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Knowledge Mobilization and Network Ambidexterity in a Mandated Healthcare Network

A CLAHRC Case Study

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CHAPTER SUMMARY

This chapter explores the role of mandated networks in supporting knowledge mobilization. It applies a social network lens to one such network—CLAHRC-NET, which was part of a wider initiative within the UKs NHS. The focus of his chapter is on the ability of mandated networks to provide the combination of different network structures needed for knowledge mobilization. Such structures, which have been described in the social network literature as "brokerage," and "closure," are seen as supporting knowledge mobilization in two ways. Brokerage, which involves linking disconnected groups, is seen as valuable in knowledge "exploration"; that is, acquiring and creating new knowledge. Closure, involves the development of tight-knit groups of individuals, and is seen as helping to exploit such knowledge by embedding it within practice. In our research, by using an innovative combination of research methods, we were able to identify how CLAHRC-NET was able to achieve a balance between mutually reinforcing structures of brokerage and closure; a state we term "network ambidexterity." We further show how the emergence of these patterned social network ties was linked to the formal management structure and organization of CLAHRC-NET, with formal "Knowledge Broker" roles helping to create linkages between external sources of knowledge and information, and internal organized thematic work-groups that provided a focus for the embedding of new ideas in practice. The study thus highlights the scope for mandated networks to support knowledge mobilization through formal structures and roles that promote ambidexterity in the development of social ties. This has important implications for policy and practice in relation to the design of such

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networks. The chapter also serves to underline the value of a social network perspective for addressing the informal social dynamics of formally mandated networks.

7.1 Introduction

This chapter addresses one of the most critical questions concerning attempts to overcome the "knowing–doing gap" within a healthcare environment. This is the question of whether networks of collaborating organizations can be constructed to provide an effective mechanism for "knowledge mobilization" between domains of research and practice. The promise of such "mandated networks" has been widely touted in the healthcare management literature, but evidence on their ability to deliver valued outcomes remains mixed.

In this chapter, we address this question by drawing on some well-established concepts from social network theory—namely, "brokerage," "closure," and "structural holes"—to explore the capacity for mandated "knowledge mobilization" networks to enable both the exchange of knowledge and its implementation within practice. Networks that possess this capacity can be termed "ambidextrous." This property, which has been analyzed in some detail by Oborn et al. in Chapter 5, is important since it involves the ability to simultaneously accommodate processes of exploration and exploitation. By applying a social network lens to an empirical case drawn from the UK NHS (National Health Service), we aim to address the broad question of mandated networks' support for knowledge mobilization, and in particular their ability to develop the ambidextrous capacity seen as so vital to that objective.

A further question that arises from the focus of our study is the character of the interaction between the formal structures (divisions of work and responsibility, role assignments and management hierarchy) associated with mandated networks and the emergence of informal social ties. This interplay has been recognized as important in Ferlie et al.'s recent review of networks in healthcare (Ferlie et al., 2010). This distinguishes between "mandated," "organic," and "hybrid" networks—the latter being an amalgam of the others. Beyond this initial recognition, however, as yet we know comparatively little about the interplay between formal structures and informal social ties or, most importantly given the focus of this chapter, the consequences that this may have for knowledge mobilization. A second aim of this chapter then is to seek to better understand that interplay through the use of a social network perspective.

The need to address these questions arises in part because the attention paid to social networks in organization studies has not, so far, been matched by work in the healthcare management field. Here, recent studies, with relatively few exceptions, have focused on mandated networks associated with policy

interventions (Martin, Currie, and Finn, 2009; McAneney et al., 2010). Only in more recent work do we find social network analytical techniques being applied to uncovering the latent structure of informal ties between groups and individuals (Currie and White, 2012). However, given our growing under-standing of the importance of social ties, coupled with recognition of the limitations of formal structures, we see a compelling need for research on informal network dynamics and how these underpin initiatives aimed at knowledge mobilization.

In this chapter we aim to show how applying a social network perspective can help us to address this need. To show the value of such a perspective we ground our research in an empirical study of a knowledge mobilization initia-tive in the UK, the CLAHRC (Collaborations for Leadership in Applied Health Research and Care) initiative over the period 2009–13. The CLAHRC initiative was the National Funding Body's largest investment in knowledge mobiliza-tion to date, encompassing £90 million funding for nine regionally-based CLAHRCs. The CLAHRCs were designed as environments that would speed knowledge mobilization between research and practice. They were based on partnerships between a diverse range organizations within the same geo-graphic locality, including universities, local healthcare organizations (e.g. acute hospitals, mental health trusts, and primary care trusts), and other relevant groups (e.g. local authority, third-sector organizations, and charities). These partnerships supported collaborative projects that linked academic researchers with healthcare managers and a range of medical practitioner groups.

The chapter begins with a review of the literature on social networks as relevant to knowledge mobilization efforts. Subsequently, we outline some findings from our study of the CLAHRC iniative in the UK, and this leads to a discussion and conclusion which draw out the theoretical and practical impli-cations of those findings. Important contributions from our study are a greater understanding of the role of different social network structures in knowledge mobilization, and insights based on empirical evidence on the value of "ambi-dexterity" in the development of mandated networks.

7.2 A Social Network Perspective on Knowledge Mobilization in Mandated Networks

From an organizational perspective, knowledge mobilization has been seen as requiring the development of linkages among a range of collaborating organizations. This reflects a recognition that the knowledge needed to support problem solving and change tends to be distributed within and between organizations and thus emanates from multiple disparate sources

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(McAneney et al., 2010). As a result, policy-driven initiatives aimed at promoting knowledge mobilization typically involve the development of formal network arrangements. In the UK's NHS, such initiatives include including Diagnostic Evidence Co-operatives and Academic Health Science Networks. These kinds of policy interventions are typically based on the assumption that supporting new forms of highly networked collaboration will result in better knowledge sharing between professional groups and, as a result, the speedier translation of research evidence into practical applications.

As evidence has begun to accumulate on such initiatives, a recent systematic review of knowledge mobilization in healthcare organizations raised some concerns about the assumed advantages of such "managed" or "mandated" networks (Crilly, Jashapara, and Ferlie, 2013). This review found that the effectiveness of such networks rested upon the quality of the relationships that they promoted rather than their formal structure. For example, low-trust relationships in networks can lead to poorer knowledge sharing than high-trust relationships in hierarchies (Crilly, Jashapara, and Ferlie, 2013). Put simply, the review concluded that: "Relationships trump design" (Crilly, Jashapara, and Ferlie, 2013: 173). The broad conclusion of this review then, was that the benefits of managed or mandated network arrangements for knowledge translation cannot be taken for granted.

This finding is also echoed and reinforced by other work on mandated networks, with several studies highlighting the inability of such networks to overcome the constraints on knowledge mobilization posed by professional demarcations (Addicott, McGivern, and Ferlie, 2006; Currie and Suhomlinova, 2006; Currie, Finn, and Martin, 2008). One UK study of pilot projects in the genetics arena concludes that "even with structural change the same set of institutionalized boundaries adversely impact upon knowledge sharing" (Currie, Finn, and Martin, 2007). These studies tend to question the linear or mechanistic assumptions built into previous models of knowledge mobilization (Cooksey, 2006; Ferlie et al., 2012). Instead, they highlight the boundaries of *practice* (Carlile, 2004; Oborn, Barrett, and Racko, 2010), *cognition* (Szulanski, 2000), and *power* (Swan, Scarbrough, and Newell, 2010) (Carlile, 2002; Oborn and Dawson, 2010) that make it difficult to translate knowledge between distinct communities (Caplan, 1979). These hitherto neglected aspects of knowledge mobilization are given renewed attention within this section of the book and in related work: for example, in addition to Newell and Marabelli's Chapter 6, which provides a valuable focus on the role of power, certain journal papers explore in more detail relevant issues such as boundary-spanning practices (Evans and Scarbrough, 2014), and the relationship between cognition and social network structures (D'Andreta et al., forthcoming 2016).

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Network Ambidexterity

But while *formal* mandated network arrangements are seen as having limited ability to overcome these more deep-seated boundaries, evidence from the organization and management literature has increasingly high-lighted the value of *informal* social ties. Such ties are seen as playing an important role in enabling the sharing of knowledge across organizational boundaries, providing a capacity for innovation and change not always available from formal arrangements alone (Currie and White, 2012). Thus, studies have highlighted the importance of network structures in shaping the flow of knowledge and information within and between organizations (Powell and Koput, 1996; Hansen, 2002) and have shown the roles played by different kinds of social ties, with weak ties being linked to the acquisition of codified knowledge and strong ties being linked to the establishment of trust and the sharing of tacit knowledge (Hansen, 1999).

While this work has shown the importance of the quality of interpersonal ties to the exchange of knowledge, an understanding of the capacity of network forms to promote knowledge mobilization rests not only the quality of the ties that they contain but also on the patterning of such ties in terms of network structures. Two structural forms which have been identified as par-ticularly important in this respect are termed "brokerage" and "closure," and these are described in more detail in subsections 7.2.1 and 7.2.2.

7.2.1 *Brokerage*

"Brokerage" denotes the opportunity to span parts of a network that are unconnected. As described by Burt (2000) this disconnectivity produces net-work "gaps," otherwise known as "structural holes." These network "gaps" or "structural holes" may emerge where there is no tie between actors and/or there are disconnected clusters of actors. Actors located structural holes (in disconnected groups) thus have the potential to "broker" across such gaps to connect new or disparate sources of information (Burt 1997, 2000). This might initially involve the establishment of a "weak tie" between disconnected third parties. Brokerage is, therefore, the action taken to close structural holes—in others words closing network gaps through network bridges or intermediary "between" actors (Freeman, 1977). Research suggests that knowledge exchanged as a result of brokerage across structural holes is likely to be novel (or as Burt terms it "non-redundant") precisely because it involves the pooling or cross-fertilization of knowledge from previously unconnected sources (Burt, 1997, 2000).

This strand of social network theory around structural holes and brokerage has been paralleled by developments in knowledge mobilization initiatives where "knowledge broker" (or equivalent terms) roles have been established explicitly to create links between different domains of research and practice

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(Lomas, 2007; Dobbins et al., 2009; Ward, House, and Hamer, 2009). The knowledge broker role is designed so that individuals can act as facilitators of collaboration and "translators" of knowledge from one community to another, thus actively attempting to close structural holes. Indeed, as the use of interpersonal contacts and good communication skills in the context of partnerships and research collaborations is emphasized in knowledge broker-ing, it has been described as particularly suitable for linking up-stream research with downstream practice (Lomas, 2007). However, it is important to differentiate between knowledge brokerage as defined by social network position in a mandated network and that which is assigned by nature of one's formally mandated role; the first involves investigating the shape or structure of informal knowledge-sharing relations to assess a network's actual or poten-tial ability to close "gaps," and the latter involves individuals purposefully enacting an organizational role that aims to support interaction between groups.

7.2.2 Network Closure

Tight-knit networks with overlapping ties are described in terms of "network closure." Such closure creates conditions of "social cohesion" or "embedded-ness" (Reagans and McEvily, 2003), because dense or overlapping social circles encourage the development of trust, reciprocity and cooperation (Coleman, 1988; Gnyawali and Madhavan, 2001). This creates a supportive environment for information sharing and problem solving (Gulati, 1995; Uzzi, 1997), which may be valuable during times of organizational ambiguity and uncer-tainty (Krackhardt, 1992; Kijkuit and van den Ende, 2010) and for embedding new knowledge (Coleman, Katz, and Menzel, 1966; Coleman, 1988). Though unlikely to be the locus of innovative ideas because it is less open to new, non-redundant knowledge (Burt, 1997, 2000), network closure does support the exploitation or implementation of knowledge (Hansen, 1999; Krackhardt, 1992; Reagans and McEvily, 2003). In particular, interests and perspectives in under conditions of closure are more likely to be aligned or normatively constrained, and the shared language and trust needed for close collaboration is already in place (Obstfeld, 2005).

As with brokerage, there are also parallels within the knowledge mobiliza-tion literature that seek to produce this network condition. In this case, the parallel with closure is the notion of "Communities of Practice." Explicit efforts have been made in some initiatives to develop such communities. These are seen as promoting knowledge sharing amongst individuals in a very similar fashion to network closure, but involving in addition to close social ties a shared sense of social identity (Kislov, Harvey, and Walshe, 2011; Thomson, Schneider, and Wright, 2013).

7.3 Network Ambidexterity and the Capacity for Knowledge Mobilization

Within the social networks literature then, there is an emerging consensus that brokerage across disconnected groups (closing structural holes) helps to facilitate the creation of new knowledge and idea generation, and that social closure within cohesive groups helps to implement and embed knowledge in practice (Baum, Shipilov and Rowley, 2003; Shipilov and Li, 2008; Porter, Whittington, and Powell, 2005). Closure and brokerage, therefore, offer different benefits for knowledge mobilization (Burt, 2005; Reagans and McEvily, 2008).

These conditions of brokerage and closure are normally viewed separately as discrete local network phenomena in the existing literature (Oliver and Ebers, 1998). When we consider their relevance to the local networks linked by knowledge mobilization initiatives, however, it is clear that brokerage and closure can occur simultaneously within an initiative's wider social network (Burt, 2000, 2005). It follows that network brokerage and closure can be seen as playing complementary roles by supporting both the creation and embedding of knowledge. We describe this ability to accommodate structures of both brokerage and closure as "network ambidexterity."

The value of such ambidexterity is that it enables the benefits of both brokerage and closure to be achieved simultaneously. This also avoids the risks of, for example, the new, non-redundant knowledge created at structural holes being lost or underexploited because it is not embedded in the practices of cohesive groups (West et al, 1999; Janssen, Van de Vliert, and West, 2004). Both network states are relevant to knowledge mobilization because structural holes may support idea generation, radical thinking, and theory building, whereas the closure of structural holes through brokerage facilitates practical implementation.

As an illustration of the value of network ambidexterity within the healthcare setting, consider the example of a clinical researcher in a CLAHRC who is looking for greater knowledge of recent research being used to assist patients with COPD (Chronic Obstructive Pulmonary Disease). He decides to link up with other COPD researchers both within his own CLAHRC and externally to other geographic environments. This brokerage allows him to build new contacts and widens his pool of knowledge. He then brings these new ideas back to his work team (characterized by the denser interconnected ties of network closure), and together they are able to develop a protocol on best practice, which becomes embedded in the implementation work of the team. In short then, brokerage and closure are network structures that can support knowledge mobilization efforts, though their usefulness will depend on the specific contexts of such efforts.

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A number of recent social network studies support this view of the importance of network ambidexterity in knowledge mobilization efforts. Reagans and McEvily (2008), for example, argue that brokerage is needed to aid idea generation during knowledge seeking, while closure is required to ensure that information is embedded into a firm's existing routines and practices during knowledge transfer. Likewise, Tortoriello and Krackhardt (2010) use the Simmelian theory of social circles to illustrate the need for both closure and brokerage (Tortoriello and Krackhardt, 2010). Battilana and Casciaro further extend the analysis by developing a contingency model of the roles of brokerage and closure (Battilana and Casciaro, 2012). In their study of change processes in the UK's NHS, they observe that networks rich in structural holes support change that is more divergent from the status quo. In contrast, networks with high levels of closure are more resistant to such divergent change, but supportive of change aligned with the status quo.

7.4 Context for Our Study

Our own empirical study focuses on a knowledge mobilization initiative within the UK NHS, namely the CLAHRC initiative. Each CLAHRC enjoyed great flexibility in interpreting their broad remit, and this was reflected in the development of different operational and management structures, and distinctive visions for their work-program (D'Andreta, Scarbrough, and Evans, 2013; Evans and Scarbrough, 2014). In this chapter, we present a CLAHRC case study—termed CLAHRC-NET—for analysis.

The lead partner in this CLAHRC was an NHS mental health trust, and the core of the initiative built upon established academic–research links between this healthcare trust, a university hospital acute trust, and a university institution. However, one aim of this CLAHRC was to reach beyond the organizations that have traditionally been involved with research in order to build research capacity in localities further away from this core. In terms of formal structure, this CLAHRC was similar to others in that it was organized around a central management team and a set of broad themes encompassing clinical-research and implementation work-programs. These included "Mental Health," "Children and Young People," "Stroke Rehabilitation," and "Primary Care." Support was provided from shared services of health economics, statistics, implementation, healthcare commissioning, healthcare management, clinical-practice, and social-sciences insight. The CLAHRC also sought to put into practice its own distinctive interpretation of its mission centered on organizational learning. This spawned a number of features intended to embed this interpretation into its structure and practices. These included the clustering of work programs within a small number of defined clinical themes,

which support the building of communities around these clinical areas. There was also resourcing of dedicated "Knowledge Broker" (KB) roles through which a selected group of practitioners would support knowledge translation from project teams to the wider NHS. Cross-cutting themes were formed with the aim of providing clinical project team members with specialist forms of expertise in areas such as knowledge translation, synthesis of evidence, external engagement and communication, and statistical support. The work programs of the CLAHRC-NET supported a range of outputs, including; sharing new research evidence to inform decisions made by local healthcare commissioners; incorporating findings into local and national clinical-guidelines; contributing to local healthcare services redesign; empirically testing and implementing new interventions to be used by NHS Trusts; and becoming a source of information for local clinical networks to support service development.

7.4 Methodology

To investigate knowledge mobilization using a social network lens, we adopted an innovative mixed-methods approach, encompassing, firstly, a social network study to address the informal structure of social ties manifested by the membership of our CLAHRC sample. This revealed the structure of the informal knowledge-sharing network underpinning the formally mandated network. The social network survey was sent by e-mail to a total of 109 individuals at Time 1 (January 2011) and 102 individuals at Time 2 (March 2012), with a final average response rate of 68 percent. Our aim was not to generate a network of all social ties, but to identify ties that were most important to the work of individuals within the CLAHRC. Network analysis was conducted in UCINET with visualization in NetDraw (Borgatti, Everett, and Freeman, 2002). Second, to complement this work, we carried out a qualitative investigation with a sample of individuals playing a variety of roles within the CLAHRC-NET, and interviewed these individuals at two time points. This enabled us to address the way in which knowledge mobilization was interpreted and realized over time by groups charged with realizing the CLAHRC-NET's objectives.

7.5 Findings: A Social Network Analysis (SNA) of Knowledge Mobilization

In this section we use some methods and techniques of social network analysis (SNA) to study the network structure of knowledge mobilization in CLAHRC-NET.

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In doing so, we demonstrate how network ambidexterity—a balance of mutually reinforcing structures of brokerage and closure—was achieved in this formally mandated network. The first part takes the perspective that knowledge mobilization occurs by nature of people's positions in the informal network of knowledge sharing exchanges within the context of a formally mandated network and, to illustrate, we present some SNA metrics for brokerage and closure. The second part uses SNA to investigate how knowledge mobilization is influenced by the interplay between network position and organizational role—here we zoom in on individuals with formally assigned knowledge broker roles.

7.6 Network Ambidexterity: Combining Brokerage and Closure

Knowledge mobilization in mandated networks is supported by the network positions occupied by individuals in the informal social network of knowledge sharing relations underpinning that formally mandated network. To illustrate and unpack this further, we present and discuss some SNA metrics and visuals. Taking a quick glance at the scores in Table 7.1, it appears that brokerage activity reduces over time, whereas levels of closure are maintained.

We first take a look at the extent of brokerage taking place in CLAHRC-NET as conferred by the network positions of individuals at two time points. The three SNA metrics we provide tap into the extent to which individuals are acting as brokers across gaps in the network and the extent to which structural holes (gaps that are yet to be brokered) are present.

Table 7.1. Network ambidexterity metrics for CLAHRC-NET at two time points

	Network Metric	Time 1	Time 2
Brokerage	Ego Betweenness[a]	19.1%	10.7%
	G and F Brokerage[b]	50%	43%
	Structural Holes (efficiency):[c]	69%	68%
Closure	Density (network connectivity)[d]	8.6%	7.8%
	Average Geodesic Distance[e]	2.6	2.7
	Reciprocity[f]	24%	21%

[a] Proportion of individuals acting as "bridges."
[b] Proportion of dyads (pairs of individuals) who are not already directly connected.
[c] Structural holes measure based on the proportion of non-redundant ties in the ego-networks of CLAHRC members (efficiency).
[d] The number of observed ties divided by the total number of possible ties.
[e] The average number of links it takes to connect between one person and any other person in the network.
[f] Two-way ties. Scores taken at average across CLAHRC-NET and normalized relative to ego-network size.

The overall picture is that brokerage activity decreases over time for CLAHRC-NET, except for structural holes, which remain constant. The ego-betweenness metric represents the proportion of individuals acting as CLAHRC-NET brokers by nature of their position in the network as "bridges" between otherwise disconnected parties. Interestingly, this type of brokerage decreases between Time 1 and Time 2, as over time some of these bridges disappear. The structural holes efficiency score assesses what proportion of ties are "non-redundant," that is the extent to which connections are to contacts who are not connected to actors' other contacts. In this case, at both time points CLAHRC-NET members are investing their efforts in non-redundant ties (the proportion of non-redundant ties is 69 percent at Time 1 and 68 percent at Time 2), thus suggesting that these network interactions have the potential to offer fruitful opportunities for the mobilization of new knowledge and more exploratory forms of innovation.

Although brokerage supports the cross-fertilization of fresh ideas and the generation of new knowledge, closure is equally as important because it provides an effective structural environment for anchoring and implementing this new knowledge in practice. It is interesting, in this respect, that the CLAHRC-NET closure metrics do not alter much over time. We can discuss each metric in turn. Density is a measure of the overall connectedness of a network. Only 8.6 percent (Time 1) and 7.8 percent (Time 2) of all possible ties are present making CLAHRC-NET quite a loosely structured network. Reciprocity measures the extent to which relations are two-way, so that where *a* nominates *b* as a knowledge contact, *a* also names *b* in return. Reciprocity of ties is often used as a proxy for trust, which has been shown to be associated with the sharing of knowledge within a network (Dirks and Ferrin, 2002). The temporal data show that of the ties that are present in this low-density network, a quarter of these are reciprocal at Time 1, dropping to 21 percent at Time 2. Figure 7.1 provides a visual illustration of the reciprocal knowledge translation ties (in red) for CLAHRC-NET at Time 1, note how reciprocity is not evenly distributed but creates "pockets" or clusters in some parts of the network.

Finally, the geodesic distance metric measures the network distance between individuals as popularized by the term "six degrees of separation." Figure 7.1 reveals that geodesic distances are largely unchanged between time points. It takes an average of 2.6 or 2.7 links for one person in CLAHRC-NET to connect with any other person in the network. These low geodesics (short distances between contacts) positively impact the speed at which knowledge can be mobilized. This is particularly relevant because the relatively high structural hole scores and low density make it more likely that individuals are exchanging novel knowledge and information with each other (Burt, 1992).

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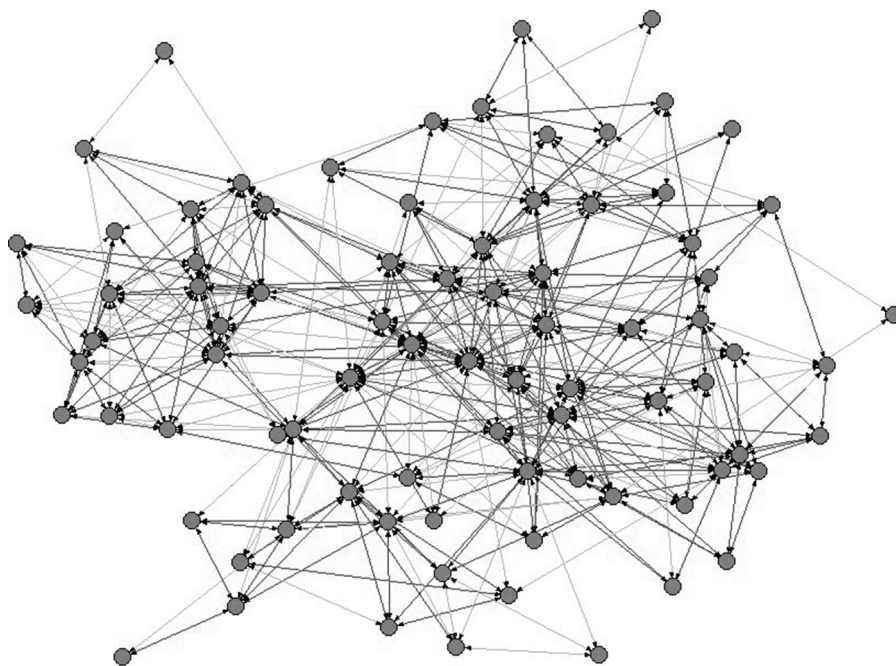**Daniela D'Andreta and Harry Scarbrough**

Figure 7.1 CLAHRC-NET reciprocal ties at Time 1 (in dark grey)

7.6.1 *How Ambidexterity Worked in CLAHRC-NET*

Our data shows that for this networked initiative, over time, actual brokering reduced but levels of closure and structural holes (potential for brokerage) were maintained. More brokerage work was to be done at the early stages of CLAHRC-NET's evolution as heterogeneous teams were assembled from individuals from different backgrounds, with different sets of personal networks and professional expertise. Actual brokering activity was higher at the start of the CLAHRC and decreased at later stages. This is probably because at the start clinical themes had to scope out prospective collaborators, and individuals became connected to one another through their work in the initiative over time (thus closing gaps in the informal knowledge network). However, the proportion of structural holes remained constant over time as the nature of CLAHRC work meant that members were constantly seeking to branch out in their ties, reshaping the approaches and the networks used to achieve their work (unlike traditional organizational forms where teams may be more static). The change in brokerage activity was also influenced by the stages at which clinical themes needed to access expertise provided by specialist support services (changing over the project life cycle).

At the network level, we see that levels of closure were also maintained throughout, holding the network together. This was important in supporting CLAHRC-NET's ethos of "collaborative co-production" between academic and NHS members, and to coordinate the actual delivery of project work. The proportion of reciprocal (two-way) ties is suggestive of stronger working relations that would underpin shared understandings and mutual agreements across a diversity of perspectives. The distances from one person to another (through the network of informal knowledge ties) are low at both time points. This is conducive to the speedier translation of knowledge between members of the initiative, producing fewer silos.

7.7 Interplay between Formal Organization and Social Network Structures

We found that the informal social networks which developed within the CLAHRC were influenced by its management structure and organization. Two main aspects of this were found in our data; the influence of formal thematic groups on structuring social ties, and the impact of having designated knowledge brokers.

7.7.1 *Thematic Groups and Closure*

In relation to the first aspect, the work of the CLAHRC was organized into large teams referred to as "themes." Each theme had a specific healthcare focus and members of each theme therefore shared common reference points in terms of research and implementation goals, working practices, projects, and sometimes co-located office space. One result of this was the clustering of work activities that promoted a degree of "closure" within the themes (so that knowledge became embedded in projects, more so over time). Yet as we have seen, at the level of the initiative, CLAHRC-NET exhibited moderate levels of closure (that is, high in terms of geodesics and reciprocity but with low density), which meant that knowledge developing within themes could be brokered, or translated, at speed across the initiative whilst avoiding the "group-think" that might emerge in very closed, tight-knit network structures (Coleman, 1988; McEvily, Perrone,and Zaheer, 2003; Chung and Jackson, 2013).

An example from our data to illustrate how CLAHRC-NET formal structure influenced social network ties and knowledge mobilization work is provided by a CLAHRC-NET member with a background in adult mental health. She describes the networking and learning opportunities that membership in the initiative offered her, "Coming to CLAHRC has meant that I have been

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exposed to such a diverse range of people to start with . . . I would never have done stuff with children. I would never have learned about ADHD. I certainly wouldn't have gone into anything to do with stroke." She describes how the initiative was designed to encourage her to work with sociologists and organizational theorists, and to embark on a learning journey that as a practitioner she would not have experienced, "[CLAHRC-NET] opened my eyes to all this other potential . . . And exposed me to all those other things. It has exposed me to a wide range of networks, a wide range of different people, and enabled me to build different skills."

Our SNA also showed that collaboration between CLAHRC-NET themes increased over time from 40 percent (Time 1) to 60 percent (Time 2). For example, the CLAHRC-NET Stroke theme increased its proportion of ties to other CLAHRC-NET teams from 20 percent at Time 1 to 30 percent at Time 2. A member of the Stroke theme described how his outlook was focused on his project in the earlier stages of the CLAHRC, but later developed to encompass a greater emphasis on brokering to other CLAHRC-NET theme groups:

> Actually the whole process of CLAHRC has been quite interesting because at the beginning I guess I was quite evangelical about what the clinical trials have said that the service would do, and I am also from a quantitative background so I was very kind of black and white. And over time I've noticed in myself that I'm a lot more, kind of, flexibly thinking about things . . . So I feel like I've evolved as the project has evolved, if that makes sense. So . . . And again I think that was a good part of the design of the project really. . . . Because we've been with that team from the start when it was set up, there's a lot of nuances that the team have embedded that we know why that practice has been embedded . . . (Hugo, Stroke theme, CLAHRC-NET)

This account shows how Hugo was engaged in embedding knowledge within the project team at the same time as extending his wider access to knowledge through brokering (he describes how the team organized and learnt from participatory workshops). This is illustrative of network ambidexterity in practice (from closure around team based work to brokerage through networking with other CLAHRC-NET themes).

7.7.2 *Formal Roles and Brokerage*

As part of its knowledge mobilization strategy, CLAHRC-NET funded a cohort of 30 "knowledge brokers" (KBs) who held their roles on a part-time (roughly one day per week) basis. Those appointed to the KB role were senior clinical or managerial staff (consultant doctors, matrons, allied health professionals, and senior directorate managers). The aim of their appointment was to support knowledge mobilization by; ensuring CLAHRC-NET research was aligned with

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the needs of the NHS; promoting the research amongst their NHS colleagues
and potential participants; and supporting the implementation of emerging
research evidence in clinical and managerial practice. In this next example, we
use our SNA data to zoom in on individuals with designated knowledge broker
roles. This enables us to show how the interplay between an individual's
network position and organizational role may influence knowledge mobiliza-
tion. The impact of knowledge brokers can be gauged from our social network
data as summarized in Figures 7.2 to 7.5.

We first look at the pattern of informal knowledge sharing ties at data
capture Time 1. Figure 7.2 visualizes knowledge sharing ties between
CLAHRC-NET members and shows that KBs were typically positioned towards
the periphery of the CLAHRC-NET social network (KBs visualized as red nodes).
Figure 7.3 re-presents the image when we also add external (non-CLAHRC-NET
actors) where the outer node spokes are CLAHRC-NET's external stakeholders.
Through these visualizations, we see that individuals occupying formal KB
roles are positioned at the edge of the knowledge-sharing network between
CLAHRC-NET members, which puts them in between internal CLAHRC-NET
colleagues and external stakeholders. This means, in effect, that the KBs were
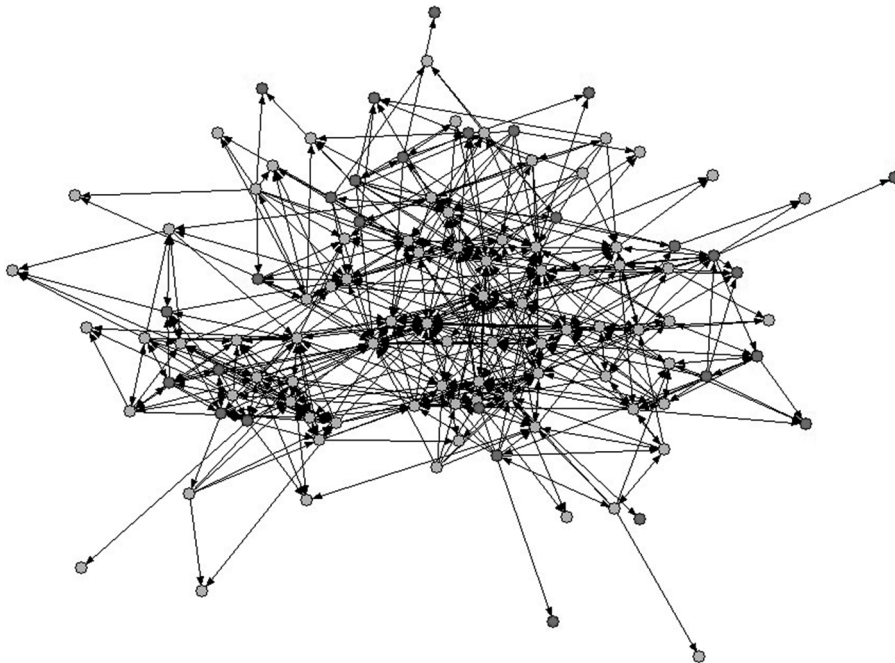playing a true brokering role by nature of their network positions. Moreover,

Figure 7.2 Network position of CLAHRC-NET knowledge brokers (dark grey nodes) at
Time 1, internal ties only
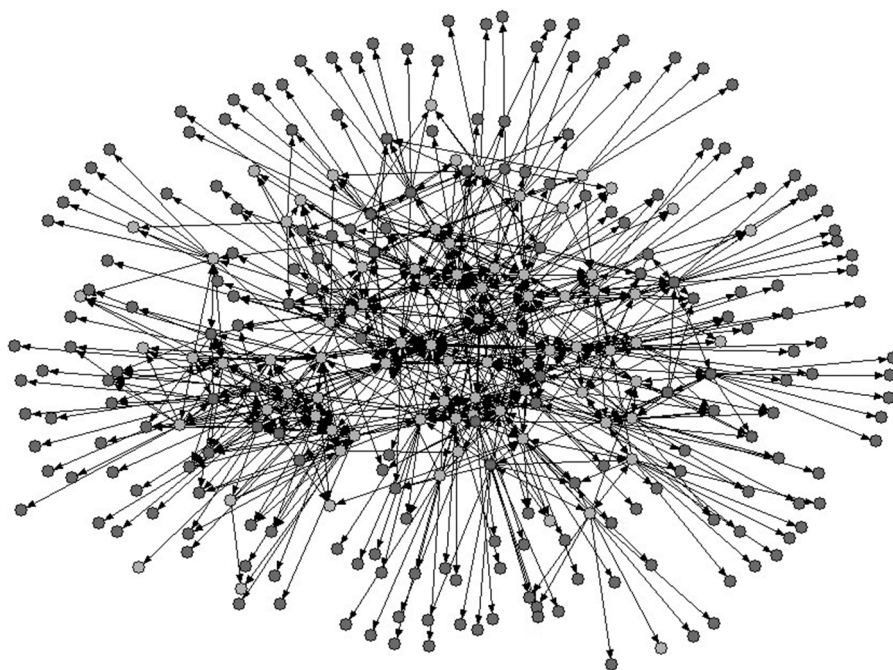
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Figure 7.3 Network position of CLAHRC-NET knowledge brokers (dark grey nodes) at Time 1, including ties to external actors

the distribution of KBs across CLAHRC-NET themes (displayed as a rough circular configuration in Figure 7.3) means that each KB was tapping into different parts of the network and makes likely that they were accessing diverse knowledges.

Because their designated roles effectively positioned them at the fringes of the formally mandated network, the KBs helped to create and sustain links with external groups such as other clinicians and members of the NHS. This is important because it shows that the KBs as a group supported a specific type of knowledge mobilization role compared to other groups in CLAHRC-NET. The KBs were well positioned to be true knowledge "brokers" in the SNA sense because they occupied intermediary positions between CLAHRC-NET and its external collaborators. Moreover, because at least one KB was assigned to each CLAHRC-NET theme this capability was distributed strategically across the formally mandated network. This "in-between" position is aptly captured in the following description of the CLAHRC-NET KB program that encapsulates the internal and external facing role of the KB:

> One of the things they are doing currently is identifying the stakeholders around the areas in which we seek to make an impact. We then recruit those stakeholders

as members of our CLAHRC-NET. . . . So we take them and we work with them,
engage them in the CLAHRC-NET way of doing things and what we're trying to
do. And in essence that's led by the KB, and it's an attempt to try and engender
community tendencies around a very specific clinical domain in which we are
seeking to make an impact. (KB Program Lead)

Perhaps most surprising is the speed at which the KBs were able to mobilize
into these network positions (our Time 1 data capture was at six months after
CLAHRC-NET was established). This pattern of positions was largely main-
tained over time but with some DFs moving toward the centre of the network
(see Time 2 positions in Figures 7.4 and 7.5).

This reflects a general development trend in CLAHRC-NET's knowledge
mobilization activity from an expansive brokering strategy (outwardly
focused stakeholder networking) to a targeted strategy (that became more
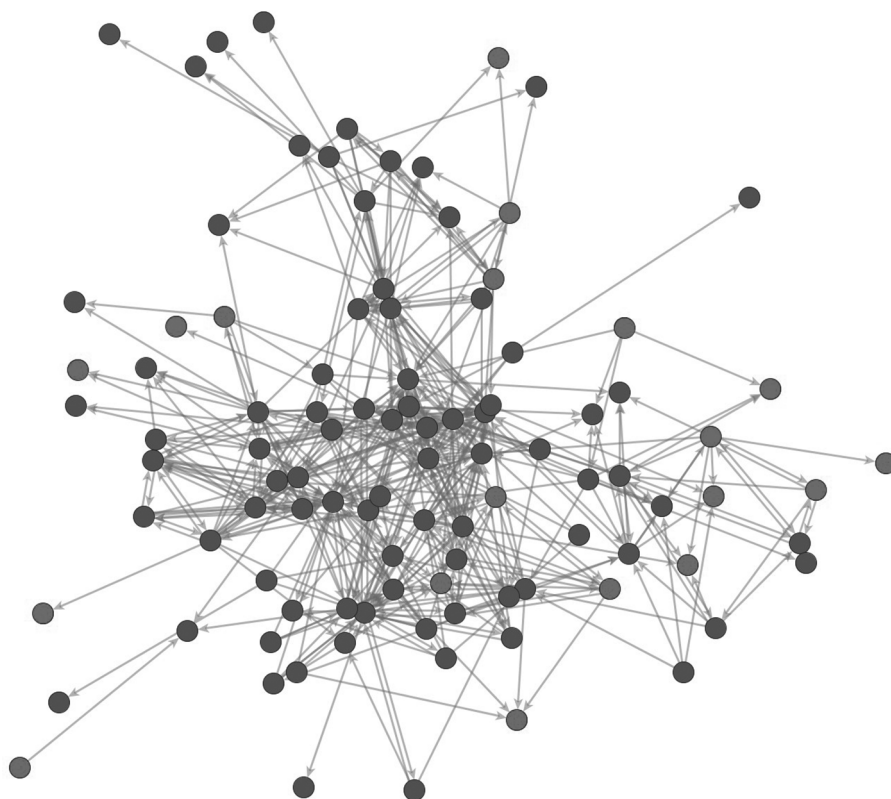internally focused on building networks around the NHS–university nexus).

Figure 7.4 Network position of CLAHRC-NET knowledge brokers (light grey nodes) at
Time 2, internal ties only

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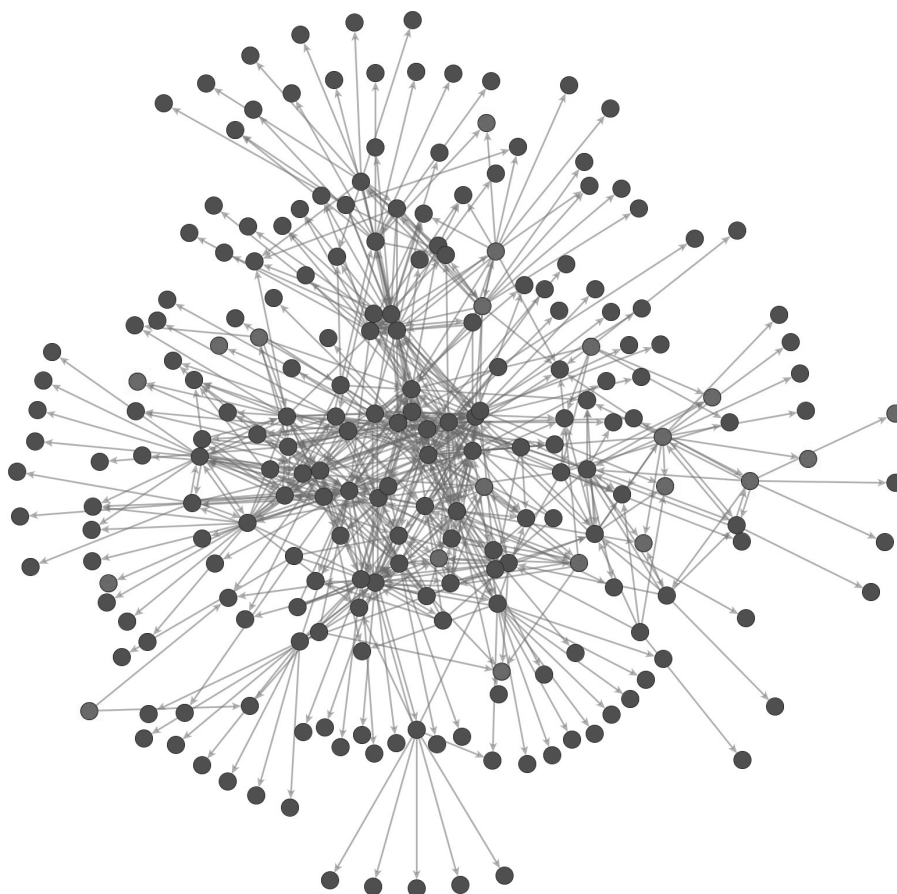**Daniela D'Andreta and Harry Scarbrough**

Figure 7.5 Network position of CLAHRC-NET knowledge brokers (light grey nodes) at Time 2, including ties to external actors

Our SNA revealed that at Time 1, CLAHRC-NET used an expansive information search strategy; that is to say, its knowledge networks were diverse, spanning multiple sources beyond the core NHS–university nexus (for example, to include also local authorities, central government, private industry, the third sector, and service users). In general, external contacts were important for accessing new contacts and obtaining practical advice. This branching-out supported CLAHRC-NET's strong co-production ethos that involved brokering collaboration with external stakeholders from day one. As one of our early interviewees describes:

> I think CLAHRC has forced people, researchers to expose things early before it's ready. So you're being asked to do conferences before you kind of got proper, nice findings and it's kind of a warts and all view. And I think that's a different way of working.

As the CLAHRC matured, however, this expansive networking strategy became less important. Our Time 2 SNA revealed that knowledge mobilization became more internally focused between colleagues within CLAHRC-NET itself (healthcare practitioners and university researchers) and knowledge sharing activity became predominantly based upon the exchange of scientific knowledge and on strengthening academic–health collaborations. This reduced reliance on external sources can be viewed as evidence of CLAHRC-NET becoming more self-reliant as the development of ties within the CLAHRC (through both brokerage and closure) enabled actors to access knowledge and information much more readily (and speedily given relatively low geodesic distances) from other CLAHRC members than from external contacts. There is also a sense here of groups and individuals moving from using expansive to more targeted search strategies, as the development of network ties increased their understanding of the knowledge and expertise available from different groups and individuals within the network.

7.8 Discussion

Several key findings emerge from our study that shed new light on the role of mandated networks in knowledge mobilization. Most importantly, we found that CLAHRC-NET as a mandated network was able to accommodate the qualitatively different patterns of social ties which are seen as crucial to the mobilization of knowledge. In other words, our SNA revealed that CLAHRC-NET ties exhibited both "closure," as its theme-based working helping to promote strong, interconnected ties, and "brokerage" due to the structural holes between groups and themes. The former helped ensure that new knowledge could be *exploited* effectively by embedding it in practice, and the latter enabled the *exploration* of knowledge by giving disconnected groups the potential to connect and exchange new knowledge and information (cf. Oborn et al., Chapter 5).

Second, we found an important interaction between the formal organization of the CLAHRC and its emergent social network. As noted earlier, this interaction has been noted in other studies in the NHS, with Ferlie et al. (2010) using the term "hybrid" to describe a network that grew out of pre-existing organic networks but then became mandated. In our study, hybridity was rather due to a mandated network prompting the emergence of an organic set of social ties. The direction of that interplay between formal and informal relationships, however, was less important in our case than its implications for social network structures. In particular, we found that the hybridity of the network in our case helped to enable ambidexterity. Thus,

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at the overall mandated network level the thematic clustering of working teams promoted the kind of network closure that supported the embedding of new knowledge and evidence into practice. At the same time, the relatively loose structure of social ties at CLAHRC level incorporated "structural holes" that provided brokerage opportunities to create and acquire new knowledge. Thus, the dual challenges of knowledge mobilization—both creating new knowledge and evidence and putting this into practical application—could be supported.

In addition, and reinforcing the link between formal structure and social network development, we found that the designation of KB roles within CLAHRC-NET made a valuable contribution to brokerage activity as individuals responded to the peripheral positioning of their role by extending the CLAHRC's external links. We saw that these positions were maintained as CLAHRC-NET became more established over time, but that some KBs moved into more central positions in the informal knowledge-sharing network in line with the overall shift in emphasis toward internally focused networking around the NHS–university nexus. Although the designation of formal brokering roles by no means guarantee that individuals will be able to perform a brokerage function, in this case the positioning of the role seems to have been important in encouraging the social ties needed to do so, but also that the enactment of formal brokering roles was influenced by the shifting distribution of ties at the organizational level.

A third, and related, finding from our study was that the persistence of CLAHRC-NET's formal arrangements over time helped to promote an ongoing dynamic of networking which helped to create new patterns of social tie formation. Thus, we found that CLAHRC-NET became more self-reliant and self-referential as a network over time; moving from using expansive (stakeholder-based) to targeted (NHS–university-based) search strategies. External knowledge ties became less important (these connections had been key for accessing new contacts and proving practical advice on knowledge mobilization work), as members became increasingly able to draw on more relevant niche, scientific knowledge from their CLAHRC-NET colleagues. In this sense, CLAHRC NET itself became the pivotal knowledge resource facility by nature of its ambidextrous networks supporting a continued ability to both access and bank the knowledge that had been mobilized through the work of its members but also for developing a specialist offering in terms of the provision of scientific knowledge.

This finding on the importance of networking activity represents a counterpoint to much previous research which has tended to view networks primarily in structural terms, as channels, conduits or "pipelines" through which knowledge is transferred (Owen-Smith and Powell, 2004), thereby neglecting their dynamic and evolving properties (Grandori and Soda, 1995). The

progressive interweaving of formal organization and social ties seen in our case also underlines the benefits that arise where the formation of social networks contributes to organizational goals. Such benefits, in our case, were not limited to the knowledge mobilizing advantages of ambidexterity, but also extended to more relational forms of organizing as developing social ties enabled greater mutual knowledge and access to expertise (Cramton, 2001), coordination and problem solving (Hoffer Gittell, 2002).

One important caveat to our finding on the positive impact of the interplay between formal organization and informal ties seen in CLAHRC-NET is that this may not be generalizable to other settings, including to other mandated networks. What was observed in our study was, broadly, a virtuous circle in which formal structures and roles helped to catalyze a rich and productive combination of patterned social ties. However, it is equally possible to imagine other settings in which a vicious circle might operate where formal structures promote excessive closure in network ties, limiting the exchange of new knowledge and promoting inwardness rather than exploration. This is potentially an important topic for future research.

More broadly, our study has important implications for future research, policy, and practice in the area of knowledge mobilization. For one, it suggests that future research could usefully build upon the mixed methods approach outlined here to capture the interplay between the interpretive aspects of knowledge mobilization and the effect of shifting social network structures. In addition, important policy and practice implications arise from our study for the many mandated networks whose work involves a knowledge mobilization remit. From a practical point of view, our discussion of network ambidexterity provides a greater understanding of the need to develop formal structures that will evolve social networks that are able to accommodate both brokerage and closure, and thus sustain knowledge mobilization activity over time. Equally, consideration of the interplay between the formal arrangements of the mandated network and informal social ties highlights the possibility of both vicious and virtuous circles in their reciprocal development, leading to significantly different outcomes in each case.

These strands in our analysis not only highlight a need for greater research attention to the network dynamics of knowledge mobilization initiatives, but also highlight the significant opportunities (and risks) that attend the design of formal roles and structures in mandated networks. Although it would be a mistake to assume that formally networked arrangements necessarily secure the effective patterning of informal ties seen in CLAHRC-NET, it is clear from our study that the appropriate design and enactment of such arrangements have a significant impact on the social ties which ultimately help to realize knowledge mobilization.

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7.9 Conclusion

This chapter has contributed in several ways to the broader theme of "mobilizing through networks." By applying a social network perspective, it has identified the importance of network ambidexterity as both a desirable and empirically attainable objective for a mandated network seeking to mobilize knowledge. Further, our study highlights how the choices made in the management and organization of such mandated networks—specifically, in the design of themes and the designation of broker roles—may help to promote such ambidexterity. This analysis provides a useful contribution to the debate on knowledge mobilization that has, hitherto, tended to focus only on brokerage and closure as separate network conditions. This analytical framework can thus help to inform future policy and practice as to the appropriate design and development of knowledge mobilization initiatives.

Acknowledgments