihan 2008a, 2008b). A network member explained the association between performance information use and mutual dependence: “I use data if they are not actively involved and need to be involved. When data show some concerns related to them, we do invite them, we encourage them to be at the table.”

While the similar factors explain local and national performance information use, there are some differences between them. Network members with similar patterns of ties tend to use national performance information in similar manners, which accord with the prediction based on the structural equivalence mechanism in the network perspective, that actors with similar patterns of ties are likely to develop similar behaviors because they occupy the same position and play the same role in their network and consequently face and adapt to similar social pressures (Borgatti and Foster 2003; Borgatti and Halgin 2011a; Burt 1987; Friedkin 1984; Marsden and Friedkin 1993; Mizruchi 1993). On the other hand, using local evaluation results is not associated with network members’ positions or roles in the network. Interview data suggest why positions or roles matters for national performance information use:

I know that we were getting some site visit reports in and we were getting some other information. But I don’t have or remember getting a complete evaluation. I also would say that we were a partner in the process, not the main partner, so other evaluations that were happening across the country, we weren’t attending to. This was mental health primarily, they were the driver of this. They certainly might have been looking at more national evaluations . . . Yes this was their project. Not that I didn’t care, I certainly care. But in the day-to-day functions of what I was doing, this was not at the top of my list.
Another member explained why she uses national evaluation results: “the national evaluation really just gave us more of an overall picture of how our system is functioning. . . Because I do system oversight for children services, so I have to think very broadly in terms of what’s going on.” These interview data suggest that members in central positions are expected, and are more likely, to use national evaluation results because national performance information is mainly about overall functioning and performance of the Faraway County system of care.

Regarding the difference between using local and national evaluation results, two control variables deserve discussion: “merit of performance information” and “meeting attendance.” Local performance information is more likely to be used by network members perceiving the merits of local performance information, but not by those perceiving the merits of national performance information. The difference might result from the characteristics of two types of performance information. A member described the difference as follows:

National evaluations are helpful. They provide you a guidance, but . . . we would definitely rely heavily on local evaluations to make local decision. Best way to describe this properly, say, we would look at national evaluations on program effectiveness. But, when it came to making a decision about what to do on the ground locally, we use local data to make that decision.

It suggests that local performance information is critical to support decision making in the Faraway County system of care. On the other hand, national performance information provides them with hints about how to improve the Faraway County system of care. It is natural that network members use local performance information only if they perceive its merits since local performance information has such an important function. But, network members may not
use national performance information even if they perceive its merits, because it is not related directly to their main work, namely, decision making about the Faraway County system of care.

Another distinctive difference between using local and national evaluation results is that national performance information is likely to be used by network members often attending meetings where performance information is presented and discussed, while local performance information use is not associated with the meeting attendance. As mentioned above, many network members do not see that national evaluation results are relevant for them. In such cases, providing a formal forum where network members are familiarized with performance information could promote performance information use (Moynihan and Kroll 2016). On the other hand, when network members see that performance information is relevant for them, “[i]nteractive processes provide a forum for discussing the results of monitoring processes” (Imperial 2004, p.17) without a formally-convened forum.

This study shows four characteristics of performance information use in collaborative networks. First, network members do not use performance information in the same manner. Some members actively use performance information and others do not, which results in a core-periphery structure of performance information use ties. This finding suggests the importance of capturing the heterogeneity among network members in performance information use rather than conceptualizing collaborative networks metaphorically. Second, such heterogeneity is related to with whom network members communicate (i.e., cohesion mechanism), what positions they occupy (i.e., structural equivalence mechanism), and what relationship they develop (i.e., mutual dependence). That is, interactions and relational characteristics among network members are associated with performance information use. Third, how interactions and relational characteristics among network members are associated with performance information use is
different depending on types of performance information. While various types of performance information are used in collaborative networks (Koliba, Campbell et al. 2011), their use would be explained by different factors. Finally, as the social contagion theory and mutual dependence are associated with performance information use in collaborative networks, network members’ performance information use is affected by their interaction patterns; at the same time, they actively influence and manipulate their interactions and relationships by using performance information.

At this point some limitations to this study need to be mentioned. First, the results of this study are not generalizable. It is not reasonable to generalize findings from one case to collaborative networks in various policy settings. Second, reliance on cross-sectional data limits the ability to specify causal relationships between the dependent variables and the independent variables. For instance, this study assumes that network members’ interaction patterns influence using local and national performance information. However, the causal direction might be the opposite: using performance information in a pair of network members might lead to frequent interactions and communication in the pair because using performance information could enrich communication in the pair. The argument of causal relationships in this study is based solely on theory. In order to mitigate this limitation, this study uses interview data to complement the statistical findings. However, it is desirable to collect longitudinal data in order to specify the causality. Third, this study does not differentiate the types of performance information use. Moynihan (2009) presents four types of performance information use: purposeful, passive, political, and perverse. Purposeful use is considered to be functional use since it leads to performance improvement by enhancing goal-based learning (Moynihan 2009). Future study should address the factors affecting purposeful use of performance information in collaborative
networks, because it is most likely to contribute to improving network performance. Finally, it is assumed that performance information use, especially the purposeful use, improves performance. However, there is little research to investigate the consequences of performance information use (Moynihan et al. 2011). Future study should address the consequences of performance information use in collaborative networks.

Remembering these caveats, the findings do suggest some academic and practical implications. This study contributes to network management research. Network management is an essential function for collaborative networks to produce satisfactory results (Edelonbos et al. 2011; Kelman et al. 2013; Kickert et al. 1997; Klijn, Steijn et al. 2010; Meier and O’Toole 2001, 2003; Rhodes 1997), and evaluation and performance measurement is an important tool for network management (Kenis and Provan 2009; Klijn 2005; McGuire and Agranoff 2011; Provan and Milward 2001; Provan and Sydow 2008). However, existing research has not fully shown that performance measurement or evaluation properly works in network settings by paying little attention to performance information use, which is considered to be the key for the success of performance measurement or evaluation (Moynihan and Lavertu 2012; Moynihan and Pany 2010; Van Dooren 2008). This study suggests that performance measurement or evaluation could work as a network management tool by showing network members’ use of performance information during interactions and communication.

This study also contributes to research on performance information use in two respects. First, it responds to the big question of performance management — why performance information is used (Moynihan and Pandy 2010) — in collaborative networks, an increasingly important context (Pandy 2015). This study identifies that interactions and relational characteristics among network members are important factors in promoting performance
information use in collaborative networks by showing that performance information use is related to with whom network members communicate (i.e., cohesion mechanism), what positions they occupy (i.e., structural equivalence mechanism), and what relationships they develop (i.e., mutual dependence). These results support the extant research suggesting that collaborative capacity is the key for successfully implementing performance management in collaborative networks (Appleton-Dyer et al. 2012; Imperial 2004; Page 2004, 2008; Zia et al. 2015), since interactions and relational characteristics are essential to organizing and managing collaborative networks (Ansell and Gash 2008; Bryson et al. 2006; Emerson et al. 2012; Gray 1989; Huxham and Vangen 2005; Jones et al. 1997; Podolny and Page 1998; Powell 1990).

Another contribution is that, in accordance with Kroll (2013), this study finds that different factors are associated with using different types of performance information in collaborative networks. The finding suggest that research needs to pay attention to each type of performance information to correctly understand antecedents, patterns, and consequences of performance information use in collaborative networks.

As for practical implications, the findings offer a hint about how to promote performance information use in collaborative networks. First, since performance information use is likely to be reciprocated in frequently communicating pairs of network members, network administrators should actively use performance information when they interact with frequently communicating partners; also, since performance information is used among mutually dependent network members, network administrators should actively use performance information when they communicate with other influential members. This effort could lead to performance information use by other members and thus, to performance improvement such as better decision making and resource allocation, through expanding effective programs and eliminating ineffective programs.
and by adjusting strategies and operations (Moynihan 2008a, 2008b; Wholey 1986). However, network administrators should carefully select with whom they use performance information in communication because the involvement of many actors in network processes results in inefficiency due to increased cooperation and coordination costs (McGuire and Agranoff 2011; Provan and Kenis 2008; Scharpf 1988). For instance, it might be too time-consuming for all network members to participate in discussing and making sense of performance information.

Second, since interactions and relational characteristics among network members affect performance information use, improving the quality of performance information is not sufficient: to promote performance information use in collaborative networks, the key is to enhance collaborative capacity such as interactions and positive relational characteristics among network members (Appleton-Dyer et al. 2012; Imperial 2004; Page 2004, 2008). Finally, since the meetings wherein performance information is presented and discussed provide a chance to familiarize network members with performance information that they do not voluntarily use, network administrators should actively use such opportunities to present performance information to network members, and explain its relevance and credibility.
ESSAY TWO

Is performance information used for learning purposes in collaborative networks?

ABSTRACT

The purpose of this study is to explore performance information use for learning purposes in collaborative networks. Collaborative networks often face performance and accountability problems resulting from the involvement of multiple actors. Performance management is recognized to increase such networks’ performance and accountability. To improve network performance and accountability, generated performance information must actually be used by network members for learning purposes. Exploring a case from a health and human service network, this study examines whether, and under what conditions, performance information is used for learning purposes among the members of this collaborative network. While the study shows that performance information is used for learning purposes among this network’s members, it also indicates that not all members use performance information equally. Results obtained using social network analysis explain such heterogeneity among network members, by showing that: (1) central network members are more likely to use performance information for learning purposes than periphery members and (2) network members use performance information for learning purposes when they perceive that performance information is useful.
The essential need . . . is the improvement of the methods and conditions of debate, discussion and persuasion. That is the problem of the public. We have asserted that this improvement depends essentially upon freeing and perfecting the processes of inquiry and of dissemination of their conclusions (Dewey 1954, p. 208).

INTRODUCTION

Collaborative networks38 are prevalent as instruments for implementing public policies and delivering public services (Agranoff 2007; Agranoff and McGuire 2003; Alter and Hage 1993; Bardach 1998; Feiock and Scholz 2010; Innes and Booher 2010; Koppenjan and Klijn 2004; Provan and Milward 1995); their strength in addressing complex public problems derives from the broad range of resources, information, expertise, and perspectives that resides in the differently-endowed organizations (Huxham and Vangen 2005). The multiplicity of member organizations in these networks can also be a weakness, often causing performance and accountability problems (Page 2004, 2008). Organizations with different resources, information, expertise, and perspectives are likely to have different (at times, even conflicting) goals, strategies, perceptions, and ways of working. As a result, cooperation and coordination problems often arise among collaborative network members (Feiock and Scholz 2010; Gulati et al. 2012;

38 Collaborative networks are goal-directed inter-organizational networks composed of three or more organizations to collectively achieve a common goal that cannot be achieved by single organizations (Kilduff and Tsai 2003; Provan et al. 2007). They are defined as “collections of government agencies, nonprofits, and for-profits that work together to provide public goods, services, or ‘value’ when a single public agency is unable to create the goods or services on its own and/or the private sector is unable or unwilling to provide the goods or services in the desired quantities” (Isett et al. 2011, p. i158).
Jones et al. 1997). Since interdependent network members co-produce the network’s outputs and outcomes (Klijn and Koppenjan 2000), these problems generally result in unsatisfactory performance. Along with performance, accountability is often also negatively affected by the involvement of multiple actors in decision-making and implementation processes (Bardach and Lesser 1996; Koliba, Mills et al. 2011; Page 2004, 2008; Romzek et al. 2012, 2014). It can be unclear who is responsible for failed policies or services when implementation or service delivery is dependent on multiple actors’ activities (Van der Meer and Edelenbos 2006). That is, accountability is “lost in the cracks of horizontal and hybrid governance” (Bovens et al. 2008, p. 240).

Because performance management contributes to performance and accountability improvement (Moynihan 2008a, 2008b; Pandy 2015; Van Dooren et al. 2010), performance management is recognized as an essential management tool for collaborative networks (Agostino and Arnaboldi 2015; Bryson et al. 2006; Imperial 2004; Koliba, Campbell et al. 2011; Koliba et al. 2010; Page 2004, 2008). Agranoff and McGuire (2001) note that “[w]e must be able to measure the outcomes and performance of networks in order to assess how accountable a particular network is to its stakeholders and for achievement of its stated goals” (p. 311). Performance management is “a system that generates performance information through strategic planning and performance measurement routines and that connects this information to decision venues, where, ideally, the information influences a range of possible decisions” (Moynihan 2008a, p. 5). Research on implementation of performance management has demonstrated the difficulty in single organizations, due to internal complexities, when no individual actor can determine the organizational goals against which performance is to be measured; produced performance information is ambiguous and incomplete to help improving organizational
performance (Moynihan 2008a, 2008b; Radin 2006). Such complexity becomes exacerbated in collaborative networks. Multiple network members with diverse goals, strategies, perceptions, and ways of working are meant to collectively make decision via interactions and communication based on consensus (Teisman 2000); yet the differences among them and complex modes of communication make successful implementation of performance management in collaborative networks very challenging (Frederickson and Frederickson 2006; Koliba et al. 2010; Moynihan et al. 2011).

Because of network performance’s importance, and its difficulty to achieve, research has been conducted on how to measure and evaluate it that takes into account the complexity of collaborative networks (e.g., Hertting and Vedung 2012; Kenis and Provan 2009; Koppenjan 2008; Mandell and Keast 2007, 2008; Provan and Milward 2001; Provan and Sydow 2008). Research has also explored the value of various tools for its measurement and evaluation (e.g., Herranz 2010; Kapucu and Demiroz 2011; Mandell and Keast 2007; Milward and Provan 1998; Provan et al. 2005). The various studies all agree on this point: “network performance must be measured on multiple dimensions and multiple network levels” (McGuire and Agranoff 2011, p. 274).

However, producing performance information39 is not the end itself. Even if network performance is successfully measured or evaluated, information produced by performance

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39 Performance information is defined as “systematic information describing the outputs and outcomes of public programs and organizations – whether intended or otherwise – generated by systems and processes intended to produce such information.” (Pollitt 2006, p. 39). Performance information includes information produced by evaluation and performance measurement (Pollitt 2006). Information produced by performance measure and evaluation faces a similar challenge of not being used (Julnes 2007).
measurement or evaluation needs to be used to improve performance (cf., Behn 2003; Hatry 1999; Moynihan 2008a, 2008b; Patton 1997; Van de Walle and Bovaird 2007; Van Dooren and Van de Walle 2008). Performance management does not necessarily lead to improved performance and accountability of collaborative networks, especially when produced performance information is not used among network members (Moynihan et al. 2011; Page 2004, 2008). Since decision making in collaborative networks is based on consensus (reached through interactions and communication among network members by considering and integrating each member’s goals, strategies, perceptions, and ways of working), performance information must be used in interactions and communication among network members to have effects on their decision making.

The fact that performance management requires using performance information in order to increase performance and accountability does not mean that performance information is actually used to improve performance (Moynihan 2008a, 2008b; Randnor 2008; Taylor 2009). It might be used, for instance, in “gaming” — “hitting the target and missing the point” (Bevan and Hood 2006. P. 521) — by juggling data to cover unsatisfactory performance, “creaming” easy targets to inflate performance, and manipulatively interpreting data to emphasize good aspects of performance (Bevan and Hood 2006; Courty and Marschke 1997; Heinrich and Marschke 2010; Hood 2006; Thiel and Leeuw 2002). Yet research shows that the positive benefit of performance management depends on how management uses performance information (Ammons and Roenigk 2015; Gerrish 2015).

While research on performance information use has identified several types of usage (e.g., Leviton and Hughes 1981; Moynihan 2008a, 2008b, 2009; Moynihan et al. 2012a; Vedung 1997), using it for learning purposes — “actors collectively examine information, consider its
significance, and decide how it will affect action” (Moynihan 2008a, p.167) — is likely to contribute to performance and accountability improvement (Greiling and Halachmi 2013; Mousolff 2004; Moynihan 2005, 2008a, 2008b). Using performance information for learning purposes is similar to what Hood (2012) calls performance information use as “intelligence” — using performance information to support continuous performance improvement.

It is well documented that using performance information for learning purposes contributes to performance improvement (Askim et al. 2008; Moynihan 2005, 2008a, 2008b; Moynihan and Landuyt 2009). Moynihan (2008b) notes that “[h]opes that performance measures are used ultimately rest on a theory of learning. Decision makers are expected to learn from performance information, leading to better informed decisions and improved government performance” (p. 35). Collaborative networks especially are expected to use performance information for learning purposes, in order to gain a comprehensive understanding of the complex public problems facing them and to come up with innovative solutions for such problems (Head 2008; Hetting and Vedung 2012; Koppenjan and Klijn 2004; Mandel and Keast 2007; Van der Meer and Edelenbos 2006). As for improving accountability, the availability of performance information alone could increase accountability (Pollitt 2006), but more meaningful accountability is ensured by using performance information for learning purposes to identify and overcome weakness, improve performance, and ultimately provide public values (Bardach 1998; Bovens et al. 2008; Greiling and Halachmi 2013; Van Dooren 2011).

While it has been well documented that performance information is not always used for learning purposes by single organizations (Moynihan 2008a, 2008b; Moynihan and Landuyt 2009), less well examined is the extent to which collaborative networks — wherein successful performance management implementation is more challenging — use performance information
for learning purposes. There are, as yet, too few studies on performance information use in
network settings (Agostino and Arnaboldi 2015; Appleton-Dyer et al. 2012; Imperial 2004;
Moynihan et al. 2011) to determine definitively whether and under what conditions performance
information is used for learning purposes in collaborative networks.

To bridge the gap in the literature, this study explores two research questions:

**Research Question 1:** Is performance information used for learning purposes in
collaborative networks?

**Research Question 2:** Under what conditions is performance information used for learning
purposes in collaborative networks?

Answering these research questions can clarify whether performance management is the
right management tool to improve performance and accountability of collaborative networks,
since, as mentioned above, using performance information use for learning is a linkage
connecting performance management with performance and accountability improvement.
Understanding the factors associated with using (and not using) performance information for
learning within networks can provide an important guide for successful implementation of
performance management in collaborative networks.

The remainder of this paper is structured as follows. The next section will review the
extant studies on performance information use in collaborative networks and present hypotheses.
The method section will present the data, measures, and analytical method for this researcher’s
exploration, followed by the result section. The final section will outline implications drawn
from this research.
PERFORMANCE INFORMATION USE FOR LEARNING PURPOSES AND SOCIAL RELATIONSHIPS

2-1. Literature review

Extant studies have pointed out that performance information is used during interactions and communication among network members in collaborative networks (Agostino and Arnaboldi 2015; Gibson and de Lancer Julnes 2010; Imperial 2004; Koliba, Campbell et al. 2011; Koliba et al. 2010). In collaborative networks, the link between performance information and decision making is loosely coupled, in that the link is mediated by interactions and communication among network members (cf., Van de Walle and Van Dooren 2008). Since network members mainly make decisions based on consensus (due to their interdependence), they promote mutual adjustment and build consensus through interactions and communication whereby they bargain, persuade, discuss, and learn from one another.

Focusing on performance information use among actors during interactions and communication, Moynihan (2008a, 2008b) proposes an interactive dialogue model of performance information use. The model emphasizes the social and political nature of performance information use by focusing on interactions and dialogue among actors, whereby performance information is presented and interpreted (Moynihan 2008a, 2008b). The description below captures the model’s essence.

Information is exchanged between multiple parties, suggesting the potential for multiple interpretations of information. Information is not static, but is created and presented to have an impact on another actor, who may in turn respond with his or her own interpretation of events. The meaning of information for different actors is established in the exchange. Interactive dialogue therefore implies the ambiguity and subjectivity in the
construction of meaning. In the same ways that some interactive dialogues lead to agreement, and some crystallize conflict, the exchange of performance information can sometimes lead to greater agreement and coordinated action between parties and sometimes do little more than reflect the different positions of the actors involved (Moynihan 2008a, pp. 95–96).

In the model, performance information is considered to be used for advocacy and learning purposes (Moynihan 2008a, 2008b). Actors use performance information to advocate and legitimatize their goals, strategies, and positions by presenting information that supports their arguments (i.e., advocacy use). Actors also use performance information collectively to understand problems, causes of problems, and how to solve problems (i.e., learning use) (Moynihan 2008a, 2008b). When performance information is used for learning purposes, “[d]ialogue forms a basis of social cooperation, and people feel committed to the agreements reached in such a context. Interactive dialogue therefore acts as a social process that helps to create shared mental models, has a unifying effect, and helps to develop credible commitment for the execution phase” (Moynihan 2008b, p. 39). As a result of performance information being used for learning purposes, two types of learning could occur: “single-loop learning,” where organizations improve or change means to achieve their goal (i.e., organizations do things right), and “double-loop learning,” where, as a result, organizations change the goal itself (i.e., organizations do right things) (Moynihan 2005, 2008a, 2008b).

Under what conditions is performance information used for learning purposes during interactions and communication among actors? The interactive dialogue model assumes that performance information is more likely to be used for learning purposes in intra- rather than
inter-organizational settings, because actors tend to be more homogeneous and have shared goals in the former. Accordingly, actors in intra-organizational settings can interpret performance information in similar ways and develop shared understanding on their performance, problems, and solutions (Moynihan 2008a, 2008b). In addition to the differences between intra- and inter-organizational settings regarding performance information use for learning purposes, the model also points out the connection between social relationships among actors and performance information use. When performance information is used between actors who have a positive relationship, performance information is likely to be used for learning purposes. In particular, trust and balanced power are important relational characteristics that affect how performance information is used (Moynihan 2008a, 2008b; Moynihan and Landuyt 2009). Trust reduces the perceived risk that performance information may be used against one’s interests; with trust, actors can frankly discuss problems and solutions based on performance information (Moynihan 2008a, 2008b; Moynihan and Landuyt 2009). Balanced power between network members facilitates the use of performance information for learning purposes, because in balanced power relationships actors are less likely to take defensive attitudes toward each other. Defensiveness is a barrier to having candid discussions based on performance information (Moynihan 2008a, 2008b; Moynihan and Landuyt 2009; Van der Knaap 1995).

The interactive dialogue model is a useful conceptual framework for studying performance information use in collaborative networks, because, as extant studies have found, network members use performance information during interactions and communication (e.g., Agostino and Arnaboldi 2015; Gibson and de Lancer Julnes 2010; Imperial 2004; Koliba, Campbell et al. 2011; Koliba et al. 2010). Indeed, several studies rely on this model to examine performance management in collaborative networks (e.g., Kim et al. 2011; Koliba, Campbell et
However, the model is limited when examining whether and under what conditions performance information is used for learning purposes in collaborative networks. The model assumes that performance information use for learning purposes is more likely to occur in intra-organizational than inter-organizational settings without actually examining the ongoing social relationships among actors. Granovetter (1985) notes that:

A fruitful analysis of human action requires us to avoid the atomization implicit in the theoretical extremes of under- and oversocialized conceptions. Actors do not behave or decide as atoms outside a social context, nor do they adhere slavishly to a script written for them by the particular intersection of social categories that they happen to occupy. Their attempts at purposive action are instead embedded in concrete, ongoing systems of social relations (p. 487).

Given that social relationships among actors affect performance information use, it is essential to explore their ongoing social relationships rather than assuming anything about performance information use for learning purposes. For instance, Uzzi (1996, 1997) shows that actors could develop trust relationships and exchange detailed, valuable, and timely information based on trust across organizational boundaries (see also Dawes 1996; Dawes et al. 2009; Huang 2014; Ingram and Roberts 2000; Larson 1992; McEvily et al. 2003; Uzzi and Lancaster 2003; Zand 1972). Moreover, the few empirical studies that examine performance information use in collaborative networks show that performance information is used for learning purposes in collaborative networks during interactions and communication among network members (e.g., Agostino and Arnaboldi 2015; Imperial 2004). Imperial (2004) notes:
[T]he interactive processes at the heart of collaboration enhance these learning processes. . . It [performance management] stimulates policy-oriented learning by allowing competing stakeholder interests to have objective evidence about how programs are working (or not working). It stimulates learning within the network of professionals from various disciplines and backgrounds that share normative principles, beliefs, and values. While these individuals often constitute a relatively small proportion of an agency, profession, or policy network, they have a disproportionate effect on organizational learning and behavior due to their influence on the policy process (pp. 25–26).

However, these studies do not examine the factors contributing to performance information use for learning purposes among network members. Through their metaphoric conceptualization of collaborative networks as “undifferentiated forms, as if they all could be characterized in the same general way” (Provan and Kenis 2008, pp. 232–233), the researchers closed off this avenue of inquiry. By implicitly assuming members’ homogeneity, the studies failed to acknowledge differences among network members in terms of performance information use; they certainly did not ask what factors would explain the differences they did not see.

In sum, the existing few empirical studies that examine performance information use in collaborative networks indicate that performance information is used for learning purposes during interactions and communication among network members, and that members’ social relationships affect performance information use for learning purposes. However, the studies have not fully addressed how social relationships affect performance information use for learning purposes in collaborative networks, by ignoring members’ heterogeneity with respect to using
performance information. On the other hand, the interactive dialogue model of performance information use points out how actors’ social relationships affect performance information use for learning purposes within single organizations, though it presumes that performance information use for learning purposes is more likely to occur in intra-organizational than inter-organizational settings without actually examining the effects of actors’ ongoing social relationships on performance information use for learning purposes in inter-organizational settings.

2-2. Hypotheses

Given that extant studies have shown that actors’ social relationships affect performance information use for learning purposes, this study examines how network members’ relational characteristics are associated with performance information use for learning purposes in collaborative networks (Hypotheses 1, 2, 3, and 4). In addition, based on the finding that network members use performance information during interactions and communication, this study also examines how network members’ interaction patterns are associated with performance information use for learning purposes (Hypothesis 5). It is well documented that actors’ interaction patterns and positions in a network affect knowledge sharing and learning activities at every level of analysis — individuals, organizational subunits, and organizations (Phelps et al. 2012). Centrally located actors, in particular, have an advantage in accessing and integrating diverse information and knowledge (Ahuja 2000; Borgatti 2005; Freeman 1979; Powell et al. 1996; Tsai 2001). Focusing on the effects of relational characteristics and interaction patterns among network members on performance information use for learning purposes is consistent with the suggestion that research on performance information use in collaborative networks
should pay attention to network complexity. Rationalistic assumptions in the performance management doctrine do not necessarily hold in network settings, due to complexity (Frederickson and Frederickson 2006; Koliba et al. 2010; Moynihan et al. 2011) that mainly results from the involvement of diverse actors and their interactions and social relationships (Klijn and Koppenjan 2015; Koppenjan and Klijn 2004). The involvement of diverse actors with different goals, strategies, perceptions, and ways of working makes it difficult to collectively make sense of performance information. Furthermore, network members change their perceptions, and sometimes even their goals, during interactions and communication wherein they bargain, persuade, discuss, and learn from one another, then make decisions based on mutual adjustment and consensus.

As mentioned above, the interactive dialogue model of performance information use argues that performance information is more likely to be used for learning purposes in intra-organizational settings than inter-organizational, because actors tend to be more homogeneous and have shared goals (Moynihan 2008a, 2008b). However, actors can develop shared goals across organizational boundaries (Deyer and Nobeoka 2000; Gerlak and Heikkila 2011; Schalk 2013; Thomas 2003). With goal similarity, they are likely to engage in knowledge sharing and learning across organizational boundaries (Dawes et al. 2009), because it is easier to communicate with similar others than dissimilar others (Brass 1995; Rogers 2003). It is documented that regardless of organizational boundaries, actors with shared goals use performance information for learning purposes to improve their joint efforts and achieve their shared goals by identifying problems and their causes and solutions (Contandriopoulos et al. 2010; Valovirta 2002). Within organizations, actors may use performance information to
advocate for and legitimize their goals or interests when those conflict with the goals of others (Van der Meer 1999).

In line with the argument above, research based on advocacy coalition framework shows that actors with similar policy beliefs are likely to develop cooperative relationships across organizational boundaries wherein they use scientific information for learning purposes rather than advocacy purposes (Weible 2008; Weible and Sabatier 2009). These studies suggest that goal similarity among actors affects performance information use for learning purposes regardless of organizational boundaries. Thus, it is expected that:

**Hypothesis 1: Network members with similar goals as their network partners are likely to use performance information for learning purposes.**

Along with goal similarity, power distribution and trust among network members, by enhancing learning among network members, also affect whether using performance information has a positive effect on collaborative networks (Appleton-Dyer et al. 2012). The interactive dialogue model points out that equality among actors promotes using performance information for learning purposes in intra-organizational settings (Moynihan 2008a, 2008b; Moynihan and Landuyt 2009). Power balance among network members is an important issue for collaborative networks since it affects members’ willingness to participate in, and commit to, their joint efforts (Ansell and Gash 2008; Bryson et al. 2006; Gray 1989; Huxham and Vangen 2005), and it affects performance information use among network members as well (Appleton-Dyer et al. 2012).

Imbalanced power negatively affects performance information use for learning purposes by preventing actors from engaging in honest communication and free idea exchange because
powerful actors may suppress or ignore information and ideas that negatively affect them (Agranoff and McGuire 2001; Valovirta 2002). In addition, coercive power exerted by powerful actors negatively affects knowledge sharing (Willem and Buelens 2007). Powerful actors often influence decisions of less powerful actors, forcing less powerful actors to make decisions beneficial to powerful actors (Provan et al. 1980). Moreover, less powerful organizations perceive that powerful organizations exert influence on their decision making, even in the context of a cooperative relationship (Provan and Gassenheimer 1994). These studies suggest that actors in an imbalanced power relationship are demotivated from frankly discussing problems identified by performance information: powerful actors ignore information that is detrimental to them, and less powerful actors avoid information sharing with powerful actors, to avoid the exertion of influence on their decision-making processes. In an imbalanced power relationship, less powerful actors are also likely to avoid being criticized, blamed, and embarrassed by developing “defensive routines,” which are “any routinized policies or actions that are intended to prevent the experience of embarrassment or threat and simultaneously make it unlikely that they can help to reduce the factors that caused the embarrassment or threat in the first place” (Argyris 1987, p. 345). Accordingly, actors are unlikely to use performance information for learning purposes in imbalanced power relationships because using performance information for learning purposes includes acknowledging, admitting, and discussing mistakes and errors. Thus, it is expected that:

**Hypothesis 2: Network members in imbalanced power relationships with their network partners are unlikely to use performance information for learning purposes.**
The interactive dialogue model points out that trust between actors in intra-organizational settings facilitates the use of performance information for learning purposes (Moynihan 2008a, 2008b; Moynihan and Landuyt 2009). “Trust is an important social lubricant of a social system” (Arrow 1974, p.23), and actors can develop trust across organizational boundaries (Gulati 1995b; Larson 1992; Uzzi 1996, 1997). It is a necessary characteristic of network forms of organizations, facilitating effective and efficient functionality by reducing complexities and uncertainties in network processes: trust makes network members’ behaviors predictable and mitigates concerns about opportunistic behaviors (Ansell and Gash 2008; Bardach 1998; Bryson et al. 2006; Edelenbos and Klijn 2007; Emerson et al. 2012; Gray 1989; Huxham and Vangen 2005; Klijn, Edelenbos et al. 2010; Podolny and Page 1998; Powell 1990). Trust among network participants affects performance information use in collaborative networks (Appleton-Dyer et al. 2012) along with knowledge sharing and learning (Dawes et al. 2009; Huang 2014; Ingram and Roberts 2000; Larson 1992; McEvily et al. 2003; Uzzi 1996, 1997, Uzzi and Lancaster 2003, Zand 1972). It facilitates information and knowledge exchange among network members by alleviating the concern that others will opportunistically use shared information and knowledge, and by reducing the concern that others may share incorrect information and knowledge (McEvily et al. 2003). As a result, network members in trusting relationships openly exchange information and knowledge including fine-grained information (Uzzi 1996, 1997) as well as broad-scope information (Larson 1992; Zand 1972); and network members adopt information and knowledge provided by others because they can trust the accuracy and usefulness of shared knowledge (McEvily et al. 2003). Therefore, network members in trusting relationships are motivated to frankly discuss problems identified by performance information, because they do not need to worry about performance information being used to criticize, embarrass, or take
advantage of them. They have confidence, as well, that their partners will correctly use and interpret performance information. Therefore, it is expected:

**Hypothesis 3: Network members in trust relationships with their network partners are likely to use performance information for learning purposes.**

Hypotheses 1, 2, and 3 predict, respectively, that goal similarity, power balance, and trust among network members are individually associated with performance information use for learning purposes. However, the three conditions may need to be met concurrently in order to affect network members’ performance information use for learning purposes. Research suggests, for instance, that trust and goal congruence promote inter-organizational cooperation only when they exist simultaneously (Lundin 2007). Thus, it is expected:

**Hypothesis 4: Network members with simultaneous conditions of similar goals, balanced power relationships, and trust relationships with other members are likely to use performance information for learning purposes.**

Actors’ interaction patterns and resulting their positions in a network affect knowledge sharing and learning activities (Phelps et al. 2012). Centrally located actors are able to access, mobilize, and integrate diverse resources, including information, knowledge, and expertise possessed by other actors (Ahuja 2000; Borgatti 2005; Freeman 1979; Powell et al. 1996; Tsai 2001). In addition, central actors are generally highly involved in, and committed to, their network; as a result, they are likely to be perceived as trustworthy and influential, and to have a good reputation within their collaborative network (Huang and Provan 2007; Provan et al. 2009). Research has suggested that while not all network members use performance information for
learning purposes, a core group of network members use performance information for learning purposes to collectively discuss and make sense of performance information and make decision (Imperial 2004; Koliba 2014; Koliba, Campbell et al. 2011; Koliba et al. 2010).

Such central network members are likely to have necessity, willingness, and skill to use performance information for learning purposes. Since “a dominant core within the network may drive how the network develops and/or evolves” (Provan et al. 2007, pp.502–593) and accordingly affect what level of performance the network produces, they have a responsibility to understand performance, identify and discuss challenges and problems, or search and implement solutions. While using performance information for learning purposes requires actors to invest their own resources, such as time, energy, and cognitive capacity, to understand and interpret performance information and to identify and discuss problems and their causes and solutions (Askim et al. 2008; Bekgaard and Serrizlew 2015; Moynihan 2005, 2008a, 2008b; Moynihan and Landuyt 2009), due to their responsibility, central members involved in and committed to their joint efforts see the necessity to invest such resources into using performance information for learning purposes. Moreover, since network processes and activities need to be perceived as legitimate by network participants to secure their supports (Human and Provan 2000), central members need establish network legitimacy. They are able to establish network legitimacy by using performance information to identify, discuss, and address problems in decision-making processes because using information sends to network members a signal that their network's decision making processes are rational (cf., Feldman and March 1981). Second, central members are more motivated to use performance information for learning purposes than peripheral actors. They are likely to have more decision-making power than peripheral actors (Huang and Provan 2007; Provan et al. 2009). Since actors are discouraged from using performance information for
learning purposes when they cannot effectively apply what they learned (Moynihan and Landuyt 2009; Moynihan et al. 2012b; Taylor 2014), peripheral, less empowered, actors are less likely to use performance information than central ones. Finally, central actors have an advantage in using performance information for learning purposes: communicating with many other actors increases their capacity to understand and interpret what performance information means and what actions should be taken. Since performance information may be ambiguous and incomplete, understanding and interpreting why certain data are produced and what they mean requires some contextual and background knowledge (Hood 2012; Moynihan 2015; Moynihan and Pandy 2010). Central actors communicating with many members are likely to have more of such contextual and background knowledge than peripheral members. At the same time, interactions and communication with other actors provide an opportunity to use performance information (Moynihan and Hawes 2012). Through using performance information in communication with many actors, central actors become skillful at using performance information in communication with other members (cf., Reagans and McEvily 2003). Thus, it is expected that:

**Hypothesis 5: Central network members are more likely than peripheral ones to use performance information for learning purposes.**

**METHOD**

**3-1. Research setting and data collection**

To test the above hypotheses about performance information use for learning purposes in collaborative networks, this study examines a “system of care” in a county in a northeast state
with the pseudonym “Faraway County” as an instrumental case\textsuperscript{40} (Stake 1998). System of care is an initiative administrated by the Center for Mental Health Services (CMHS) of the Substance Abuse and Mental Health Services Administration, and is defined as “a comprehensive spectrum of mental health and other necessary services which are organized into a coordinated network to meet the multiple and changing needs of severely emotionally disturbed children and adolescents” (Stroul and Friedman 1986, p.3). To realize the system of care approach and provide comprehensive, integrated, and individualized services to children and youth with serious emotional disturbance and their families, multiple organizations such as mental health, educational, vocational, juvenile justice, and social services need to work together. For example, mentally ill children and youth need more than mental health treatments to be well served; they also need such services as education and vocational training to live as independently as possible within their community. The effectiveness of one service area is affected by activities of other areas (Stroul and Friedman 1986). For instance, when the family court decides that mentally ill children and youth should be treated in a restrictive setting, the mental health department cannot provide community-based care that it prefers. That is, “[w]orking collaboratively is believed to be a key ingredient and driving force in developing systems of care to serve children with serious emotional disturbance and their families” (Hodges et al. 1999, p. 21).

CMHS implements a grant program known as Children’s Mental Health Initiative (CMHI) to proliferate the system of care approach. Faraway County was a recipient of the grant; as with all the systems of care funded by the CMHI grant, it was obligated to monitor and

\textsuperscript{40} An instrumental case is chosen to facilitate understanding of a particular phenomenon – performance information use for learning purposes in collaborative networks in this study – rather than to be interested in the case itself (Stake 1998).
evaluate its performance by hiring evaluation staffs. This is called “local evaluation.” Faraway County was also required to participate in the so-called “national evaluation” conducted by CMHI and its contracted evaluation agent. The main component of local evaluation activities in the Faraway County system of care was to monitor outputs and outcomes of its services based on the logic model\textsuperscript{41} developed at the inception of the grant period. The Faraway County system of care additionally conducted evaluation studies focused on such specific issues as culturally competent service delivery, operational-level interagency collaboration, and system-level interagency collaboration. Local evaluations of Faraway County’s system of care provided information on intake quality, service quality improvement, child- and family-level outputs and outcomes, and so on. Regarding the national evaluation, CMHS and its contracted evaluation agent visited Faraway County four times during the grant period to evaluate the extent to which its system of care embraced the core values and guiding principles of the system of care approach.\textsuperscript{42} Additionally, the contracted evaluation agent periodically provided aggregated data about the demographic information of children and families receiving services, their treatments, and their outcomes in the county. The data provided by national evaluation activities made it possible to compare Faraway County’s performance with other communities.

\textsuperscript{41} The logic model, also known as outcome sequence charts: “[e]very program has implicit hypotheses about what actions will produce what results. The charts attempt to identify these hypotheses by showing the outputs, intermediate outcomes, and end outcomes expected to flow from program activities” (Hatry 1999, p. 48).

\textsuperscript{42} The core values are: (1) child centered and family focused, (2) community-based, and (3) culturally and linguistically competent services; the guiding principles are (1) comprehensiveness, (2) individualization, (3) least restrictive setting, (4) family orientation, (5) service integration, (6) case management, (7) early identification, (8) smooth transition, (9) right protection and advocacy, and (10) nondiscrimination (Stroul and Friedman 1986).
Using an online survey from August to October 2013, I collected data from 24 actors involved in the decision-making processes in the Faraway County system of care. The survey was sent to 27 individuals in the 24 network members. Most survey participants were the highest administrator responsible for services to children and youth, or administrators who represented their organization in the Faraway County system of care and participated in the network’s decision-making processes. After follow-ups using email, postal mail, and phone call, 24 individuals completed the survey (88.89% response rate), representing 21 network members (87.50% response rate).

The dataset used in this paper consists of these 21 network members and represents nine government organizations, five non-profit organizations, three public schools/school districts, two community-based groups, one network administrative organization, and one legislator. On average, they had about four employees (4.16) working at least half time or more on services or programs for the Faraway County system of care. Most respondents (76.19%) were responsible for a budget of more than $500,000 related to services or programs for children and youth. Most respondents (71.43%) had been involved in the Faraway County system of care for more than 48 months.

The 21 network members were split into four categories of performance information use, based on the survey data: (1) active performance information user (three members), (2)  

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43 The survey was sent to four staffs of its network administrative organization, which was set up to manage and coordinate network activities (cf., Provan and Kenis 2008), because each of them was involved in the decision-making processes in the Faraway County system of care.

44 The four categories were identified based on blockmodeling using CONCOR algorithm. I used UCINET (Borgatti et al. 2002), a social network analytical program, to perform blockmodeling.
moderate performance information user (three members), (3) less active performance
information user (four members), and (4) non-performance information user (11 members).
Semi-structured interviews were conducted with several of the survey respondents and a local
evaluator. At least two network members from each category were interviewed. As a result, in
addition to a local evaluator, 10 network members were interviewed: two active performance
information users, two moderate performance information users, two less active performance
information users, and four non-performance information users. Each interview lasted
approximately 30-60 minutes. The goal of the interviews was to complement the survey data in
helping the researcher understand why these network members used (or did not use) performance
information for learning purposes. Typical interview questions included: on what occasions did
you typically use evaluation results for learning purposes in communication with the system of
care partners; why did you use evaluation results for learning purposes in communication with
the partners in such occasions? All the interviews were recorded and transcribed, except for one
conducted via phone. The interview data coding for this study focused on why the network
members used (or did not use) performance information for learning purposes.

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45 One representative of a network member did not find time for an interview. I sent him my questions via email,
and he answered them via email.

46 Regarding the interview conducted via phone, I sent a summary of the interview to the interviewee, and she
confirmed the summary.
3-2. Measures

3-2-1. Dependent variables

(1) Locally generated performance information use for learning purposes and (2)
Nationally generated performance information use for learning purposes. As mentioned
above, two types of performance information were available for the network members, which
derived from local and national evaluations. Accordingly, this study has two dependent variables
that hereon will be called: (1) local performance information use for learning purposes, and (2)
national performance information use for learning purposes.

The Faraway County system of care members were asked about how often they used
local performance information for learning purposes for four items: (1) to support and improve
decision-making processes, (2) to discuss new approaches for doing old things, (3) to discuss
priorities, and (4) to discuss problems that need attention. The response scale consisted
of seven categories from one (never) to seven (almost always). To construct an overall measure of
the “local performance information use for learning purposes” variable for each member, I
computed a factor score. Factor analysis showed that all the four items loaded highly on one
dimension (eigenvalue: 3.906; explained variance: 0.968%). The larger the value was, the more a
network member uses local performance information for learning purposes.

Similarly, the network members were asked about how often they used national
performance information for learning purposes using the same four items. The second dependent
variable — “national performance information use for learning purposes” — was created in the
same way as that for local performance information. Factor analysis showed that all the four
items loaded highly on one dimension (eigenvalue: 3.921; explained variance: 0.973%).

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47 The four items were adopted from Moynihan et al. (2012a) and modified to fit this study.
3-2-2. Variables to test hypotheses

**Goal dissimilarity.** Hypothesis 1 predicts that network members with similar goals as their network partners are likely to use performance information for learning purposes. The “goal dissimilarity” variable is used to test Hypothesis 1. The network participants were asked about the extent to which the seven goals of the collaborative network were central to the core mission of their organizations. The seven goals were adopted from the strategic planning document of the Faraway County system of care. The response scale consisted of seven categories from one (not at all central) to seven (extremely central). The Euclidean distance of the seven goals was computed for each pair of network members. Then, the “goal dissimilarity” score of each member was created by adding its Euclidean distance scores with all the other members. The larger the value of the “goal dissimilarity” variable, the more a network member’s goal is dissimilar to other members.

**Power imbalance.** Hypothesis 2 predicts that network members in imbalanced power relationships with their network partners are unlikely to use performance information for learning purposes. The “power imbalance” variable is used to test Hypothesis 2. The network members were asked to rate each partner, and themselves, in terms of overall influence over the

---

48 The seven goals were: (1) everyone works together to plan for one child and family at a time, (2) families, youth, and professionals work together as equal partners, (3) help is available and accessible when and where families and youth need it, (4) all communities and cultures in [Faraway] County have access to services, and a voice, in our system of care, (5) services and support are provided in an effective continuum of care, (6) youth with challenges and their families are valued members of our communities, and (7) community transformation will last after grant funding ends.
system of care, on a scale from one (no influential) to five (extremely influential).\textsuperscript{49} The response matrix was transformed to a symmetrical $21 \times 21$ matrix with binary values (0 or 1). A cell $(i, j)$ in the matrix had a value “1” when two conditions were simultaneously satisfied: (1) partner $i$ gave higher rating to partner $j$ than itself and (2) partner $j$ gave lower rating to partner $i$ than itself. Finally, the “power imbalance” variable of each member was created by counting the number of imbalanced power relationships that partner $i$ had from the transformed $21 \times 21$ matrix. The larger the value of the “power imbalance” variable, the more a network member has imbalanced power relationships.

\textbf{Trust}. The network members were asked to rate each partner in terms of the overall quality of their working relationship with each partner on a scale from one (no working relationship) to six (very good). The quality of working relationship between network members represents trust between them\textsuperscript{50} (Provan et al. 2009). The response matrix was transformed to a symmetrical $21 \times 21$ matrix with binary values (0 or 1). A cell $(i, j)$ in the matrix had a value “1” when partner $i$ perceived that partner $j$ was trustworthy — cell $(i, j)$ was equal to or more than “5” and, at the same time, partner $j$ also perceived that partner $i$ was trustworthy — cell $(j, i)$ was equal to or more than “5”. That is, the value “1” in a cell $(i, j)$ represented that both in a pair considered

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{49} In addition to the choices from one (not at all influential) to five (extremely influential), the respondents had the choice to answer six (I don't know) to this question.
\item \textsuperscript{50} Provan and his colleagues note that “[i]f partners report good relationships with a particular agency to which they are actually linked (i.e., a task-specific tie), then that agency is likely to be trusted. Trust is based on the confidence one party has in another that the other party will behave in a reliable manner . . . if the quality of relationships maintained by an agency is poor, it seems highly unlikely that that agency will be perceived as trustworthy by that agency's linkage partners (Provan et al. 2009, p. 882).
\end{itemize}
\end{footnotesize}
that the other was trustworthy. Finally, the “trust” variable of each member was created by counting the number of trust relationships that partner \( i \) had from the transformed 21 x 21 matrix. The larger the value of the “trust” variable, the more a network member has trust relationships.

**All three conditions.** This variable was created to test Hypothesis 4, predicting that network members with simultaneous conditions of similar goals, balanced power relationships, and trust relationships with other members are likely to use performance information for learning purposes. First, a symmetrical 21 x 21 matrix with binary values (0 or 1) was created, whose cells \((i, j)\) had a value “1” when all the three conditions were simultaneously met: (1) the “goal dissimilarity” score of a cell \((i, j)\) was smaller than one-half standard deviation from its mean;\(^{51}\) (2) a cell \((i, j)\) did not have “1” in the imbalanced power matrix, above; and (3) a cell \((i, j)\) had “1” in the trust matrix, above. Then, by counting the number of a value “1” that partner \( i \) had from the 21 x 21 matrix, the “all three conditions” variable was created.

**Centrality.** Hypothesis 5 predicts that central network members are more likely than peripheral ones to use performance information for learning purposes. The network members were asked how often they communicated with each network member to discuss system-level issues\(^{52}\) of the Faraway County system of care on a scale from one (never communicate about system-level issues) to six (more than once a week). From the communication matrix among the network members, a “regular communication” matrix was created in which a pair of network participants received a value “1” if partner \( i \) responded that it communicated with partner \( j \) more

---

\(^{51}\) The criterion of “smaller than one-half standard deviation from its mean” was chosen because there were very few cells with a value that was smaller than one standard deviation from the mean.

\(^{52}\) System-level issues include goal achievement, effectiveness, efficiency, agenda setting, strategic planning, resource allocation, cross-system collaboration.
than once a month, and, at the same time, partner $j$ responded that it communicated with partner $i$ more than once a month. Finally, the “centrality” variable of each member was created by counting the number of regular communication ties that partner $i$ had from the regular communication matrix. The larger the value of the “centrality” variable, the more centrally a network member is located in the network. This operationalization of centrality is called “degree centrality,” a social network analysis term that captures the number of direct connections an actor has (Borgatti et al. 2013). Since actors with high degree centrality have direct connection with many actors, they are actively engaged in their network and occupy a focal point of information flow; conversely, actors with low degree centrality are not actively engaged in their network and occupy a peripheral position of information flow (Freeman 1979). Among various centrality measures, degree centrality was chosen because it is in direct interactions and communication that one will find network members using performance information for learning purposes (Agostino and Arnaboldi 2015; Imperial 2004). Lasker and his colleagues emphasize the importance of direct connection to create collaborative advantage: “[i]t is only possible for the group to think in new ways if partners are able to talk to each other and are influenced by what they hear” (Lasker et al. 2001, p. 192).

3-2-3. Control variables

Due to the small number of observations, this study includes only two control variables, organizational resource and perceived merit of performance information.

**Organizational resource.** The network participants were asked how many employees worked at least half time or more on services or programs related to the Faraway County system of care. The “organizational resource” variable could be a confounding factor affecting both
performance information use for learning purposes and independent variables, especially the “power imbalance” and “centrality” variables. Actors with resources are more likely to use performance information (Kroll 2015a); actors with more resources are likely to be seen as influential and are able to actively participate in network activities more than those with less resources.

**Perceived merit of performance information.** This variable is included to control for an alternative explanation that the quality, or perceived quality, of performance information affects performance information use (Ammons and Rivenbark 2008; Dull 2009; Kroll 2015a; Taylor 2011; Yang and Hsieh 2007). Actors are likely to use performance information when they recognize the merits of performance information (Kroll 2015a; Taylor 2011). The network participants were asked about the extent to which they believed the local and national evaluations were useful using five items. The five items were adopted from Taylor (2011). The response scale consisted of seven categories from one (not at all useful) to seven (extremely useful). To construct an overall measure of “perceived merit of local performance information” for each member, I computed a factor score. Factor analysis showed that all the five items loaded highly on one dimension (eigenvalue: 4.652; explained variance: 0.914%). Also, a factor score was computed to create an overall measure of “perceived merit of national performance information.” Factor analysis showed that all the four items loaded highly on one dimension (eigenvalue: 4.830; explained variance: 0.961%). The “perceived merit of local performance information” variable is

53 The five items were: (1) providing the right information to the right people at the right time, (2) bringing more advantages than disadvantages to [Faraway] County system of care, (3) improving decision making of [Faraway] County system of care, (4) improving performance of [Faraway] County system of care, and (5) improving accountability of [Faraway] County system of care.
used to predict local performance information use for learning purposes among network members; the “perceived merit of national performance information” variable is used to predict national performance information use for learning purposes among network members.

3-3. Analytical method

Node-level regression was used to analyze the dataset for this study. Node-level regression, also called permutation testing, is a nonparametric technique based on “resampling’ to generate sampling distribution and determine the significance level of a statistic (Borgatti et al. 2013; Hanneman and Riddle 2005; Mooney and Duval 1993; Snijders and Borgatti 1999). This analytic method is appropriate for datasets that violate assumptions of standard regression: sampling is not random; observations are not independent; and distribution of variables of interest is not known or normal (Borgatti et al. 2013; Mooney and Duval 1993). In this study’s dataset, observations are not independent. For instance, network members’ centrality scores are not independent. The score was computed from the regular communication matrix, where a pair of members was considered to regularly communicate only if partner $i$ responded that it communicated with partner $j$ more than once a month, and, at the same time, partner $j$ responded that it communicated with partner $i$ more than once a month. If a network member did not communicate with any other members more than once a month, it affected not only that member’s centrality score but also the centrality scores of others. Therefore, node-level regression was used to account for autocorrelation resulting from non-independent observations.

Node-level regression proceeds in two steps. First, a standard multivariate regression analysis is performed. Second, a dependent variable is randomly permuted and a regression is rerun. This step is repeated hundreds of times (10,000 in this study) to generate distributions of
coefficients of variables of interest. The significance of each coefficient is determined by comparing its coefficient from the first step with the generated distribution. When the coefficient from the first step has an extreme value in comparison to the generated distribution — for instance, less than five percent of random permutations have a value larger than the coefficient — the coefficient is considered to be statistically significant, in this case, at five-percent level.

The analysis was implemented by a social network analysis program, “UCINET” (Borgatti et al. 2002).
RESULTS

Figure 2-1(a) and (b) show distributions of two dependent variables: “local performance information use for learning purposes” and “national performance information use for learning purposes” respectively. Both figures indicate that the Faraway County system of care members are categorized into two groups with respect to performance information use: one actively uses performance information for learning purposes, and the other does not.

Figure 2-1(a) Local Performance Information Use for Learning Purposes
Table 2-1 presents the means, standard deviations, and correlations for all the variables analyzed in this study. It demonstrates that using local and national performance information for learning purposes are highly correlated ($r = 0.834$). Despite the high correlation between the two variables, this study analyzed the two variables separately, because different factors explain the usage of different types of performance information (Kroll 2013).

As shown in Table 2-1, the “goal dissimilarity” variable is moderately correlated to both the dependent variables, local and national performance information use for learning purposes ($r = -0.405$ and -0.423, respectively). The “trust” variable is also moderately associated with both the dependent variables ($r = 0.417$ and 0.400, respectively). However, the correlations between “power imbalance” and both the dependent variables are weak ($r = 0.141$ and 0.119, respectively). Surprisingly, the correlations between the “all three conditions” variable and the dependent variables ($r = 0.281$ and 0.332, respectively) are not as high as those of the “goal
dissimilarity” and “trust” variables. Finally, the “centrality” variable is most highly correlated to
the dependent variables among five hypothesized variables (r = 0.650 and 0.589, respectively).

Besides the hypothesized variables, the “perceived merit of local performance
information” variable is strongly correlated with local performance information use for learning
purposes (r = 0.737); and “perceived merit of national performance information” is strongly
correlated with national performance information for learning purposes (r = 0.823).

Table 2-1 Means, Standard Deviations, and Correlations (N = 21)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S. D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Local learning use</td>
<td>0.000</td>
<td>0.973</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. National learning use</td>
<td>0.000</td>
<td>0.974</td>
<td>0.834</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Goal dissimilarity</td>
<td>116.234</td>
<td>59.424</td>
<td>-0.405</td>
<td>-0.423</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>4. Trust</td>
<td>8.762</td>
<td>3.939</td>
<td>0.417</td>
<td>0.400</td>
<td>-0.429</td>
<td>1.000</td>
</tr>
<tr>
<td>5. Power imbalance</td>
<td>3.810</td>
<td>2.575</td>
<td>0.141</td>
<td>0.119</td>
<td>-0.246</td>
<td>-0.066</td>
</tr>
<tr>
<td>6. All three conditions</td>
<td>2.952</td>
<td>2.699</td>
<td>0.281</td>
<td>0.332</td>
<td>-0.483</td>
<td>0.680</td>
</tr>
<tr>
<td>7. Centrality</td>
<td>3.429</td>
<td>3.553</td>
<td>0.650</td>
<td>0.589</td>
<td>-0.293</td>
<td>0.324</td>
</tr>
<tr>
<td>8. Resource</td>
<td>3.952</td>
<td>4.123</td>
<td>0.285</td>
<td>0.237</td>
<td>-0.101</td>
<td>-0.100</td>
</tr>
<tr>
<td>9. Local merit</td>
<td>0.000</td>
<td>0.970</td>
<td>0.737</td>
<td>0.753</td>
<td>-0.538</td>
<td>0.387</td>
</tr>
<tr>
<td>10. National merit</td>
<td>0.000</td>
<td>0.974</td>
<td>0.596</td>
<td>0.823</td>
<td>-0.523</td>
<td>0.468</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Power imbalance</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. All three conditions</td>
<td>-0.323</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Centrality</td>
<td>0.212</td>
<td>0.236</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Resource</td>
<td>0.389</td>
<td>-0.116</td>
<td>0.060</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Local merit</td>
<td>0.131</td>
<td>0.476</td>
<td>0.417</td>
<td>0.093</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>10. National merit</td>
<td>0.119</td>
<td>0.364</td>
<td>0.456</td>
<td>0.178</td>
<td>0.672</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Figure 2-2(a) and (b) provide an additional support to the hypothesis that network
members’ centrality is associated with performance information use for learning purposes.\textsuperscript{54}

\textsuperscript{54} The figures were created using NetDraw embedded in UCINET (Borgatti 2002).
Each node represents a Faraway County system of care member. The node shape shows the network member types (e.g., public agency, non-profit organization) and the node size in the figures represents the extent to which each network member uses local and national performance information, respectively, for learning purposes. A line between a pair of the nodes indicates that they regularly communicate to discuss system-level issues about the Faraway County system of care. The figures indicate that large nodes (that is, organizations that used local and national performance information for learning purposes, respectively) are likely to have many connections with other network members.

**Figure 2-2(a) Local Performance Information Use for Learning Purposes and Central Position**

![Network Diagram]

- Down Triangle = Community-Based Group
- Circle = Government Organization
- Up Triangle = Non-Profit Organization
- Diamond = Public School/School District
- Square = Network Administrative Organization
- Plus = Others
4-1. Node-level regression results: Local performance information use for learning purposes

We now turn to node-level regression results to explore under what conditions local performance information is used for learning purposes. Table 2-2(a) shows eight models. The Base Model includes only control variables. Model 1, 2, and 3 are used to test the effect of each relational characteristic – goal dissimilarity (Hypothesis 1), power imbalance (Hypothesis 2), and trust (Hypothesis 3) – on local performance information use for learning purposes, respectively. Model 4 tests whether local performance information is more likely to be used for learning purposes when all the three relational conditions are simultaneously met (Hypothesis 4). Model 5 tests Hypothesis 5, central network members are more likely than peripheral ones to use performance information for learning purposes. Model 6 is a full model, including all the
variables except for the “all three conditions” variable; and Model 7 is another full model, including the “all three conditions” variable instead of each relational characteristic variable.

Hypothesis 1 predicts that network members with similar goals as their network partners are likely to use performance information for learning purposes. As demonstrated by Table 2-2(a), the coefficient of “goal dissimilarity,” contrary to our expectation, has a positive sign, albeit small and not statistically significant, suggesting that Hypothesis 1 is not supported by the data. Hypothesis 2 predicts that network members in imbalanced power relationships with their network partners are unlikely to use performance information for learning purposes. The “power imbalance” variable has only a statistically insignificant negative effect on using local performance information for learning purposes; Hypothesis 2 is not supported. Hypothesis 3 predicts that network members in trust relationships with their network partners are likely to use performance information for learning purposes. As shown by Table 2-2(a), the “trust” variable has a positive impact on using local performance information for learning purposes, but, again, the effect is not statistically significant. Thus, Hypothesis 3, as well, is not supported by the data. Unexpectedly, the coefficient of the “all three conditions” variable has a negative sign, though not a statistically significant one, suggesting that Hypothesis 4 is also not supported by the data.

In sum, none of the variables to test hypotheses that network members in positive relationships are likely to use performance information for learning purposes has a significant effect on local performance information use for learning purposes.

Model 5 tests whether network members’ interaction patterns within collaborative networks affect local performance information use for learning purposes. Hypothesis 5 predicts that central network members are more likely to use performance information for learning purposes. As shown in Table 2-2(a), the “centrality” variable has a positive and significant
impact on performance information use for learning purposes (10% level of significance). Thus, Hypothesis 5 is supported by the data. Moreover, the "centrality" variable is significant at 10-percent level in the full models (Model 6 and 7). The result indicates that the level of network members' using local performance information for learning purposes increases by 0.112 when the "centrality" variable increases by one unit. For instance, in comparison with network members with a degree centrality score of one, those with the degree centrality score of 10 have a score 10 times higher in the "local performance information use for learning purposes" variable.

Besides the hypothesized variables, Table 2-2(a) also shows that the control variable — "perceived merit of local performance information" — consistently has a positive and statistically significant impact on local performance information use for learning purposes, suggesting that the network members’ perception that using local performance information has merits is likely to affect using it for learning purposes. In the full model (Model 6), the coefficient of the "perceived merit of local performance information" is 0.541, which suggests that the level of network members' using local performance information for learning purposes increases by 0.541 when the control variable increases by one unit.
Table 2-2(a) Factors Affecting Local Performance Information Use for Learning Purposes (N = 21)

<table>
<thead>
<tr>
<th></th>
<th>Base Model</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
<th>Model 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-.204***</td>
<td>-.212***</td>
<td>-.155***</td>
<td>-.649***</td>
<td>-.148***</td>
<td>-.580***</td>
<td>-.872***</td>
<td>-.501***</td>
</tr>
<tr>
<td>Resource</td>
<td>.052</td>
<td>.052</td>
<td>.056</td>
<td>.058</td>
<td>.050</td>
<td>.050</td>
<td>.063</td>
<td>.047</td>
</tr>
<tr>
<td>Merit</td>
<td>.718***</td>
<td>.721***</td>
<td>.723***</td>
<td>.641***</td>
<td>.741***</td>
<td>.548**</td>
<td>.541*</td>
<td>.580**</td>
</tr>
<tr>
<td>Goal dissimilarity</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power imbalance</td>
<td></td>
<td>-.017</td>
<td></td>
<td></td>
<td></td>
<td>.030</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust</td>
<td></td>
<td>.048</td>
<td></td>
<td></td>
<td></td>
<td>-.037</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All three conditions</td>
<td></td>
<td></td>
<td>-.016</td>
<td></td>
<td></td>
<td>-.025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centrality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.112*</td>
<td>.112*</td>
<td>.113*</td>
</tr>
<tr>
<td>R-Squared</td>
<td>.590</td>
<td>.590</td>
<td>.592</td>
<td>.621</td>
<td>.592</td>
<td>.729</td>
<td>.752</td>
<td>.732</td>
</tr>
<tr>
<td>Adjusted R-Squared</td>
<td>.544</td>
<td>.518</td>
<td>.520</td>
<td>.555</td>
<td>.520</td>
<td>.681</td>
<td>.645</td>
<td>.665</td>
</tr>
</tbody>
</table>

*Note:* *=p < .1, **=p < .05, ***=p < .001

4-2. Node-level regression results: National performance information use for learning purposes

Table 2-2(b) includes eight models that explore the conditions under which national performance information is used for learning purposes, in the same manner as local performance information was examined. In line with local performance information, all the variables concerning the effect of relational characteristics on national performance information for learning purposes do not
have a significant effect, suggesting that Hypotheses 1, 2, 3, and 4 are not supported. While the “centrality” variable had a positive and significant effect on using local performance information for learning purposes, the variable does not have impact on using national performance information for learning purposes. This result is consistent with the argument that different factors explain the usage of different types of performance information (Kroll 2013), even in this case, where the two types of performance information use is highly correlated.

In line with local performance information, Table 2-2(b) shows that the control variable — “perceived merit of national performance information” — consistently has a positive and statistically significant impact on national performance information use for learning purposes, suggesting the network members’ perception that using national performance information has merits is likely to affect using it for learning purposes. In the full model (Model 6), the coefficient of the "perceived merit of national performance information" is 0.685, which suggests that the level of network members' using national performance information for learning purposes increases by 0.685 when the control variable increases by one unit.
DISCUSSION AND CONCLUSIONS

The purpose of this study was to explore whether and under what conditions performance information is used for learning purposes — understanding problems and their causes and solutions. Despite its importance to performance and accountability improvement, performance information use for learning purposes in collaborative networks has been understudied. To
bridge the gap, this study posed two research questions: (1) is performance information used for learning purposes in collaborative networks; and (2) under what conditions is performance information used for learning purposes in collaborative networks?

Regarding the first question, this study finds that network members fall into two categories regarding performance information use for learning purposes. One group actively uses performance information for learning purposes, the other does not. Based on the high correlation between two types of performance information use (i.e., local and national performance information), the active users tend to use both local and national performance information for learning purposes; on the other hand, the less active users tend not to use either type for learning purposes. This finding suggests that a metaphorical conceptualization of collaborative networks, which disregards the heterogeneity among network members’ performance information use, is not helpful in understanding the levels of and reasons for performance information use in collaborative networks.

What factors explain the difference between the active and less active groups? This study identifies two factors that are associated with such a segregated pattern of performance information use for learning purposes in collaborative networks. First, as Appleton-Dyer and his colleague (2012) suggest, the quality of performance information is associated with its use for learning purposes among network members, regarding both local and national performance information. One network member emphasized that the quality of performance information is more important in using performance information than its relational characteristic with network members: “if it’s a conflict because we might have a divergent opinion . . . I’m still going to use it [performance information], if I trust the information, sure.” This is not a surprising finding; it would be hard to imagine that performance information perceived as irrelevant or unreliable
would be used by network members seeking to accurately understand performance, identify and discuss challenges and problems, or search for and implement solutions. While research has emphasized the effects of organizational and sociopolitical contexts on performance information use (e.g., Hood 2012), the finding shows that the quality of performance information is an important factor associated with performance information use, even in collaborative networks where contextual factors such as relationships and interaction patterns among network members are assumed to have strong impacts on performance information use (Agostino and Arnaboldi 2015; Imperial 2004; Koliba, Campbell et al. 2011; Koliba et al. 2010; Moynihan et al. 2011).

Second, regarding using local performance information, central network members are more likely than peripheral members to use it for learning purposes. The interviews with network members provide an explanation of why that may be. Interview data suggest that central network members are likely to use performance information for learning purposes because they are responsible for and are committed to whole network performance (i.e., serving their clients), and because they believe that using performance information helps them better serve their clients. One central member emphasized the importance of using performance information for learning purposes: “we realize that it's important to present the good and the not-so-good. It is done in a way that is always productive . . . like how to improve and make those improvements. So, we have always been forthcoming with what it is, and we don't try to sugarcoat it in any way, because there are numerous reasons why evaluation comes out the way it does.” Another member explained why he used performance information for learning purposes: “it’s very simple. We cared, we had the children we were serving, and we had certain goals we wanted to accomplish . . . We would use data that was coming in to make decision about process: you
know, how we are going to design new services; what our pieces are going to look like? I mean, that’s what we were doing.”

Why are centrally located actors likely to use local performance information for learning purposes but not national performance information? It might be related to the characteristics of the two types of performance information. A member described the difference as follows: “national evaluations are helpful. They provide you guidance, but . . . we would definitely rely heavily on local evaluations to make local decisions . . . We would look at national evaluations on program effectiveness. But when it came to making a decision about what to do on the ground locally, we used local data to make that decision.” It is suggested that local performance information is considered critical to good decision making in the Faraway County system of care, while national performance information is considered a less immediately relevant source of guidance. Therefore, central network members rely more on local performance information for learning purposes than on national performance information in making decisions and improving operations as they strive to better serve their clients by using performance information to identify, discuss, and address problems.

It is worth discussing why none of the relational characteristics among network members is associated with performance information use for learning purposes. It is especially surprising that trusting relationships do not associate significantly with performance information use for learning purposes, when previous research has consistently found that trust affects performance information use (e.g., Moynihan 2008a, 2008b; Moynihan and Landuyt 2009), knowledge sharing, and learning among actors (e.g., Dawes et al. 2009; Huang 2014; Ingram and Roberts

55 The “trust” variable is moderately correlated with the two dependent variables. However, the correlations are not as strong as “centrality” and “perceived merit of local (or national) performance information use.”
One explanation may be that what matters is not how many trusting relationships a network member develops, but how deep the trust goes between that network member and specific other actors the member communicates with using performance information. Network members may not use performance information with all the other network members. That is, the quality rather than quantity of trust relationships may be the important factor affecting performance information use in collaborative networks. The trust variable in this study captures the latter aspect but not the former aspect of trust relationships. The same explanation could apply for goal similarity and power imbalance, that the quality rather than the quantity of such relationships is the determining factor.

Another possible explanation is that the relationship between trust and performance information use is complex rather than straightforward (Pandy 2015; Sydow 2004). It could be that too little trust prevents network members from using performance information for learning purposes, because with too little trust, they are worried about being taken advantage of, blamed, or embarrassed. On the other hand, too much trust could also negatively affect performance information use, because network members in trust relationships share broad-scope information (Larson 1992; Zald 1972); other information may be prioritized over performance information (Kroll 2013). A moderate or “just-right” level of trust might be what enhances performance information use for learning purposes among network members. As for goal similarity and power imbalance, just-right levels of goal dissimilarity or power imbalance could stimulate network members to use performance information for learning purposes, because members could learn from disagreement by critically reflecting on their own perspectives, positions, or roles (Askim et al. 2008; Beckman and Haunschild 2002). Finally, it may be that while relational
characteristics among network members do provide a basis for use of performance information for learning purposes, the motivation to serve their clients well is the real stimulus promoting use of performance information. When asked what factors facilitate performance information use, one network member answered that “[It is] not so much whether we like them or not, but it is more important for us to have in-depth conversations depending on what the issue is with certain agencies.”

At this point, this study’s limitations must be mentioned. First, the results of this study are not generalizable. It is not reasonable to generalize findings from one case to all collaborative networks in various policy settings. Since members in health and human services networks are willing to work together to promote clients’ well-being (Romzek et al. 2012, 2014), the findings might not apply for performance information use among network participants addressing environmental or economic development issues, wherein they are likely to have competing and conflicting interests (Berardo and Scholz 2010; Feiock and Scholz 2010; Lee et al. 2012). Second, reliance on cross-sectional data limits the ability to specify causal relationships between the dependent and independent variables. The argument of causal relationships in this study is theoretical. This study used interview data to mitigate this limitation by complementing the statistical findings with qualitative data. However, it would be desirable to collect longitudinal data in order to specify causalities. Third, while the ultimate goal of using performance information is to improve performance (Behn 2003), this study did not empirically examine the association between performance information use for learning purposes and collaborative networks’ outputs and outcomes. Future research needs to empirically study such association to understand if using performance information improves network performance. Finally, if the quality, rather than quantity, of goal congruence, power balance, and trust relationships matters
for performance information use for learning purposes, as discussed above, one would need to
examine the association between relational characteristics of pairs of network members and the
performance information use between them. This study did not examine such association.

Remembering these caveats, the findings have academic and practical implications for
performance information use in collaborative networks. The interactive dialogue model of
performance information assumes that performance information is more likely to be used for
learning purposes in intra-organizational than inter-organizational settings, because in intra-
organizational settings, actors tend to be more homogeneous and have more shared goals
(Moynihan 2008a, 2008b). However, actors in collaborative (inter-organizational) networks are
likely to use performance information for learning purposes when: (1) they are centrally located
within their network, and (2) they perceive the merits of using performance information. Both
conditions suggest that performance information could be used for learning purposes regardless
of organizational boundaries.

This last point has an implication for network management research, as well. While the
research acknowledges the importance of performance management, performance information
use – especially for learning purposes – is a missing link in the research. Using performance
information for learning purposes could be used to investigate whether performance management
works in collaborative networks, because collaborative networks are expected to use
performance information for learning purposes to develop a holistic understanding of complex
public problems and come up with innovative solutions for such problems (Head 2008; Hetting
and Vedung 2012; Koppenjan and Klijn 2004; Mandell and Keast 2007; Van der Meer and
Edelenbos 2006). This study shows that performance information is used for learning purposes
by central network members, which suggests that performance management can be an
appropriate network management tool by providing useful information to key players and helping them make decisions in collaborative networks.

Regarding practical implications, since participants in collaborative networks are likely to use performance information for learning purposes when they perceive the merits of using it, performance management should be conducted taking network members’ goals and interests into account, to influence members to see the merits of using performance information for learning. Network members’ participation in the performance management process should be valued (Mandell and Keast 2007; Patton 1997). Their involvement increases the relevance and credibility of performance information, and they are more likely to use performance information for learning purposes when they are engaged in generating it. Since central network members are likely to use performance information for learning purpose when they find that performance information supports decision-making processes, network administrators or evaluators could enhance performance information use by involving central actors in the performance management processes, and conveying to them the relevance and credibility of performance information. Because central network actors directly influence whole network’s decision making, such activity could contribute to improving network performance and accountability.
ESSAY THREE

Does use of performance information foster network learning in collaborative networks?

ABSTRACT

The purpose of this study is to explore whether and under what conditions using performance information facilitates learning among network members (i.e., network learning). Network learning is essential for collaborative networks to create collaborative advantage and mitigate cooperation and coordination problems among network members. However, network members may have difficulty learning collectively due to differences in their goals, strategies, perceptions, and ways of working. While research on performance management assumes that using performance information facilitates learning, the assumption has not been fully examined in single organizational settings, let alone in network settings. This study addresses the gap through targeted exploration of a case from a health and human service network. It empirically examines the effect of performance information use on network learning. Results obtained using social network analysis show that using performance information does contribute to network learning in collaborative networks, although the presence or absence of the effect depends on the type of performance information. Results also demonstrate that using performance information is likely to be associated with network learning when (1) multiple types of performance information are used by network members and (2) performance information is used for learning purposes: to understand problems and their causes and solutions.
Learning is the dominant form in which rationality exhibits itself in situations of great cognitive complexity. This suggests that the rationality of public policymaking depends more on improving the learning capacity of the various organs of public deliberation than on maximizing achievement of particular goals (Majone 1989, p. 183).

INTRODUCTION

The raison d’être of collaborative networks is to provide public services that would be difficult or impossible for single organizations to provide on their own; that is, to create collaborative advantage, “synergy that can be created through joint working” (Vangen and Huxham 2010, p.163; also see Huxham 1996; Huxham and Vangen 2005; Lasker et al. 2001). Bardach (1998) notes that “[c]ollaboration should be valued only if it produces better organizational performance or lower costs than can be had without it. We should not be impressed by the idea of collaboration per se” (p.17).

To deal with complex public problems, individual organizations have imperfect information and limited perspectives. By working together, they are able to gain more holistic perspectives on the problems and to develop comprehensive, integrated solutions by transferring, sharing, and integrating information and knowledge that each member organization possesses (Lasker and Weiss 2003; Lasker et al. 2001; Weber and Khademian 2008). In other words,

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56 Collaborative networks are defined as “collections of government agencies, nonprofits, and for-profits that work together to provide public goods, services, or ‘value’ when a single public agency is unable to create the goods or services on its own and/or the private sector is unable or unwilling to provide the goods or services in the desired quantities” (Isett et al. 2011, p. i158).
members in collaborative networks must be able to learn together to create collaborative advantage (Agranoff 2003). Furthermore, by developing trust and shared perceptions among network members, such learning alleviates cooperation and coordination problems that arise in collaborative networks due to the involvement of multiple actors with different (or even conflicting) goals, strategies, perceptions, and ways of working (Bouwen and Taillieu 2004; Doz 1996; Hertting and Vedung 2012). Koppenjan and Klijn (2004) posit, “cooperation presupposes learning between the actors, crossing the boundaries of organizations, networks and coalitions” (p.10). That is, learning together reduces both substantive and relational complexities and uncertainties in collaborative networks by enhancing comprehensive, integrated, and holistic problem identification and solution development as well as building positive social relationships among network members (Bouwen and Taillieu 2004; Hertting and Vedung 2012). Consequently, studies on collaborative networks have extensively reported the importance of learning within them (e.g., Bate and Robert 2002; Gerlak and Heikkila 2011; Heikkila and Gerlak 2013; Klijn and Koppenjan 2000; Knight 2002; Knight and Pye 2005; Koppenjan and Klijn 2004; Leach et al. 2014; Newig et al. 2010; Poppe et al. 2014; Van der Meer and Edelenbos 2006; Weber and Khademian 2008). Some scholars even argue that learning is inherent to collaborative networks, since they are formed to address complex public problems beyond the individual capacity of each member organizations by integrating information and knowledge across organizational boundaries (Ferlie et al. 2011; Koppenjan and Klijn 2004; Poppe et al. 2014). Agranoff (2006) notes that:

Indeed, the data-information-knowledge function of networks is so paramount that their collaborative communities of practice across agencies distinguish them from more bureaucratically oriented hierarchies . . . In particular, they add value through their
knowledge-enhanced functions, which in the long run, bring beneficial outcomes to the participating managers and professionals, the partner agencies, the collaborative process, and to short- and long-term policy and program solutions (p. 63).

The very factors that make learning among network members essential also make that learning difficult to accomplish. It is well known that actors with different knowledge bases have difficulty communicating, sharing information and knowledge, and learning together. For instance, network members with different “ways of knowing” are likely to differ in their perceptions of what knowledge is valid, what the problems are, and how to approach problems and implement solutions. As a result, interactions and communication among them tend to result in misunderstanding, fragmentation, conflict, and ultimately, a “dialogue of deaf” (Van Buuren 2009; also see Feldman et al. 2006).

How, then, can collaborative networks foster and facilitate learning among their members? This study examines the effect of performance management, and in particular, of performance information use, on learning in collaborative networks. Why focus on performance information use? First, while learning in collaborative networks results from acquiring and sharing various types of information and knowledge (Gerlak and Heikkila 2011), performance information is expected to facilitate learning in collaborative networks by providing feedback on their processes, outputs, and outcomes (Koliba 2014; Mandell and Keast 2008;

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57 Performance information is defined as “systematic information describing the outputs and outcomes of public programmes and organizations – whether intended or otherwise – generated by systems and processes intended to produce such information” (Pollitt 2006, p.39). Performance information includes information produced by evaluation and performance measurement (Pollitt 2006).
Torres and her colleagues (1996) mention that “[t]here is no other function within an organization that has more potential to contribute to the organization’s learnings than evaluation” (pp. 27–28). Second, recent research on performance management suggests that the effect of performance management on performance improvement depends on whether and how performance information is used (Ammons and Roenigk 2015; Gerrish 2015; Kroll 2015b). Yet the effect of performance information use has not been fully studied in single organizational settings (Bryson 2012; Kroll 2015a, 2015b; Moynihan 2009), let alone in network settings. There are not enough empirical studies on the effect of performance information use to have more than speculative hypotheses on its effects (Moynihan 2009). Moynihan and his colleagues point out the necessity to study the effect of performance information use: “we lack definitive evidence about whether performance regimes ultimately improve public sector capacity and outcomes . . . we need to not just identify the causes of performance information use but also to systematically examine how the sustained use of performance data affects a variety of individual and organizational phenomena in governance” (p. i151).

To address the gap in the literature, this study explores two research questions:

**Research Question 1:** Does use of performance information facilitate learning in collaborative networks?

**Research Question 2:** Under what conditions does performance information use facilitate learning in collaborative networks?

Answering these questions can enable collaborative networks to facilitate learning among network members, create collaborative advantage, and ultimately provide effective public services. The remainder of this paper is structured as follows: the next section will review previous studies on learning in collaborative networks and the effects of performance
information use on learning. The method section will present the data, measures, and analytical method. Following that will be the result section. The final section will outline implications drawn from this research.

**NETWORK LEARNING AND PERFORMANCE INFORMATION USE**

Although learning is an essential feature for collaborative networks, research on learning in collaborative networks is in its beginning stage; there is no unified theory within which to study the phenomenon (Gerlak and Heikkila 2011; Leach et al. 2014). Knight (2002) presents a useful conceptual framework to study learning in collaborative networks, “network learning.” She explains network learning as follows: “learning by a group of organizations as a group. If, through their interaction, a group of firms change the group’s behaviour or cognitive structures, then it is the group of organizations that is the ‘learner’, not just the individual organizations within the group” (Knight 2002, p.428; also see Dyer and Nobeoka 2000; Larsson et al. 1998). In the public administration and policy field, Gerlak and Heikkila (2011) use the term “collective learning” to describe learning in collaborative networks in the similar manner with Knight (2002). They posit that a group of organizations can change their collective cognitions and behaviors through acquiring, exchanging, and integrating information and knowledge to respond to complex public problems that they face.

Network learning, or collective learning, is based on a social constructionist view of learning, presupposing that learning occurs through interactions and communication among actors whereby they access, transfer, and adopt information and knowledge (cf., Freeman 2008; Powell et al. 1996; Rashman et al. 2009; Van der Knaap 1995). Network learning is consistent with the whole network perspective, which focuses on overall processes, structures, outputs, and
outcomes of network organizations rather than those of each network member (Kilduff and Tsai 2003; Provan et al. 2007). As a whole-network-level activity, network learning affects the processes, structures, outputs, and outcomes of whole networks by generating shared perceptions and practices among network members (Knight 2002; Knight and Pye 2005). For instance, as a result of network learning, a group of organizations may initiate an environmental restoration project (Gerlak and Heikkila 2011), change their health service practices (Knight and Pye 2005), develop routines to respond to an emergency situation (Moynihan 2008c), or build shared understanding on a problem definition and intervention strategies in various policy areas (Knoepfel and Kissling-Naf 1998). In short, network learning is characterized in three respects:

1. Learning agent: a group of organizations considered to be the learning agent in network learning;
2. Learning process: network learning results from interactions and communication among network members; and,

Network learning does not necessarily result in improved network processes or performance (Gerlak and Heikkila 2011; Heikkila and Gerlak 2013; Knight 2002; Knight and Pye 2005). Huber (1991) notes that “learning does not always increase the learner’s effectiveness, or even potential effectiveness. Learning does not always lead to veridical knowledge . . . Entities can incorrectly learn, and they can correctly learn that which is incorrect” (p. 89).
Collaborative networks increasingly address complex public problems; whether the problems get solved depends on the network-level performance (Gray 2000; Kenis and Provan 2009; Provan and Milward 1995, 2001); and, network learning contributes to that performance. Thus, it is important to understand what factors affect the network learning processes and how, in order to support and facilitate network learning in collaborative networks. As mentioned above, network learning results from interactions and communication among network members. Indeed, extant studies have found that interactions and communication (or dialogue) among network members are the keys to network learning (e.g., Dawes et al. 2009; Gerlak and Heikkila 2011; Heikkila and Gerlak 2013; Knight 2002; Knight and Pye 2005; Knoepfel and Kissling-Naf 1998). Knight (2002) notes that “[a]n essential aspect of network learning process is interaction between network members . . . Collective cognitive structures and coordinated practices cannot become established other than through relating across organizational boundaries” (p. 446).

Network members access, transfer, share, and integrate information and knowledge through interactions and communication to develop shared meanings of, commitment to, and strategies for the network’s newly developed goals and practices (Gerlak and Heikkila 2011; Knight and Pye 2005).

How does using performance information facilitate network learning in collaborative networks? While network learning results from interactions and communication among network members, performance information is used in interactions and communication among them (Agostino and Arnaboldi 2015; Gibson and de Lancer Julnes 2010; Imperial 2004; Koliba, Campbell et al. 2011; Koliba et al. 2010; Van der Meer and Edelenbos 2006). Since decision making in collaborative networks is a collective process, members use performance information in interactions and communication to bridge the differences among each member’s goals,
strategies, perceptions, and ways of working. Using performance information supports interactions and communication among network members by helping them engage in informed and focused communication. First, performance information use improves the quality of communication among network members by providing relevant and credible information (Hertting and Vedung 2012; Majone 1989; Van der Knaap 1995). Although performance information may not provide comprehensive or unambiguous problem definitions and solutions (Moynihan 2008a, 2008b; Radin 2006), it nonetheless provides a basis for communication among network members. Interpretations and arguments disconnected from and contradicted by disseminated performance information would be less convincing; once the performance information is shared, members cannot deny it without convincing arguments (Van der Knaap 1995). Valovirta (2002) points out that:

[T]he most important value of evaluation is that it incites argumentation and can direct it towards a more reasoned debate. When taken seriously, evaluations force people to present well-grounded arguments for refuting evaluation conclusions and recommendations. This opens up possibilities for new understandings to emerge. It entails the potential of building up consensus and learning through disagreement. It also increases consciousness about elementary conditions for action in particular policy contexts. People can become more aware of the factors that constrain effective action and how different constraints can be eased (p. 77).

The other benefit of using performance information during interactions and communication is that performance information enables network members to engage in focused communication. Performance information functions as a feedback mechanism (Koliba 2014;
Mausolff 2004; Mausolff and Spence 2008; Nielsen 2014; Van der Knaap 1995). Problems identified through performance information stimulate communication focused on the problems, such as sharing interpretations of problems, finding solutions for problems, and evaluating and implementing solutions (Mausolff 2004). These two effects (i.e., informed and focused communication) make network members’ interactions and communication through performance information an arena for collective learning to solve problems (Knoepfel and Kissling-Naf 1998), or a learning forum “where actors collectively examine information, consider its significance, and decide how it will affect action” (Moynihan 2008a, p.167). Therefore, it is expected:

**Hypothesis 1: Network learning is more likely to occur among network members when they use performance information during interactions and communication.**

Performance information is used in various ways and to many ends, sometimes even generating negative consequences (Bevan and Hood 2006; Courty and Marschke 1997; Heinrich and Marschke 2010; Hood 2006; Moynihan 2009; Van Thiel and Leeuw 2002). During interactions and communication, actors sometimes use performance information for advocacy (Moynihan 2008a, 2008b), to legitimatize their goals, strategies, and perspectives by presenting information that supports their interpretation and argument. For learning, actors might use performance information collectively to discuss and learn about their problems, along with the causes and potential solutions (Moynihan 2008a, 2008b). In his study of performance information use in state correction departments, Moynihan (2005, 2008a) find that performance information use for learning purposes leads to “single-loop learning,” where organizations improve or change means to achieve their goals (i.e., organizations do things right), and “double-
loop learning,” where organizations actually change their goals (i.e., organizations do right things). The Department of Corrections in Virginia, for instance, changed their practices to reduce cost and to improve performance by using performance information for learning purposes (i.e., single-loop learning); and, the Department of Corrections in Vermont changed their basic corrections approach (i.e., double-loop learning) by learning from performance information that their current approach was not effective.

The positive effects of performance information use occur when performance information is used for learning (Moynihan 2005, 2008a, 2008b; Moynihan and Landuyt 2009). When performance information is used to learn, “[d]ialogue forms a basis of social cooperation, and people feel committed to the agreements reached in such a context. Interactive dialogue therefore acts as a social process that helps to create shared mental models, has a unifying effect, and helps to develop credible commitment for the execution phase” (Moynihan 2008b, p.39). Performance information use for learning purposes moderates the relationship between performance information use and network learning. Thus, it is expected:

**Hypothesis 2: Using performance information during network members’ interactions and communication is more likely to generate network-learning products when it is used for learning purposes.**

Multiple types of performance information are produced in collaborative networks (Agostino and Arnaboldi 2015; Koliba, Campbell et al. 2011; Zia et al. 2015). Using multiple types of performance information allows network members to triangulate them and shed brighter light on various aspects of performance. This approach is likely to generate rich understandings of problems and their causes and potential solutions (Askim 2004; Greiling and Halachmi 2013).
Since performance information is incomprehensive and ambiguous (Moynihan 2008a, 2008b), network members are able to form better ideas about problems and their solutions by combining multiple types of performance information. Thus, it is expected:

**Hypothesis 3:** Network learning is likely to occur among network members when they use multiple types of performance information during interactions and communication.

Figure 3-1 summarizes a model of how using performance information affects network learning, whereby (1) using performance information for learning purposes moderates the link between performance information use and network learning, and (2) using multiple types of performance information leads to network learning.
METHOD

3-1. Research setting and data collection

To test the above hypotheses about the effect of performance information use on network learning, this study examines a “system of care” in a county in a northeast state with the pseudonym “Faraway County” as an instrumental case\(^{59}\) (Stake 1998). System of care is an initiative administrated by the Center for Mental Health Services (CMHS) of the Substance Abuse and Mental Health Services Administration. The term is defined as “a comprehensive spectrum of mental health and other necessary services which are organized into a coordinated network to meet the multiple and changing needs of severely emotionally disturbed children and adolescents” (Stroul and Friedman 1986, p. 3). To realize the system of care approach and provide comprehensive, integrated, and individualized services to children and youth with serious emotional disturbance and their families, multiple organizations have been brought together to work in concert with each other; effectiveness of one service area is affected by activities of other areas. That is, “[w]orking collaboratively is believed to be a key ingredient and driving force in developing systems of care to serve children with serious emotional disturbance and their families” (Hodges et al. 1999, p.21).

Through its Children’s Mental Health Initiative grant, CMHS has supported a number of communities to implement the system of care approach in a way that fits the social, economic, and political contexts of their community, to best serve their clients. The Faraway County system

\(^{59}\) An instrumental case is chosen to facilitate understanding of a particular phenomenon – association between performance information use and network learning in this study – rather than to address the case itself (Stake 1998).
of care was an “action network” (Agranoff 2007) responsible for service provision to mentally ill youth and children, and for decision making regarding which populations were served, which services were prioritized, which intervention strategies were prioritized, and so on. Its responsibility was quite similar to what Bardach and Lesser (1996) describe:

A collaborative is not simply a service delivery network; it is also a community that must make choices about which services to deliver – or to put it more generally and also more precisely, about which individuals, which families, which neighborhoods, which problems, which types of service, and which philosophies of intervention deserve priority. Federal and state categorical grant funding of local services often prescribes, in rigid and confining detail, what services are to be provided by what kinds of providers to recipients with what sorts of characteristics. Nevertheless, even within these boundaries, providers often have room to choose their priorities and, under some conditions, to create new priorities that none of the agencies had ever considered when they worked independently. How they do so depends both on political bargaining and on a more disinterested dialogue concerning the public interest. (p. 201).

As one recipient of the CMHS grant, Faraway County accepted the attendant obligation to monitor and evaluate their performance by hiring evaluation staff to conduct “local evaluation.” They were also required to participate, along with all other grantee networks, in regular “national evaluation.” Local evaluation in the Faraway County system of care mainly
monitored outputs and outcomes of its services based on the logic model developed at the grant’s inception. In addition to the performance monitoring based on the logic model, the Faraway County system of care conducted focused evaluation studies on specific issues such as culturally competent service delivery, operational-level interagency collaboration, and system-level interagency collaboration. Its local evaluation staff provided information on intake quality, service quality improvement, child- and family-level outputs and outcomes, and so on. For participation in the national evaluation, CMHS and its evaluation agent visited, evaluating the extent to which the Faraway County system of care embraced the system of care approach’s core values. Periodically, CMHS’s evaluation agent also provided aggregated data about the demographic information of children and youth receiving services, their treatments, and their outcomes in the county. These data made possible comparisons of Faraway County’s performance with that of systems of care in other communities.

Twenty-four actors involved in decision making at the Faraway County system of care were surveyed online between August and October 2013. A link to the survey was sent to 27 individuals in the 24 network members. Most survey participants were the administrators who

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60 The logic model, also known as outcome sequence charts: “[e]very program has implicit hypotheses about what actions will produce what results. The charts attempt to identify these hypotheses by showing the outputs, intermediate outcomes, and end outcomes expected to flow from program activities” (Hatry 1999, p. 48).

61 The core values are: (1) child centered and family focused, (2) community-based, and (3) culturally and linguistically competent services (Stroul and Friedman 1986).

62 The survey was sent to four staffs of its network administrative organization, which was set up to manage and coordinate network activities (cf., Provan and Kenis 2008), because each of them were involved in the decision-making processes in the Faraway County system of care.
represented their organization for the Faraway County system of care or the highest-level administrator responsible for services to children and youth. After email, postal mail, and telephone follow-ups, 24 individuals completed the survey (88.89% response rate), representing 21 network member organizations (87.50% response rate).

The dataset for this research derives from 20 network members, comprising nine government organizations, five non-profit organizations, two public schools/school districts, two community-based groups, one network administrative organization, and one legislator. On average, at the time of this research, the organizations had about four employees (4.16) working half time or more on services or programs for the Faraway County system of care. Most responding members (75.00%) controlled budgets in excess of $500,000 for children’s services or programs. Most individual respondents (75.00%) had been involved in the county’s system of care for over 48 months.

Semi-structured interviews conducted with the surveyed network members and a local evaluator supplemented survey data. Members had been grouped into four categories of performance information use: (1) active performance information user (three members), (2) moderate performance information user (three members), (3) less active performance information user (four members), and (4) non-performance information user (11 members). At least two network members from each group were interviewed; as a result, in addition to a local evaluator, 10 network members were interviewed — two active performance information users,

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61 The survey responses of one survey participant, who did not answer the questions used for the dependent variable, were omitted from this study.

64 The four categories were identified based on blockmodeling using CONCOR algorithm. I used UCINET (Borgatti et al. 2002), a social network analytical program, to perform blockmodeling.
two moderate performance information users, two less active performance information users, and four non-performance information users. Each interview lasted between 30 and 60 minutes. By conducting these interviews, the researcher developed qualitative data complementary to the survey data, furthering the understanding how using performance information helped the network members learn together. Typical interview questions were: did using the data from evaluation reports affect your understanding of the achievements and challenges of the system of care; did using data from evaluation reports help you to share your understanding of the achievements and challenges with the system of care partners? With one exception (an interview conducted by phone), interviews were recorded and transcribed. Interview data coding focused on how performance information use related to network members’ collective learning.

3-2. Measures

3-2-1. Dependent variable

Network learning (Shared understanding of network challenges). The dependent variable in this study is the extent to which the network members had shared understanding of the challenges or problems that their network faced. Shared understanding among network members is an important network-learning product (Ansell and Gash 2008; Gerlak and Heikkila 2011; Knight 2002; Knight and Pye 2005; Knoepfel and Kissling-Naf 1998). Shared understanding facilitates cooperation and coordination among network members (Ansell and Gash 2008; Knoepfel and Kissling-Naf 1998).

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65 A representative of a network member did not find time for an interview. I sent him my questions via email, and he answered them via email.

66 Regarding the interview conducted via phone, I sent a summary of the interview to the interviewee, and she confirmed the summary.
As a result, shared understanding among network members contributes to satisfactory network performance; to the contrary, its lack results in unsatisfactory network performance (Gray 2004; Klijn et al. 2015; Nowell 2009, 2010). Van der Knaap (1995) notes: “[n]ot only the degree to which the policy discourse leads to a better understanding of the problems discussed is considered as learning, also the degree of mutual understanding and consensus is important for the quality of policies, especially since they constitute the basis for cooperation and future dialogue” (p. 203). Shared understanding is especially important in successful policy implementation or service delivery. O’Toole and his colleagues (1997) note: “[g]iven the more specific goal orientation of network activity during this phase, the management of implementation will also rely more on the search for and development of common purpose among the participants than is the case with the use of networks during other phases” (p. 138).

As a type of collaborative network for providing public services, systems of care also benefit from shared understanding, so that network members coordinate their activities to provide comprehensive, integrated, and individualized services to mentally ill children and youth. In sum, shared understanding contributes to a network’s satisfactory performance by facilitating network members’ cooperation and coordination, and creating collaborative advantage.

It is well documented that shared understanding among network members on critical challenges or problems is especially important for collective action and network performance (Dewulf et al. 2011; Gray 1989, 2004; Nowell 2009, 2010). Shared understanding on critical issues provides a basis for joint efforts among network members. Without it, members would find it difficult to understand one another or agree on any course of action, let alone create collaborative advantage to provide comprehensive and integrated services.
The dependent variable — “shared understanding on network challenges” — was constructed as follows. In the survey, the network members were asked about five network-level challenges, which were identified by five informants in the collaborative network. The response scale consisted of seven categories from one (not at all challenging) to seven (extremely challenging). Then, their responses on the five items were dichotomized by the response category “5”, so that a value “1” indicated that network members perceived that the issue was a challenge for them. The rationale for the dichotomization is that: (1) it can provide a more accurate measure for the dependent variable than the raw response score, because success and problem are more easily differentiated than the gradation between them (March and Simon 1958); (2) using performance information primarily helps actors to identify their problems and discuss them in a focused way (Mausolff 2004; Mausolff and Spence 2008; Moynihan 2008a, 2008b; Nielsen 2014; Rabovsky 2014; Van Dooren et al. 2010); and (3) shared understanding among network members on network challenges or problems is especially important for collective action (Dewulf et al. 2011; Gray 1989, 2004, Nowell 2009, 2010). Then, the Jaccard similarity coefficient of the five dichotomized items was computed for each pair of network members. In this study, the Jaccard similarity coefficient represents the proportion of challenges.

67 The five items are: (1) buy-in on core values of system of care, (2) reflecting youth voice in decision making, (3) implementing evidence-based practices, (4) communication among service providers, and (5) providing services sensitive to the cultural and linguistic differences.

68 The five informants were: commissioner of the Faraway County system of care, two NAO staffs, and two local evaluators. They were in a position to observe the Faraway County system of care as a whole.
that a pair of network members had in common with those which either one of the pair listed. \(^{69}\) The Jaccard similarity coefficient was chosen because it surfaces the “underlying tendency” for a pair of network members to have shared understanding on network challenges (Borgatti et al. 2013; Borgatti and Halgin 2011b). The dependent variable is a symmetrical 20 x 20 matrix. The larger the value in a cell \((i, j)\) is, the more a pair of network members agrees on the network challenges.

3-2-2. Variables to test hypotheses

(1) Local performance information use and (2) National performance information use. This research focuses on reciprocal performance information use, thereby capturing the characteristics of the learning forum wherein actors collectively discuss and make sense of performance information (Moynihan 2008a, 2008b). Pedersen and his colleagues (2011) emphasize the importance of reciprocal communication as follows: “the coordination linkages must be interactive to ensure a valuable exchange of understandings, viewpoints, knowledge, and resources among relevant actors at different levels and in different institutions and sectors. One-way processes of communication weaken this kind of exchange considerably” (p. 389).

Performance information use among the network members can be asymmetrical. That is, partner \(i\) using performance information in communication with partner \(j\) does not necessarily mean that partner \(j\) uses performance information in communication with partner \(i\). Network

\(^{69}\) The Jaccard similarity coefficient is computed as follows: \(J(A, B) = \frac{A \cup B / A \cap B}{A \cup B} \). For instance, when A perceives that all the five items are network challenges and B perceives that three items are network challenges, they have three items in common and five items are listed as challenges by either of them; as a result, the Jaccard similarity coefficient is 0.6 \((\frac{3}{5})\).
members were asked whether they used information from local evaluation reports in the
discussion of system-level issues with each partner and also asked whether they used information
from national evaluation reports. Each of the measures was transformed into a 20 x 20
symmetrical matrix with binary values (0 or 1) where a cell \((i, j)\) has the value “1” when partner \(i\)
used performance information in communication with partner \(j\) and, at the same time, partner \(j\)
used performance information in communication with partner \(i\). That is, the value “1” in a cell \((i, j)\)
in local performance information use indicates that both partner \(i\) and partner \(j\) reciprocally
used local performance information in the discussion of system-level issues of the Faraway
County system of care. Similarly, the value “1” in a cell \((i, j)\) in national performance
information use indicates that both partner \(i\) and partner \(j\) reciprocally used national performance
information in the discussion of system-level issues of the Faraway County system of care.

(1) Local performance information use x local performance information use for
learning purposes, and (2) National performance information use x national performance
information use for learning purposes. The network members were asked how often they used
local performance information for learning purposes with respect to four items\(^{70}\) adopted from
Moynihan et al. (2012a) and modified to fit this study. The response scale consisted of seven
categories from one (never) to seven (almost always). They were also asked about using national
performance information for learning, toward the same four items as above. To construct an
overall measure for “local performance information use for learning purposes” for each member,
I computed a factor score. Factor analysis showed that all four items loaded highly on one

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\(^{70}\) The four items we used are: (1) to support and improve decision-making processes of [Faraway] County system
of care, (2) to discuss new approaches for doing old things, (3) to discuss priorities, and (4) to discuss problems that
need attention.
dimension (eigenvalue: 3.900; explained variance: 0.965%). The arithmetic mean of the factor scores was computed for each network member pair, to capture the extent to which each pair used local performance information for learning. Finally, I created the interaction term to weight the local performance information use between pairs of network members by the extent to which the pairs used local performance information for learning purposes. This measure is a symmetrical 20 x 20 matrix. The larger the value in a cell \((i, j)\), the more likely a pair of network members use local performance information for learning purposes when they use it. The interaction term for national performance information was created in the same way as that for local performance information. Factor analysis showed that all the four items loaded highly on one dimension (eigenvalue: 3.915; explained variance: 0.972%).

**Multiple performance information use.** This measure is a symmetrical 20 x 20 matrix with binary values (0 or 1). The value “1” in a cell \((i, j)\) indicates that a pair of network members used both local and national performance information in discussing network system-level issues. A “0” indicates that they did not use information derived from either local or national evaluations or they did not use any of them in network-level discussions.

### 3-2-3. Control variables

This study uses nine control variables to account for factors that might generate similarity (i.e., shared understanding in this study) among network members: goal dissimilarity, mutual dependence, trust, length of involvement, meeting attendance, organization type, organizational resource, and two network effects (cohesion and structural equivalence). Since the dependent variable and the variables to test hypotheses were measured at the dyadic level, these control variables, also, were operationalized at the dyadic level.
**Goal dissimilarity.** The network participants were asked the extent to which the seven goals of the collaborative network were central to the core mission of their individual organization. The seven goals used were adopted from the Faraway County system of care strategic planning document. The response scale consisted of seven categories from one (not at all central) to seven (extremely central). The Euclidian distance of the seven items were computed for each pair of network members. This is a symmetrical 20 x 20 matrix. The larger the value in a cell \((i, j)\) is, the more dissimilar that pair of members’ goals are.

**Mutual dependence.** The network members were asked to rate each partner (including themselves) in terms of their overall influence over the Faraway County system of care on a scale from one (not influential) to five (extremely influential). The response matrix was transformed to a symmetrical 20 x 20 matrix by adding the score partner \(i\) gave to partner \(j\) and the score partner \(j\) gave to partner \(i\), following the conceptualization of mutual dependence by Casciaro and Piskorski (2005), which defines mutual dependence as the total amount of dependence between two actors.

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71 The seven goals are: (1) everyone works together to plan for one child and family at a time; (2) families, youth, and professionals work together as equal partners; (3) help is available and accessible when and where families and youth need it; (4) all communities and cultures in [Faraway] County have access to services, and a voice, in our system of care; (5) services and support are provided in an effective continuum of care; (6) youth with challenges and their families are valued members of our communities; and (7) community transformation will last after grant funding ends.

72 In addition to the choices from one (not at all influential) to five (extremely influential), the respondents had the choice to answer six (I don’t know) to this question.

73 When partner \(i\) chose to answer six (I don’t know) for partner \(j\), average score of partner \(i\)’s rating for its partners was used as a replacement.
Trust. The network members were asked to rate each partner in terms of the overall quality of their working relationship with each partner on a scale from one (no working relationship) to six (very good). The quality of a working relationship between network members represents trust between them (Provan et al. 2009). The response matrix was transformed into a symmetrical 20 x 20 matrix with binary values (0 or 1). A cell \((i, j)\) in the matrix has a value “1” when partner \(i\) perceived that partner \(j\) was trustworthy — cell \((i, j)\) was equal or more than “5” and, at the same time, partner \(j\) also perceived that partner \(i\) was trustworthy — cell \((j, i)\) cell was equal or more than “5”. That is, the value “1” represents that both members in a pair consider that the other is trustworthy.

Length of involvement in the network. The response scale consisted of five categories: one (0 – 12 months), two (13 – 24 months), three (25 – 36 months), four (37 – 48 months), and five (more than 48 months). The geometric mean of their length of involvement was computed for each pair of members.

Meeting attendance. The network participants were asked how often they attended the meetings in which performance information was presented and discussed. The response scale consisted of seven categories from one (never) to seven (almost always). The geometric mean of their meeting attendance was computed for each pair of members.

Provan and his colleagues note that “[i]f partners report good relationships with a particular agency to which they are actually linked (i.e., a task-specific tie), then that agency is likely to be trusted. Trust is based on the confidence one party has in another that the other party will behave in a reliable manner . . . if the quality of relationships maintained by an agency is poor, it seems highly unlikely that that agency will be perceived as trustworthy by that agency’s linkage partners (Provan et al. 2009, p. 882).
**Organization type.** This measure is a symmetrical 20 x 20 matrix with binary values (0 or 1). The value “1” in a cell \((i, j)\) indicates that a pair of network members is the same type of organization (e.g., public agency, non-profit organization).

**Organizational resource.** The network participants were asked how many employees worked at least half time or more on services or programs related to the network. Then, the absolute value of the difference of the number of employees was computed for each pair of members.

**Cohesion.** Directly connected actors are likely to have similar behaviors, attitude, perceptions, and beliefs as one another due to learning and socialization effects, especially when they have strong relationships (Borgatti and Foster 2003; Borgatti and Halgin 2011a; Burt 1987; Friedkin 1984; Marsden and Friedkin 1993; Mizruchi 1993). This variable is a symmetrical 20 x 20 matrix in which a cell \((i, j)\) has a value “1” if partner \(i\) and partner \(j\) discussed system-level issues of the Faraway County system of care at least 2 – 3 times a month.

**Structural equivalence.** Actors who have similar patterns of relationships within their network are considered “structurally equivalent” (Borgatti and Everett 1992; Borgatti et al. 2013; Scott 2000; Wasserman and Faust 1994). Structurally equivalent actors are likely to develop similar behaviors; by occupying the same type of position within their network, they are likely to face and adapt to similar social pressures (Borgatti and Foster 2003; Borgatti and Halgin 2011a; Burt 1987; Friedkin 1984; Marsden and Friedkin 1993; Mizruchi 1993). Using a correlation algorithm,\(^7\) structure equivalence was computed from the “regular communication” matrix (a symmetrical 20 x 20 matrix), in which a pair of network participants received a value “1” if they

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\(^7\) I used UCINET to perform this algorithm.
discussed network system-level issues at least once a month. The larger the value in a cell \((i, j)\), the more structurally equivalent are partner \(i\) and partner \(j\).

### 3-3. Analytical method

I used a Quadratic Assignment Procedure (QAP) multiple regression implemented in a social network analysis program, “UCINET” (Borgatti et al. 2002) to analyze this dataset. QAP multiple regression is a nonparametric statistical analysis based on “resampling” to generate a sampling distribution and determine the significance level of a statistic (Borgatti et al. 2013; Hanneman and Riddle 2005; Snijders and Borgatti 1999). The results of QAP multiple regression can be interpreted similarly as those of standard multiple regression. All the variables in this study are relational data in a matrix format, which violates a basic assumption of standard regression, independence of observations. For instance, partner \(i\)’s tendency to list network challenges affects all the cells \((i, j)\) involving partner \(i\). This violation would cause autocorrelation problem within standard regression analysis. QAP multiple regression produces statistics that are robust to the effect of autocorrelation (Krackhardt 1987, 1988). Moreover, this study ran QAP multiple regressions, employing Double-Dekker Semi Partialling method, which is robust to the effect of collinearity (Dekker et al. 2007).

QAP multiple regression proceeds in two steps. First, a standard multiple regression analysis is performed, regressing cells of a dependent matrix on corresponding cells of independent matrices. Second, all the rows and matching columns are randomly permuted and a regression is re-run. This step is repeated hundreds of times (10,000 in this study) to generate distributions of coefficients of variables of interest. The significance of each coefficient is determined by comparing its coefficient from the first step with the generated distribution. When
the coefficient from the first step has an extreme value comparing with the generated distribution, for instance, less than five percent of random permutations have a value larger than the coefficient, the coefficient is considered statistically significant at five-percent level.

RESULTS

The association between performance information use and shared understanding among the Faraway County system of care members was first analyzed visually, using “NetDraw” (Borgatti 2002) embedded in UCINET (Figure 3-2(a), 3-2(b), and 3-2(c)). Each node represents a Faraway County system of care member; the node shape shows the network member types (e.g., public agency, non-profit organization); the node size in Figures 3-2(a) and 3-2(b) represents the extent to which each network member uses performance information for learning purposes. A thin line between a pair of the nodes indicates that the pair’s Jaccard similarity coefficient is more than 0.5, which means that partner $i$ and partner $j$ share more than half of the network challenges listed by either partner. A thick line linking a dyad indicates that the dyad has more than 0.5 Jaccard similarity coefficient, and the dyad uses local and national performance information in Figures 3-2(a) and 3-2(b), respectively; and, that the dyad has a more than 0.5 Jaccard score and uses both local and national performance information in Figure 3-2(c).

The network plots indicate that: (1) using performance information is not very closely associated with network learning, as thick lines are rarely present in the network plots; (2) but where thick lines are present, they tend to connect large nodes in Figures 3-2(a) and 3-2(b), indicating that performance information use is associated with network learning when used by pairs of network members using it for learning purposes; and, (3) the tendency described above
better matches Figure 3-2(a) than Figure 3-2(b), implying that local performance information may be more strongly associated with network learning than national performance information.

**Figure 3-2(a) Local Performance Information Use and Structure of Shared Understanding on Network Challenges among the Network Members**

Down Triangle = Community-Based Group  
Circle = Government Organization  
Up Triangle = Non-Profit Organization  
Diamond = Public School/School District  
Square = Network Administrative Organization  
Plus = Others
Figure 3-2(b) National Performance Information Use and Structure of Shared Understanding on Network Challenges among the Network Members

- Down Triangle = Community-Based Group
- Circle = Government Organization
- Up Triangle = Non-Profit Organization
- Diamond = Public School/School District
- Square = Network Administrative Organization
- Plus = Others

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Figure 3-2(c) Multiple Types of Performance Information Use and Structure of Shared Understanding on Network Challenges among the Network Members

- Down Triangle = Community-Based Group
- Circle = Government Organization
- Up Triangle = Non-Profit Organization
- Diamond = Public School/School District
- Square = Network Administrative Organization
- Plus = Others

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We now turn to the QAP multiple regression results to see whether, and under what conditions, using performance information contributes to network learning. Table 3-1 presents the means, standard deviations, and correlations among the variables used in the QAP multiple regression. Table 3-1 confirms the findings of the network plots, above. The correlation between performance information use and shared understanding is not strong, while the hypothesized local performance information variables (i.e., “local performance information”, “local performance information use x local performance information use for learning purposes”) correlate significantly with the “shared understanding” variable, at 10-percent level. On the other hand, the hypothesized national performance information variables do not. The “multiple types of performance information use” variable is just short of significance (p-value = 0.109).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Shared understanding</td>
<td>0.225</td>
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<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Local use</td>
<td>0.100</td>
<td>0.300</td>
<td>0.184</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. National use</td>
<td>0.058</td>
<td>0.234</td>
<td>0.089</td>
<td>0.593</td>
<td>1.000</td>
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<td></td>
</tr>
<tr>
<td>4. Local learning use</td>
<td>0.000</td>
<td>0.669</td>
<td>0.268</td>
<td>0.474</td>
<td>0.419</td>
<td>1.000</td>
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<td>5. National Learning use</td>
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<td>0.669</td>
<td>0.262</td>
<td>0.338</td>
<td>0.366</td>
<td>0.822</td>
<td>1.000</td>
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<td>6. Local use X Local learning use</td>
<td>0.095</td>
<td>0.307</td>
<td>0.214</td>
<td>0.928</td>
<td>0.657</td>
<td>0.504</td>
<td>0.374</td>
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<td>7. National use X National learning use</td>
<td>0.057</td>
<td>0.251</td>
<td>0.080</td>
<td>0.478</td>
<td>0.921</td>
<td>0.409</td>
<td>0.394</td>
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<td>8. Multiple use</td>
<td>0.047</td>
<td>0.212</td>
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<td>0.669</td>
<td>0.900</td>
<td>0.371</td>
<td>0.293</td>
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<td>-0.132</td>
<td>-0.103</td>
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<td>-0.326</td>
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<td>0.293</td>
<td>0.363</td>
<td>0.291</td>
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<td>0.499</td>
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<td>0.086</td>
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<td>14. Resource</td>
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<td>0.793</td>
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<td>0.292</td>
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<td>0.120</td>
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<td>0.027</td>
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<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
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<td>6. Local use X Local learning use</td>
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<td></td>
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<td>7. National use X National learning use</td>
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<td>1.000</td>
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<tr>
<td>10. Mutual dependence</td>
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<td>0.270</td>
<td>-0.211</td>
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<td>11. Trust</td>
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<td>0.041</td>
<td>-0.147</td>
<td>0.384</td>
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</tr>
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<td>0.127</td>
<td>0.185</td>
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<td>0.172</td>
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<table>
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<td>0.226</td>
<td>0.017</td>
<td>0.127</td>
<td>0.071</td>
<td>1.000</td>
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</table>

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Table 3-2 shows five models of the QAP multiple regression. The Base Model includes only control variables. Models 1 and 2 test the effect of using local performance information on network learning, that is, shared understanding on network challenges. Similarly, Models 3 and 4 test the effect of national performance information use. Finally, Model 5 tests the effect of using multiple types of performance information on network learning.
Table 3-2 Effects of Performance Information Use on Network Learning (N = 280)

<table>
<thead>
<tr>
<th></th>
<th>Base Model</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
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<tr>
<td>Intercept</td>
<td>.195***</td>
<td>.271***</td>
<td>.331***</td>
<td>.202***</td>
<td>.261***</td>
<td>.222***</td>
</tr>
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<td>-.020**</td>
<td>-.018*</td>
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<td>-.047**</td>
<td>-.033</td>
<td>-.037*</td>
<td>-.036*</td>
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<td>-.071</td>
<td>-.071*</td>
<td>-.077*</td>
<td>-.087*</td>
<td>-.068</td>
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<tr>
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<td>.044</td>
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<td>Cohesion</td>
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<td>-.190**</td>
<td>-.113</td>
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<td>-.254**</td>
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<td>-.073</td>
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<td>Local use X Local learning use</td>
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<td></td>
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<tr>
<td>Multiple use</td>
<td></td>
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<td></td>
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<td></td>
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<td>R-Squared</td>
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Note: *=p < .1, **=p < .05, ***=p < .001
4-1. Effects of using local performance information on network learning

Hypothesis 1 predicts that network learning is more likely to occur among network members when they use performance information during interactions and communication. As shown by Model 1 in Table 3-2, the “local performance information use” variable has positive and significant impact on network learning (5% level of significance). Thus, the data supports Hypothesis 1. The result indicates that when a pair of network members uses local performance information, their level of shared understanding increases by 0.189 units. Given that the mean of the “shared understanding” variable is 0.225, when a pair of network members uses local performance information, their level of shared understanding is expected to increase by 84% (0.189/0.225).

Hypothesis 2 predicts that the effect of performance information use on network learning is moderated by using performance information for learning purposes. Model 2 in Table 3-2 tests the moderating effect by introducing the interaction term between “local performance information use” and “local performance information use for learning purposes.” As shown in Model 2, the coefficient of the interaction term is positive and significant at the 10% level. The result suggests that using local performance information for learning purposes does moderate the impact of using local performance information on network learning. The result indicates that the level of shared understanding between a pair of network members increases by 0.281 when the interaction term increases by one unit. Given that the mean of the “shared understanding” variable is 0.225, one-unit increase of the interaction term is expected to increase the level of shared understanding between a pair of network members by approximately 124.89% (0.281/0.225).
4-2. Effects of using national performance information on network learning

Models 3 and 4 examine the effect of using national performance information on network learning, in the same manner that local performance information was examined. In Model 3, the coefficient of the “national performance information use” variable has a positive sign, but is not statistically significant. Therefore, the data does not support Hypothesis 1 concerning national performance information. In Model 4, the coefficient of the interaction term between “national performance information use” and “national performance information use for learning purposes” has an unexpectedly negative, though statistically insignificant, sign, suggesting that Hypothesis 2 is not supported by the data regarding national performance information. These results indicated that using national performance information is not associated with the development of shared understanding among the network members.

4-3. Effects of using multiple performance information on network learning

Hypothesis 3 predicts that network learning is likely to occur among network members when they use multiple types of performance information during interactions and communication. As shown in Model 5 in Table 3-2, the “multiple types of performance information use” variable has a significantly positive impact on network learning (5% level of significance). Thus, Hypothesis 3 is supported by the data. The result indicates that when a pair of network member use both local and national performance information, their level of shared understanding increases by 0.267 units. Given that the mean of the “shared understanding” variable is 0.225, when a pair of network members use both local and national performance information, their level of shared understanding is expected to increase approximately by 118.67% (0.267/0.225).
DISCUSSION AND CONCLUSIONS

The purpose of this study was to explore whether and under what conditions using performance information facilitates network learning in collaborative networks, and in particular, the development of shared understanding. While extant research on performance management has suggested that performance information use is a key to successful performance management (Moynihan 2008a, 2008b; Van Dooren and Van de Walle 2008), the effect of performance information use has not been fully explored, even in single organizational settings (Bryson 2012; Kroll 2015a, 2015b; Moynihan 2009; Moynihan et al. 2011), and certainly not in network settings. To bridge the gap, this study explored two research questions: (1) does use of performance information facilitate learning in collaborative networks; and (2) under what conditions does performance information use facilitate learning in collaborative networks?

Analysis of the data answers these questions about the effect of performance information use on network learning in collaborative networks. First, using performance information during interactions and communication is associated with network learning in collaborative networks, although the presence or absence of the effect is dependent on the types of performance information. Second, using performance information is likely to be associated with network learning when: (1) it is used by network members for learning purposes (understanding problems, their causes and potential solutions), and (2) multiple types of performance information are used.

One interviewee’s comment provides an explanation for the association between network members’ use of performance information during interactions and communication and network learning:
You know, local evaluations were giving us data that was telling us what was changing essentially in our system. And we were trying to use that to discuss with all of our partners about where we’re trying to move the system to . . . there were four county departments that were serving kids’ mental health: youth bureau, employment and training, probation, and DSS [Department of Social Services]. You would get data coming in; it was telling you something. That doesn’t mean that my interpretation of that data was shared by the other four county departments at the same time. I mean they could see things very differently, so a lot of it really heavily depended upon what we could gain consensus of. For example, probation had very, very different goals and targets than mental health did. I mean, probation wanted to supervise kids to make sure the community was safe. Mental health wanted to empower kids and allow them to improve life going forward. DSS was very heavily engaged in safety of children. These are very difficult things to get to match, so the local evaluation was definitely helpful. It changed it for a lot of us to get the accurate perception of things, and what was occurring, and then we use that perception to try to build common ground with our partners.

The comment suggests that it is essential for network members to collectively make sense of performance information in interactions and communication in order to develop shared understandings, because they are likely to differently interpret performance information due to their different (even conflicting) goals, strategies, perceptions, and ways of working. When network members individually interpreted performance information, they would understand it differently, and interpret it differently regarding how well they were doing, and what they should
do going forward. Sanderson (2002) points out, “[i]f evaluation is to fulfill its potential for
driving policy learning, it must be fully integrated into the ongoing discourse” (p. 19).

Why does using local performance information affect network learning but using national
performance information does not? Interview data implies that local and national evaluations
provide the network members with different types of information, useful for different types of
learning. One network member described their difference as follows: “I think that some of the
local evaluations kind of home down to some of these specific outcomes in terms of the
practices. The national evaluations really just give us more of an overall picture of how our
system is functioning.” Another member commented: “I pay attention to the national numbers
just for matter of how we are stacking up at the national level . . . Let’s figure out what it is that
we can do better in terms of our national stand.” March (1991) differentiates two types of
learning: exploitation and exploration: “[t]he essence of exploitation is the refinement and
extension of existing competencies, technologies and paradigms . . . The essence of exploration
is experimentation with new alternatives (p. 85). Those interviewees’ comments imply that
network members use national performance information for exploration, to find hints or new
ideas for how to improve their performance. They use local performance information for
exploitation, to identify and solve real problems in their practices. Exploitation is more likely to
generate shared understanding than exploration, because it is concerned with concrete and
ongoing practices in which network members are engaged. In addition, network members need
to develop shared understandings about their practices in order to improve, continuously, the
services they offer.

The second set of findings clarifies the conditions under which performance information
use is likely to be associated with network learning. The first condition is using performance
information for learning purposes. Actors use performance information for advocacy as well as learning purposes during interactions and communication (Moynihan 2008a, 2008b). While they may use performance information to advocate and legitimatize their goals, strategies, and perceptions by presenting information that supports their arguments (i.e., advocacy use), they may also use it collectively to understand problems, their causes, and potential solutions (i.e., for learning) (Moynihan 2008a, 2008b). It is when performance information is used for learning that it has positive effects on network learning (Moynihan 2005, 2008a, 2008b; Moynihan and Landuyt 2009). An interviewee’s comment supports this result. When asked if using performance information helped network members to have shared understanding, she answered:

Any data collected could be perceived in numerous different ways. And, I think, what happens is that we are never sitting alone at the table when we review data. So, we come to some sort of consensus about what we feel it means . . . I think what makes us unique is that we come together to interpret. And so, somebody will say, “Well, I think that means this,” and “I think that means that,” and whatever. We’ll kind of talk that up for a while until we really, kind of, come to some sort of a consensus on it, and then determine what we should do or not . . . Data is important for us to understand how we’re doing as a community . . . but you need more than that. I think you need a deeper understanding of where people are coming from, and to have those conversations.

The second condition is using multiple types of performance information — network learning is likely to occur when network members use various types of performance information. Although performance information does not give comprehensive or unambiguous problem definitions and solutions to network members (Moynihan 2008a, 2008b), it can offer them a
clearer understanding of their performance and challenges by combining and triangulating different types of performance information (Askim 2004; Greiling and Halachmi 2013). Different types of performance information could complement one another to foster network learning and shared understanding among network members.

Besides performance information use, network members with similar goals are likely to have shared understandings. The “goal dissimilarity” variable is significantly negative in all the models in Table 3-2. One explanation is that network members with similar goals are likely to have shared understanding because of the homophily effect, that “birds of a feather flock together” (McPherson et al. 2001, p. 417). Since homophilous actors find it easy to communicate with each other (Brass 1995; Roger 2003), they could also more easily develop shared understandings based on broad-scope and fine-grained information exchanges than their heterophilous (birds of different feathers) counterparts. In addition, network members with similar goals are more likely than those with different goals to be motivated to cooperate and coordinate with one another to achieve their (common) goals. In the process of working together, they are also likely to develop shared understandings, because that is essential to understanding one another, agreeing on what to do, and creating collaborative advantage.

Unexpectedly, pairs of network members in mutually dependent as well as trust relationships are less likely to have shared understanding on network challenges. The “mutual dependence” and “trust” variables are negative and significant in most models in Table 3-2. When they are not statistically significant, their effects are just short of statistical significance at 10-percent level. Extant research considers that mutual dependence and trust are a sign of positive relationships among network members (e.g., Ansell and Gash 2008; Bryson et al. 2006; Edelenbos and Klijn 2007; Emerson et al. 2012; Gray 1989; Gulati and Sytch 2007; Huxham and
However, this study gives a warning that network members do not necessarily develop shared understanding even if they have such positive relationships. As mentioned, shared understanding is especially important for collaborative networks that implement public policies and provide public services because they need to coordinate their activities and operations to achieve specific goals (O’Toole et al. 1997). Therefore, these results suggest that collaborative networks should not be satisfied with developing positive relationships, but, to increase success in implementing public policies and providing public services, should also make the effort to develop shared understanding among their members.

This study has limitations. First, its findings are not generalizable. It is not reasonable to generalize the findings from this case of a network addressing one specific policy area to collaborative networks in other settings. Second, the argument in this study of causal relationships is theory-based; reliance on cross-sectional data limited its ability to specify causal relationships between the dependent and independent variables. In order to mitigate this limitation, interview data was collected to complement the statistical analysis. However, collecting longitudinal data would have helped specify and study causality in this case. Finally, the study uses “shared understanding of network challenges” to measure learning among network members. While shared understandings are important for members’ collective action and network performance (Dewulf et al. 2011; Gray 1989, 2004; Nowell 2009, 2010), they are only one aspect of network learning. Other important aspects, or indicators, of network learning include producing efficient outputs, delivering effective outcomes, and providing innovative services. Moreover, members gaining shared understanding may not lead inevitably to effective

[C]ollaborative institutions indirectly increase levels of consensus by changing collective-action beliefs, but may not change levels of cooperative behavior. Symbolic policy would predict exactly this pattern — creating the perception of consensus, without the behavioral follow-through. Cooperative behavior may be linked to a set of political, economic, or social constraints that insulate it from both changes in beliefs and the emergence of collaborative processes (p. 565).

A network member echoes the warning as follows: “I would love to tell you that the data tells a story, but there are politics, there are other things occurring, so [there are] a lot of other variables, other than just what’s working and what’s not.” In addition, too much shared understanding could negatively affect decision-making processes and consequently network performance, because of “groupthink” — suppressing alternative ideas and perspectives that diverge from shared understanding that was established at the beginning stages of collaboration (cf., Janis 1982).

Keeping such limitations in mind, the findings do carry academic and practical implications. Research on network management acknowledges that performance management is an essential management tool for collaborative networks (Agostino and Arnaboldi 2015; Bryson et al. 2006; Imperial 2004; Koliba, Campbell et al. 2011; Koliba et al. 2010; Page 2004, 2008). However, it is unclear whether performance management works in collaborative networks, wherein complexity poses many challenges to performance management. Multiple actors with diverse goals, strategies, perceptions, and ways of working are unlikely to develop unified goals,
agree on performance measures, and differently interpret performance information (Frederickson and Frederickson 2006; Koliba et al. 2010; Koliba, Mills, et al. 2011; Moynihan et al. 2011; Provan and Milward 2001). By demonstrating that performance information use helps the development of shared understanding among network members, this study provides empirical evidence that performance management could be appropriately employed in collaborative networks to facilitate greater cooperation and coordination that can lead to producing more satisfactory network performance. The findings of this study also contribute to the research on performance information use, in that they offer empirical evidence that using performance information makes a positive impact, even in such complex settings as collaborative networks, wherein using performance information is more challenging than in single organizations.

Practical implications of this study include demonstrating how to use performance information in collaborative networks for improved network processes and performance. First, since using multiple types of performance information leads to network learning, it is a good practice to include more than one type of performance information in interactions and communication among network members. The actors, given the opportunity to combine and triangulate various performance information, gain a clearer idea about their network’s performance and challenges. Second, this study indicates that network managers, or network administrative organizations, should use performance information for the purpose of member learning when they communicate such information, since the effect of using performance information on network learning is affected by the extent to which it is used specifically for learning purposes. Finally, since performance information use contributes to network learning independent of social relationships such as shared goals, mutual dependence, and trust, this study suggests that performance information could be used to foster shared understanding at the
beginning stages of network development, before positive (or negative, for that matter) social relationships have had much time to develop. At the start, network members need to share understandings about the challenges and problems the network faces, in order to clarify their goals, plans, and strategies, and to coordinate their activities. Network members could use extant performance information to foster shared understandings at the beginning of their collaboration.
CONCLUSION

This study aimed to explore antecedents and consequences of performance information use in collaborative networks, focusing on the effects of network members’ interaction patterns and relational characteristics on performance information use. It relied on network perspective, the most distinctive characteristic of which is its focus on relationships and patterns of the relationships among actors (Borgatti et al. 2013; Borgatti and Foster 2003; Borgatti and Halgin 2011a; Brass et al. 2004; Kilduff and Brass 2010; Kilduff and Tsai 2003; Scott 2000; Scott and Carrington 2011; Wasserman and Faust 1994). The perspective helps to bore down into metaphorical understanding of collaborative networks and capture how interaction patterns and relationships among network members are associated with performance information use (cf., Dowding 1995; Emirbayer and Goodwin 1994; Rethemeyer 2005).

Using a case of the Faraway County system of care which was an “action network” (Agranoff 2007) wherein network participants engaged in collective decision making and service provisions to mentally ill children and youth, and used two types of performance information to support decision making and adjust service activities (i.e., local and national evaluations), this study addresses three research questions:

Research Question 1: Is performance information used in collaborative networks?
Research Question 2: Is performance information used for learning purposes in collaborative networks?
Research Question 3: Does use of performance information facilitate network learning in collaborative networks?
This concluding chapter: (1) summarizes and integrates findings of this study, (2) draws academic and practical implications, and (3) presents limitations of this study and possibilities of future research.

SUMMARY OF FINDINGS

This collaborative network shows both similarities and differences of patterns, antecedents, and consequences in using local and national performance information. Figures C-1(a) and C-1(b) summarize the findings on the use of the two types of information, respectively. They also demonstrate five characteristics of performance information use in collaborative networks: (1) network members are heterogeneous in terms of performance information use, (2) their interaction patterns and relational characteristics affect performance information use, (3) different factors affect the use of different types of performance information, (4) using performance information contributes to the development of shared understanding among network members, and (5) different types of performance information have different functions in collaborative networks.
1-1. Heterogeneity of performance information use among network members

Both local and national performance information are used during interactions and communication among network members; moreover, network members use both types for learning purposes during interactions and communication. However, not all network members
use performance information in the same manner. Some network members use it in
communication with many partners while others do not. Since the patterns of local and national
performance information use are highly correlated (see Essay One), this study concludes that
active users of performance information tend to use both local and national performance
information in communication with many partners while passive users tend not to use either of
them. The similar pattern is found as to using performance information for learning purposes.
Network members are categorized into two groups with respect to using performance
information for learning purposes: one actively uses performance information to understand
problems, their causes and potential solutions; and the other does not. Since the two types of
performance information are also highly correlated in terms of using it for learning purposes (see
Essay Two), both types of performance information are used for learning by some network
members while neither type is used for learning by others.

1-2. Effects of interaction patterns and relationships on performance information
use
Interaction patterns and relational characteristics among network members are associated with
performance information use. Both local and national performance information are likely to be
reciprocally used in frequently communicating pairs of network members; also, both types of
information are likely to be used among mutually dependent members. In addition, structurally
equivalent network members are similar in using national performance information; members in
central positions tend to use local performance information for learning purposes. These findings
suggest that with whom collaborative network members communicate, what positions they
occupy within their network, and what relationships they develop affect performance information
use.
1-3. Different antecedents of using different types of performance information

Some factors are associated with both local and national performance information use. However, despite their very similar patterns of use, there are different factors that affect the use of the two types of performance information. As mentioned above, while structurally equivalent network members are similar in using national performance information, in terms of using local performance information, they are not. Also, central members tend to use local performance information for learning purposes but their centrality does not affect using national performance information for learning purposes. These differences relate to (perceived) performance information characteristics. For instance, local performance information is considered critical to good decision making in the Faraway County system of care while national performance information is considered a less immediately relevant source of guidance. Therefore, central network members rely more on local performance information for learning purposes than on national performance information in making decisions and improving operations as they strive to better serve their clients by using performance information to identify, discuss, and address problems. Similarly, the finding that structurally equivalent network members use national performance information similarly, but not local, can be explained by differences in the two types of information. Structurally equivalent members in certain network positions (i.e., central positions) are expected and likely to use national performance information because national performance information addresses the over-arching functioning and performance of the system of care for which they are responsible, and its comparison to other systems of care nation-wide.
1-4. Consequences of using performance information

Using local performance information contributes to the development of shared understanding among network members, especially when performance information is used between pairs of network members using it for learning purposes. Additionally, using multiple types of performance information (i.e., both local and national performance information) leads to the development of shared understanding. These findings suggest that using performance information contributes to improving network processes, outputs, and outcomes, by helping network members reach shared understating, which facilitates their cooperation and coordination to create collaborative advantage.

1-5. Different consequences of using different types of performance information

As mentioned above, using local performance information is associated with the development of shared understanding among network members. On the other hand, using national performance information alone does not contribute to the development of shared understanding. This difference could result from the two types of information serving different functions. March (1991) differentiates two types of learning, exploitation and exploration: “[t]he essence of exploitation is the refinement and extension of existing competences, technologies, and paradigms. Its returns are positive, proximate, and predictable. The essence of exploration is experimentation with new alternatives. Its returns are uncertain, distant, and often negative.” (p. 85). This study suggests that network members might use national performance information for exploration, to find hints or new ideas on how to improve performance; whereas they might use local performance information for exploitation, to identify and solve real problems in operations and practices. Exploitation is more likely to generate shared understanding than exploration,
because it is concerned with concrete and ongoing practices in which network members are engaged. In addition, network members need to develop shared understanding about their practices in order to continuously improve the services they offer.

In sum, performance information is used in collaborative networks during interactions and communication among network members. However, network members use performance information in individual ways. Some network members use it with many partners while others do not. Some use it for learning purposes to understanding problems, their causes and potential solutions, while others do not. Such heterogeneities among network members in performance information use are associated with interaction patterns and relational characteristics. Eventually, by using performance information, and in particular for learning, network members could develop shared understanding.

IMPLICATIONS

2-1. Academic implications

This study provides implications for research on network management, as well as on performance information use. As for network management research, this study has three implications: (1) performance management can be an appropriate network management tool, (2) a limited number of network members use performance information, and (3) collaborative capacity and performance management develop in a co-evolutionary manner.

First, extant studies on network management have investigated how to measure network performance, paying little attention to the use of resulting performance information. Using performance information helps members improve decision making and adjust implementation
activities, and therefore, is a key to successful performance management (Moynihan and Hawes 2012; Moynihan and Pandy 2010; Van Dooren 2008). Yet, whether performance management works properly in collaborative networks has been unclear. All the three essays in this study provide support for the appropriate application of performance management in collaborative networks. Essay One shows that performance information is used during interactions and communication among network members. Essay Two demonstrates that among network members, performance information is used for learning purposes, which is the main rationale for implementing performance management in collaborative networks (Head 2008; Hetting and Vedung 2012; Koppenjan and Klijn 2004; Mandell and Keast 2007; Van der Meer and Edelenbos 2006). (Performance information helps network members gain a holistic understanding of complex public problems and come up with innovative solutions for such problems). Finally, Essay Three indicates that using performance information contributes to the development of shared understanding, which facilitates cooperation and coordination among network members to heighten collaborative advantage. Using performance information especially helps the framing and mobilizing functions of network management: framing facilitates integration among network members by promoting shared goals, perceptions, and rules; mobilizing elicits commitment from network members to achieve those goals (Agranoff and McGuire 2001; McGuire 2002). Performance information contributes to the development of shared understanding as mentioned above (i.e., framing); also, Essay One shows that performance information can be used to induce cooperation from uncooperative members, convincing them to provide their resources and supports to joint efforts (i.e., mobilizing).

By conceptualizing collaborative networks as a black box, existing studies on performance information use in collaborative networks implicitly assume that all participants use
performance information in the same way. Another implication of this study comes from demonstrating that only a limited number of network members engages in performance management in collaborative networks to collectively discuss and make sense of performance information. Koliba (2014) recommends that “[b]y breaking networks down into their sub-assemblages, we may then draw on Elinor Ostrom’s conception of ‘action arenas’ as spaces within networks where critical decision making occurs (1990) . . . These action arenas are the spaces within the network where performance data are collected and used” (p. 96). To open the metaphorical black box, this study relies on the network perspective, and finds that some members actively use performance information but not others (Essay One), and that central network members in particular tend to use performance information for learning purposes (Essay Two). A potential explanation for such findings is that the involvement of many actors in network processes results in inefficiency due to increased cooperation and coordination costs (McGuire and Agranoff 2011; Provan and Kenis 2008; Scharpf 1988). For instance, it is too time-consuming for all network members to discuss and make sense of performance information and develop shared understanding. Provan and Lemaire (2012) argue, “effort should not be made to integrate all organizations into one dense set of relationships. Rather, emphasis should be placed on selective integration based on a mix of close, dense ties (closure) among organizations” (p. 644). Another, related, explanation may be that the involvement of a limited number of network members in performance management is sufficient to improve decision making and operations in collaborative networks because “a dominant core within the network may drive how the network develops and/or evolves . . . Key organizations can shape the evolution of the network by focusing time and energy on educating stakeholders and other organizations within the network” (Provan et al. 2007, pp. 502–503).
Finally, collaborative capacity development and performance management are co-evolutionary processes. On one hand, interaction patterns and relational characteristics significantly help build collaborative capacity by facilitating cooperation and coordination among network members. The interaction patterns and relationships are associated with performance information use among network members (Essay One and Two; also see Appleton-Dyer et al. 2012; Imperial 2004; Page 2004, 2008; Zia et al. 2015). On the other hand, performance management contributes to collaborative capacity development by promoting shared understanding among network members. This implication is in line with Imperial (2004):

The strategies are mutually reinforcing because collaborative processes can be used to develop performance measures and can improve monitoring and reporting processes. Performance management can motivate organizations to work together to achieve collective goals and encourage partners to adhere to agreements developed using collaborative processes (p. 6).

Regarding research on performance information use, this study offers three implications. First, collaborative capacity and performance information characteristics matter in relation to the use of performance information in collaborative networks. While existing studies have not fully explored what factors lead to performance information use in collaborative networks (Agostino and Arnaboldi 2015; Appleton-Dyer et al. 2012; Imperial 2004; Moynihan et al. 2011), this study finds that interaction patterns and relational characteristics among network members, which are an important part of collaborative capacity, affect performance information use (Essay One and Two). In addition, Essay Two finds that network members’ positive perception of performance information leads to performance information use for learning purposes. The findings are a
response to the big question of performance management: why performance information is used (Moynihan and Pandy 2010) in collaborative networks, an increasingly important context (Pandy 2015).

The second implication is that using performance information generates positive impact to improve network processes, outputs, and outcomes. Effects of performance information use have not been fully studied in single organizational settings (Bryson 2012; Kroll 2015a, 2015b; Moynihan 2009; Moynihan et al. 2011), or in more complex network settings. Essay Three shows that using performance information contributes to the development of shared understanding, which facilitates cooperation and coordination among network members (Ansell and Gash 2007; Chisholm 1996; Innes and Booher 1999; Koppenjan and Klijn 2000; Van Buuren 2009) and leads to satisfactory network performance (Gray 2004; Klijn et al. 2015; Nowell 2009, 2010).

The final implication is that different types of performance information function differently in collaborative networks. While various types of performance information are generally produced for use in collaborative networks (Koliba, Campbell et al. 2011), their respective impact had not been clearly demonstrated. Essay Three suggests that the different types of information produced through local and national evaluations enhance different types of learning in collaborative networks. As discussed previously, the study indicates that network members use national performance information for exploration, to find a hint or new idea of how to improve performance, and local performance information for exploitation, to identify and solve problems in joint practices.
2-2. Practical implications

This study provides three practical implications for promoting performance information use and its effects in collaborative networks. First, it finds that collaborative capacity affects performance information use among network members, as mentioned above. This suggests that the mere availability of performance information is insufficient to facilitate the use of performance information in collaborative networks. Consistent with performance information use in single organizations (e.g., Cousins et al. 2014; Moynihan and Pandy 2010), this finding indicates that both a supply-side approach, such as providing relevant and credible performance information, and a demand-side approach, such as improving organizational capacity to use performance information, are necessary to enhance performance information use in collaborative networks. Thus, it is recommended, for effective performance management of collaborative networks, to both improve collaborative capacity and ensure that the performance information provided is relevant and reliable.

Second, since participants in collaborative networks are likely to use performance information for learning purposes when they perceive the merits of using it, it is recommended that performance management should take network members’ goals and interests into account, to influence members to see the merits of using performance information for learning. Members’ involvement in performance measurement and evaluation processes increases their perception that performance information is relevant and credible, and consequently they are more likely to use it for learning purposes (Mandell and Keast 2007; Patton 1997).

Finally, since collaborative capacity development and performance management are co-evolutionary processes that reinforce each other, this study recommends that performance information should be used to foster shared understanding from the beginning stages of network
development. At the start, network members need to share understanding about the challenges and problems the network faces in order to clarify goals, plans, and strategies, and to coordinate activities. In return, strengthened collaborative capacity, based on this early shared understanding, will positively affect performance information use among the members, because effective performance management reflects network members’ shared understanding of what is important and what is appropriate (Sydow 2004; Sydow and Windeler 1998).

LIMITATIONS AND FUTURE RESEARCH

As with most studies, this study has limitations worth noting. First, the findings of this study might not be generalizable. It is not reasonable to generalize findings from one case, in one policy arena, to collaborative networks in other policy contexts (Isett et al. 2011). Moreover, performance management practices differ in various policy contexts, in relation to the difficulty (or ease) of observing and measuring performance (cf., Wilson 1989), and the acceptability of performance management practices (Askim et al. 2008). Members in health and human services networks, such as the one studied here, are generally willing to work together to promote clients’ well-being (Romzek et al. 2012, 2014). This study’s findings might not be applicable to performance information use among network participants addressing, for example, environmental or economic development issues, where they are likely to have more highly competitive and conflicting interests (Berardo and Scholz 2010; Feiock and Scholz 2010; Lee et al. 2012). Since network management tools contribute to performance improvement only when they are used under favorable circumstances (Kelman et al. 2013), it would be enlightening to conduct studies similar to this in different policy contexts in order to determine if performance management is an appropriate network management tool.
Second, this study’s reliance on cross-sectional data limits its ability to specify causal relationships between the dependent variables and the independent variables in all the three essays. For instance, social contagion effect cannot be separated from social selection effect (Shalizi and Thomas 2010). In Essay One, it is assumed that network members’ interaction patterns influence performance information use (i.e., social contagion effect). However, the causal direction might be the opposite: use of performance information by a pair of network members might lead to more frequent interactions and communication because using performance information enriches communication between them (i.e., social selection effect). The argument of causal relationships in this study is based solely on theory. In order to mitigate this limitation, this study uses interview data to complement the statistical findings. However, it would be enlightening to collect longitudinal data, in order to specify causality in a future study. Furthermore, social network analysis researchers have developed an analytical technique to investigate co-evolutionary processes between network members’ interaction patterns and behaviors (Snijders et al. 2010). By collecting longitudinal data, it becomes possible to understand the co-evolutionary developmental processes between collaborative capacity and performance management in collaborative networks more precisely.

This study’s use of a single respondent per network member to examine performance information use leads to another potential limitation. I sought to mitigate the effect of this limitation by selecting the highest administrators as survey respondents: (1) since they represented their organization to participate in network-level decision-making processes, it was expected that performance information was generally used during interactions and communication among them; (2) since it is known that organizational leaders affect performance information use of their subordinates (Dull 2009; Moynihan and Ingraham 2004), their
subordinates use performance information in a similar manner to them even when their subordinates participate in the decision-making processes. The working assumption here is that the highest administrators’ use of performance information would characterize performance information use among network members in general. However, by relying on single respondent per network member, this study might have missed information about performance information use in collaborative networks.

Fourth, this study focuses on the use of formally-produced performance information — local and national performance information. However, informal performance information such as feedback from network partners and outsiders (e.g., clients, politicians) is used as well (Kroll 2013; Sydow 2004); moreover, they are often more extensively used than formal performance information (Kroll 2013; Mintzberg 1973). Focusing on the use of formal performance information, this study might imperfectly capture performance information use among network members. Future study should collect data on the use of informal as well as formal performance information, and compare and contrast the two types of information.

Finally, while the ultimate objective of using performance information is to improve performance (Behn 2003), this study does not examine whether using performance information positively affects network performance. Essay Three shows that using performance information facilitates network learning among network members — the development of shared understanding. However, network learning does not necessarily lead to effective network performance such as producing efficient outputs, delivering effective outcomes, and providing innovative services, as McGuire and Agranoff (2011) (also see Lubell 2004) note: “too often, networks find reasonable solution approaches, but then run into political, financial, or legal
barriers that prevent the next action step. Although not well understood, the policy barriers to network success is one of the most logical and most powerful” (p. 269).

In conclusion, more work needs to be done to fully understand antecedents and consequences of performance information use in collaborative networks. However, focusing on the effects of interaction patterns and relational characteristics among network members to explore the factors affecting performance information use and the effects resulting from it, this study provides a solid step in moving this research agenda forward and offering generative ideas for future research.
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