

**When Discretionary Boundary Spanning Relationships Cease Becoming Discretionary:  
The Impact of Closed Ties on Informal Leadership Perceptions**

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**Abstract**

Organizations have recognized that effective informal leadership is a source of competitive advantage and invest heavily in leadership development efforts. Moreover, because of historical shifts in the nature of work, this informal leadership often takes the form of inter-unit boundary spanning. Because of these two developments, discretionary boundary spanning (DBS) between units has increasingly become a critical, dynamic, bottom-up activity where individuals lacking formal authority step up and take on informal leadership responsibilities. In this study, we draw upon Simmelian Tie Theory to examine the relationship between different types of DBS and formal leaders' perceptions of a subordinate's informal leadership and performance. We empirically document that a small number of closed task-oriented and closed friendship-oriented DBSs are instrumental in helping individuals demonstrate informal leadership. However, we also show that DBS places constraints on informal leadership when closed ties become too numerous. This results in an inverted-U relationship between the number of closed DBS ties and perceptions of leadership where the apex (i.e., point of over-embeddedness) emerges at a smaller number for friendship-oriented DBS relative to the apex for task-oriented DBSs. We discuss the theoretical implications of these results, as well as the practical implications for managers of organizations.

*Keywords:* Simmelian Tie Theory; discretionary boundary spanning; informal leadership; inter-unit coordination

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## Introduction

Contemporary organizations in Western societies have radically redesigned jobs in a way that places increased responsibility on individual job incumbents, as well as their formal leaders (Parker, Morgeson, & Johns, 2017). In particular, Mathieu, Hollenbeck, Van Knippenberg, and Ilgen (2017) documented how many historical developments across industrialized nations during the 1980s and 1990s increased the collaboration requirements for workers at all levels. Many organizations either (a) automated simple jobs that individuals could execute by working alone or (b) offshored those jobs to locales where differential labor standards created insurmountable cost disadvantages for Western societies (Child & McGrath, 2001). As a result, the remaining jobs required multiple individuals with specialized skills. This created the need for extensive collaboration both within and between teams.

Consistent with this shift, Cross, Rebele, and Grant (2016) documented that over the last twenty years, “the time spent by managers and employees in collaborative activities has ballooned by 50%” (p. 76). Correspondingly, organizational research on the changing nature of work has expanded exponentially (Kozlowski, Chen, & Salas, 2017). However, this work has tended to focus on collaboration *within* teams rather than collaboration *between* teams. In particular, extant research has focused on within team processes and the implications of flatter organizational structures for fluid leadership arrangements such as heterarchies (Aime, Humphrey, DeRue, & Paul, 2014), shared leadership (Wang, Waldman, & Zhang, 2014), and emergent informal leadership (DeRue, Nahrgang, & Ashford, 2015; Wellman, 2017).

This is problematic, however, because increased collaboration requirements beyond unit boundaries also create a strong need for managing *inter*-unit relationships (Hoegl, Weinkauff, & Gemuenden, 2004; Hogg, Van Knippenberg, & Rast, 2012). It is well established that teams that become isolated from other teams within their organizations suffer many performance problems (Ancona & Caldwell, 1992). As such, it is not surprising that organizations assign the responsibility for inter-unit boundary spanning to formal leaders. Indeed, in contemporary work contexts, boundary spanning between units is recognized as a fundamental leadership behavior – now on par with initiating structure and consideration within work units (DeRue, Nahrgang, Wellman, & Humphrey, 2011; Morgeson, DeRue, & Karam, 2010).

Formal leaders, however, are increasingly unable to manage the requisite number of inter-unit boundary spanning relationships single-handedly. For example, contemporary managers working in flatter organizational structures are asked to manage increased requisite variety within units (due to increased spans of control), while at the same time, managing even higher levels of requisite variety between units. This creates the potential for what Cross et al. (2016) called “collaborative overload,” resulting in diminished managerial performance that is attributable to requirements for working interdependently with too many other people. In this context, informal leadership demonstrated via effective boundary spanning activities initiated by team members might have immense value to formal leaders. We will use the term *discretionary boundary spanning* (DBS) to describe this type of inter-team exchange engaged in by individuals who are not formal leaders directly charged with boundary spanning responsibilities.

Given the need for boundary spanning when it comes to team outcomes, it is clear why this activity falls within the official duties of formal leaders. However, DBS on the part of team

members may not fall within their job description, and there is a lack of consensus across different literatures regarding the impact that DBS has on those who engage in such activity. For example, because boundary spanning has been incontrovertibly linked to leadership (DeRue et al., 2011; Morgeson et al., 2010), this literature assumes that those who engage in DBS will also be perceived as strong informal leaders because of their improved access to unique information and willingness to expand their role (Fleming & Waguespack, 2007).

However, in contrast to the leadership and boundary spanning literatures, research and theory on social networks suggests there are notable detriments that come with engaging in DBS (McFadyen & Cannella, 2004). Specifically, network researchers have long acknowledged the potential for “over-embeddedness,” often making reference to the “ties that torture” (Krackhardt, 1999). Indeed, over-embeddedness reduces the benefits of having access to unique information, and at the same time, creates conflicting pressures both within and between teams that make it impossible to please all parties consistently (Tortoriello & Krackhardt, 2010). In addition, because *discretionary* boundary spanning activities are beyond a team members’ formal job role, leaders who are formally responsible for engaging in such behaviors may interpret DBS from others as a threat in terms of usurping their formal authority. Also, engaging in excessive helping behavior has been shown to deplete personal resources, leaving individuals with too little time and attention to effectively discharge their own formal duties (Koopman, Lanaj, & Scott, 2016).

Regrettably, this lack of theoretical consensus regarding the impact on employees who engage in DBS is exacerbated by mixed empirically-based conclusions. For example, based on their results, Marrone et al. (2007) concluded that “building boundary spanning into the role of *all team members* will better enable a team to maximize its boundary spanning function” (p. 1436, emphasis added). This implies that team members should be rewarded for engaging in DBS. However, based upon their findings, Hirst and Mann (2004) concluded that “boundary spanning is most effective when performed by the project leader, not the team members” (p. 147). This implies that DBS on the part of team members should be discouraged, and even punished.

The purpose of this paper is to reconcile the disparate theoretical and empirical inferences regarding DBS activities when it comes to understanding how this affects those who engage in the behavior. We draw on Simmelian Tie Theory (STT) (Simmel, 1950) to show how the often overlooked structure (closed versus open) and content (task-oriented versus friendship) of ties impacts the degree to which DBS is seen as beneficial or detrimental for informal leadership. Based on STT, we predict that there will be a curvilinear relationship between the number of closed DBS ties and supervisory perceptions of employees’ informal leadership.

Specifically, we argue that closed ties (created by ties to a common third party) are particularly strong and stable, and thus, they serve as a dominant driver of both the benefits and detriments of discretionary boundary spanning currently discussed in the literature. That is, at low levels, closed ties to members of external teams can create informational benefits that promote perceptions of informal leadership within one’s own team. However, at high levels of DBS, the stability of closed ties encumbers individuals with escalating social constraints, forcing behaviors (e.g., decision paralysis when trying to please all parties) that effectively erode perceptions of informal leadership. Because of the unique nature of affectively-laden links between friends, we also predict that the apex of the curvilinear relationship (i.e., the “dark side”

or point of over-embeddedness) occurs at a smaller number of closed friendship DBS ties relative to closed task-oriented DBS ties.

### **Theoretical Background and Hypothesis Development**

In order to advance our understanding of the relationships between DBS and informal leadership perceptions, we will (a) define *formal boundary spanning* (FBS) and describe the limits of FBS in contemporary organizations that require extensive collaboration within and between teams, (b) define *discretionary boundary spanning* (DBS) and explain why this may serve as a basis for perceptions of informal leadership, (c) describe the core elements of Simmelian Tie Theory (STT), and (d) leverage STT to make specific predictions delineating how the structure and nature of ties can trigger positive effects on perceptions of informal leadership at low levels of closed DBS ties, but negative effects at high levels of closed DBS ties.

#### **Formal Boundary Spanning and Formal Leaders**

There are a large number of alternative, and somewhat inconsistent, theoretical taxonomies for describing specific boundary spanning behaviors, and this precludes the ability to leverage existing frameworks in a concise manner (Wang, Liu, & Liu, 2019). For the purpose of this study, we define formal boundary spanning (FBS) behavior as externally oriented activities by formal leaders aimed at assisting the team that are distinct from internal, within-team processes (Ancona & Caldwell, 1988; Marrone et al., 2007). At the core, this involves information exchange related to resource acquisition, mapping the external environment, informing and influencing other teams, and coordinating tasks. In contexts where there are demands for this type of inter-unit collaboration, the importance of this activity is so critical that it is generally assigned as an official job responsibility of formal leaders (Hogg et al., 2012).

Indeed, given the importance of boundary spanning, existing research on this topic has focused on helping designated formal leaders successfully execute these responsibilities. Yet, the increased requirements for collaboration in contemporary work contexts make it difficult for formal leaders to manage all of the necessary FBS relationships between teams (Cross et al., 2016). That is, the increasingly dynamic and unpredictable nature of work combined with deeper technical sophistication and use of more short-term project based teams makes a priori, formal specification of the necessary boundary spanning relationships exceedingly difficult (Mathieu et al., 2017). Indeed, Zhao and Anand (2013) suggest that in contexts where extensive collaboration requirements exist, the focus on the individual boundary spanner needs to give way to “collective bridges” where boundary spanning becomes the domain of more than one person.

#### **Discretionary Boundary Spanning and Informal Leaders**

Because teams are typically assigned only one formal leader, if there is a need to build collective bridges to avoid collaborative overload, then team members may need to take the initiative to form their own linkages to other teams. We define *discretionary boundary spanning* (DBS) as this type of inter-team exchange engaged in by individual team members who are not formal leaders directly charged with boundary spanning responsibilities.

**DBS and informal leadership.** We define *informal leadership* as a team member’s demonstrated influence in the team that cannot be attributed to formal authority (Schneier &

Goktepe, 1983). This definition has been widely used in previous studies of informal leadership (e.g., Acton, Foti, Lord, & Gladfelter, 2019; Carson, Tesluk, & Marrone, 2007; Zhu, Liao, Yam, & Johnson, 2018). The two key features of this definition are that an informal leader (a) does not have formal authority over those he or she is attempting to influence, and yet (b) demonstrates influence over those people regardless. The growing importance of this construct is evidenced by the exponential growth in research on this and related topics (i.e., informal leadership, emergent leadership, and shared leadership; Acton et al., 2019; Zhu et al., 2018) in the last twenty years.

Consistent with multiple streams of research, we believe that informal leadership is a logical and theoretically driven consequent of DBS. First, both the leadership literature and the literature on teams propose that boundary spanning behavior is a key element of leadership perceptions. In the leadership literature, contemporary approaches to leadership now view boundary spanning as an essential leadership behavior (e.g., DeRue et al., 2011; Morgeson et al., 2010). Similarly, in the teams literature, both early seminal work (Ancona & Caldwell, 1992) and subsequent research (Marrone et al., 2007) have underscored the value of boundary spanning to team-level success. Indeed, due to the increased demand for cross-unit collaboration in contemporary organizations, in their *JAP* Centennial Review of the teams literature, Mathieu et al. (2017) concluded that “the universal leadership dimensions of initiating structure and consideration made way for a third critical dimension, boundary spanning behavior, as the role of the team leader became more external to team operations” (p. 457).

Second, the broader literature on social influence outside the domain of leadership and teams also proposes that an actor has influence over those who depend on the actor to achieve their goals (Emerson, 1962). Thus, boundary spanners should have influence, and thus informal leadership, in the team because teams may depend on boundary spanners to help understand the external environment, acquire necessary resources, or handle critical inter-team coordination tasks. Relatedly, because these behaviors take place beyond the borders of one’s own team, boundary spanning activities can affect one’s reputation in other parts of the organization.

Thus, multiple literatures suggest that informal leadership is a theoretically and practically important phenomenon and that DBS is likely to inform perceptions of informal leadership. Interestingly, however, the positive relationship between boundary spanning and informal leadership inferred by this work should not be taken for granted. For example, some studies suggest that formal leaders should be the only ones to engage in this activity, and as we noted earlier, some have concluded that “boundary spanning is most effective when performed by the project leader, not the team members” (Hirst & Mann, 2004, p. 147).

Additionally, even in contexts where DBS might be good for the team, teams may nevertheless view the boundary spanner with some wariness. Indeed, one theme that runs through the literature suggests that some teams respond to boundary spanners with distrust (Adams, 1965; Hogg et al., 2012). This distrust could potentially thwart one from claiming informal leadership in the team. In fact, a formal leader may be threatened by this discretionary behavior on the part of some subordinates and view it as “going around their back” or “usurping” the formal leader’s role. Thus, for all the reasons noted above, (a) informal leadership is a theoretically-driven, practically-relevant, and plausible outcome of boundary spanning behavior, but (b) the nature of this relationship is not obvious, and may be subject to boundary conditions.

## Simmelian Tie Theory and Discretionary Boundary Spanning

**Pre-requisites for effective DBS.** In order for DBS to be valuable in terms of eliciting perceptions of informal leadership, at the very least, the boundary spanning effort has to be effective (e.g., accurately transferring information, effectively managing inter-team relationships). However, forming effective DBS relationships is challenging. Given the departmentalization and specialization of labor in many organizations, different teams often encompass different knowledge bases, possess unique skills, and represent distinct job functions (Dougherty, 1992). The unfamiliar information and tacit knowledge from other teams can create difficulty for discretionary boundary spanners when it comes to transferring valuable information. To facilitate information transfer, it is imperative that contacts of other teams commit time and effort to help the focal person understand technical terms, jargon, and highly specialized task processes (Hansen, 1999; Reagans & McEvily, 2003; Zhao & Anand, 2013).

Yet, DBS ties are *informal* and *voluntary* relationships outside of one's focal team. Unlike work roles dictated by formal organizational hierarchies or intra-team ties regulated by group norms and peer pressure, informal dyadic ties *outside the focal team* create uncertain role expectations (Pillemer & Rothbard, 2018). Without formal requirements or group norms, either party in the informal, external relationships can brush off the other party's questions or requests, withdraw from the interactions at their discretion, or stop the informal relationships entirely (Simmel, 1950). Thus, if commitment to the tie is low, external ties may have little or no value.

Overcoming these challenges and executing effective DBS requires strong and stable connections, and STT elucidates the conditions under which ties are likely to have this requisite strength and stability. Furthermore, STT suggests that the same conditions that make DBS ties sustainable in the long run can also set the stage for creating constraints that limit one's options, thus hindering informal leadership perceptions. STT suggests that the key to understanding this dilemma lies in the structural (i.e., closed and open ties) and qualitative (i.e., task-oriented and friendship-oriented ties) nature of the DBS relationship.

**Simmelian Tie Theory: Open and closed DBS ties.** Simmel (1950) distinguishes between ties that are part of open structures (i.e., dyadic ties not reinforced by a third party) and closed triadic structures (i.e., dyadic ties between two individuals who are both simultaneously linked to a common third party). Exchanges between parties in open structures, where boundary spanning can be direct or indirect (brokered), conform to the logic of dyadic exchange characterized by high individualization and high bargaining power. In addition, individuals within an open structure can manipulate information or fail to reciprocate favors, thus hindering the development of trust in the relationship. Either party in an open dyad could cease contact at any time based upon some real or imagined slight. In short, the voluntary nature of the tie, the potential lack of trust established in the tie, and the instability of the tie are the defining characteristics of relationships between two parties in an open structure (Krackhardt, 1998).

Thus, open structures may not be sufficient for successfully transferring unique expertise and information between teams characterized by different job functions or specialties. Without stable connections and sustained help from the other party, unfamiliar and non-codified information from another team can be complex and hard to understand (Hansen, 1999; Reagans & McEvily, 2003; Zhao & Anand, 2013). It is also very difficult to facilitate inter-team

coordination based on unreliable connections. Hence, in open DBS structures, a boundary spanning effort could easily fail to deliver on its potential benefits. At the same time, such ties may be so weak that they also fail to elicit any meaningful or substantial engagement costs from participants. Thus, when it comes to DBS, Simmelian tie theory does not suggest that open ties will have a positive or negative impact on perceptions of informal leadership.

According to Simmel, however, a common third party *completely changes the situation*. In particular, the existence of a shared third party reduces individualization (i.e., personal freedom) and provides group norms and clear expectations for the individuals involved that are not present with open ties. Thus, compared to open DBS ties, closed DBS ties are stronger and more stable. Individuals in closed triads are obligated to respond to each other's requests and are committed to helping each other (Krackhardt, 1998, 1999), because the failure to do so results in punitive sanctions that far exceed what one sees with open ties (Goh, Krackhardt, Weingart, & Koh, 2014). In addition, the existence of a triadic structure serves as a powerful conflict de-escalation mechanism, and compels members to resolve disputes as they arise, enhancing the utility and stability of the closed structures. Given the limited resources available within organizations, intergroup conflicts are all but inevitable (Van Bunderen, Greer, & Van Knippenberg, 2018). With only two individuals, this conflict often spirals out of control, quickly culminating in dyadic dissolution.

In contrast, a third party has the ability and motivation to break this cycle by emphasizing the broader mutual interests that are fulfilled by the triadic ties. Not only is this mediating role important, it is also an ongoing requirement for continued functioning of each of the dyads within the triad. Fulfilling this role provides an ongoing stabilizing force. Indeed, Simmel (1950, p. 149) stated that "there is no triad in which a dissent between any two elements does not occur from time to time – a dissent of a more harmless or more pointed, more momentary or more lasting, more theoretical or more practical nature – and in which the third member does not play a mediation role." Thus, for all these reasons, Simmel (1950) and Krackhardt (1998) concluded that a closed tie structure is "stable and sticky" for those embedded within it.

Building on Simmel's original insights about closed triads, we argue that there are two complementary mechanisms through which closed triadic relationships outside of the team affect an individual's ability to provide informal leadership. Specifically, closed DBS are characterized by (1) increased relational stability and (2) superior knowledge transmission benefits, both of which are of great consequence in the context of informal leadership emergence.

First, when individuals from different units need to share information and work together, their differences in professional identities set the stage for information withholding, misunderstandings, and conflict. However, when these same individuals are part of a closed DBS system, this (1) reduces conflict potential and (2) increases conflict resolution capability (Simmel 1950). This increases the stability and potentially, the visibility of closed boundary spanning ties to supervisors. All of this promotes the development of a cognitive schema of informal leadership at the supervisor level that may trigger a bandwagon effect at lower levels (i.e., peers at the focal unit gradually adjust their social schema), further reinforcing the leader's schema.

Second, when individuals from different units form stable closed triads, the duration, frequency, and intensity of interaction increases, and this facilitates the accurate and efficient

transmission of knowledge. This is especially critical when individuals are from different teams that represent different areas of expertise (Dougherty, 1992). Hence, the enhanced transmission of diverse knowledge in closed DBS configurations provides increased opportunities for valuable knowledge recombination (e.g., Perry-Smith, 2006; Rodan & Galunic, 2004) as well as the potential for disproportional contribution to team performance. Thus, closed DBS ties, up to a point, can increase an individual's social influence when the supervisor and team members depend on the boundary spanner's knowledge to achieve their goals.

However, these benefits are also associated with increased marginal costs as the number of such ties increases. Managing too many closed DBS ties means that the boundary spanner needs to spend a significant amount of time with others outside the focal team (Krackhardt, 1999). This could be harmful to one's informal leadership for several reasons. First, too much time spent outside the team could be perceived as being disloyal in the eyes of the formal leader, as well as the other team members (Adams, 1965). It could also reduce the amount of time spent on one's designated work tasks within the unit (Koopman et al., 2016). Further, being tightly embedded in multiple different closed structures also means that the boundary spanner is likely to face conflicting norms and expectations relative to those in the focal team (Krackhardt, 1999). Decisions, where one choice favors an outside group relative to the focal team, can become more frequent. This creates strain (Cross et al., 2016) and leads to the perception of indecisiveness that is antithetical to perceptions of leadership (Phillips & Lord, 1986).

Thus, although a small number of closed DBS ties should be valuable for enhancing one's informal leadership, as the number of closed DBS ties goes up, the constraints and marginal costs associated with these ties are likely to more than offset the marginal benefits, resulting in decreased informal leadership perceptions. Thus, drawing on STT (Simmel, 1950), we argue that the number of closed DBS ties – because of their stable yet sticky features – should exhibit an inverted U-shaped relationship with perceptions of one's informal leadership. However, in addition to the *structure* of the ties, the *content* of the ties is also critical.

**Simmelian Tie Theory: Task-oriented ties and friendship-oriented ties.** To further differentiate the nature of closed DBS ties, we distinguish DBS ties based on task-based relationships relative to those based on friendship. These are the two most common types of relationships, and the content of the tie is likely to impact both its advantages and disadvantages (Methot, Lepine, Podsakoff, & Christian, 2016; Tasselli, Kilduff, & Menges, 2015).

For example, when it comes to the relationship between closed *task-oriented* DBS ties and informal leadership, on the upside, closed task-oriented DBS ties support cooperation norms in the triad (Simmel, 1950), and this assures successful transfer of external information as well as effective coordination with other teams. However, as the number of closed task-oriented DBS ties increases, the marginal costs (e.g., the time and energy spent on helping and reciprocating a favor to other parties) begin to exceed the marginal benefits (e.g., information becomes increasingly redundant). This triggers the downside that completes the inverted U-shaped relationship with perceptions of informal leadership.

When it comes to the relationship between closed *friendship* DBS ties and informal leadership, one is likely to see the same inverted-U relationship; however, the marginal costs and benefits are greatly accelerated with respect to the number of ties on both the upside and the



downside of the curve. The reason for this is that workplace friendships differ from purely task-based relationships because they present both affective *and* instrumental benefits (Ingram & Zou, 2008; Krackhardt & Stern, 1988; Li, Eden, Hitt, & Ireland, 2008). That is, beyond emotional support (Bell & Coleman, 1999; Suttles, 1970), friendship relationships can also provide a number of instrumental benefits (e.g., Ingram & Zou, 2008; Krackhardt & Stern, 1988; Li et al., 2008; Methot et al., 2016). In fact, the term “appropriable” was coined early in the social network literature to highlight how this kind of friendship tie can be used in order to accomplish different goals, including task-oriented instrumental goals.

For example, boundary spanners in closed friendship relations are ready to engage in above-and-beyond help to each other (Bowler & Brass, 2006), whether it is (a) providing emotional support, (b) sharing information or resources obtained from their respective teams, or (c) helping the other person get work done by sharing knowledge from their own domains. Bowler and Brass (2006) showed that individuals were more likely to go above and beyond what was required by organizational roles to help a friend at work rather than a non-friend because mutual trust and empathy encourages friends to look out for each other.

Methot et al. (2016) also documented that trust in social relationships increases individuals’ task performance by increasing their access to valuable resources because of both parties’ willingness to “share their resources without worrying that the other party will take advantage of them” (p. 18). In fact, by definition, friendship embodies socio-emotional engagements and mutually beneficial intentions directed between two people (Chua, Ingram, & Morris, 2008; Methot et al., 2016). Thus, when team members are friends with people in different teams, their supervisor has access to broader and richer knowledge, and this can enhance performance of the focal team in a way that is valuable to the supervisor.

In addition to voluntary help and resource sharing, research suggests that friendship DBS ties may also be associated with lower inter-team conflict and increased inter-team coordination that might also be valuable to supervisors. For instance, Krackhardt and Stern (1988) argued that in times of crisis, individuals in the same team were often viewed as allies in budget battles, whereas other teams were perceived as competitors. This perceived threat led teams to withhold information and reduce cooperation with other teams. Between-unit friendships, however, promoted trustworthiness and reduced perceived threat, facilitating inter-team communication (Krackhardt & Stern, 1988). Thus, closed friendship DBS ties, up to a point, can carry invaluable instrumental benefits to the formal leaders of the focal team.

However, after a certain point, these friendships have diminishing marginal utility and escalating marginal costs. Thus, we predict that like closed DBS task-oriented ties, there is an inverted U-shaped relationship between closed friendship-oriented DBS ties and informal leadership. However, importantly, we predict that the location of the *apex of this inverted-U relationship differs*. That is, whether the relationship is task-based or friendship-based is likely to affect the optimal number of DBS ties (i.e., inflection point). Specifically, building on our previous arguments, there are several unique advantages and disadvantages associated with closed friendship-based DBS ties that lead the inverted-U relationship with informal leadership to ramp up more quickly and also descend more quickly, relative to closed task-based DBS ties.

First, on the upside, the positive intentions associated with friendship facilitate deep-level knowledge exchange and sharing beyond what one sees between individuals linked only via a closed task-oriented DBS tie. Reviewing the literature on business friends, Ingram and Zou (2008) noted that one of the advantages of friendship is that parties have better capacity to understand each other and communicate effectively. Uzzi (1997) went even further and stated the richer connection between friends was even more important when it came to the transfer of “tacit knowledge” (p. 171). Second, research on inter-organizational networks highlights that friendship relations between firms are essential to establish mutual trust, through which knowledge will be more freely shared (Li et al., 2008). Consistent with this literature, we expect that individuals can accrue information transfer benefits with fewer closed friendship DBS relationships relative to task-oriented systems. Thus, the apex of the curve shifts left.

Still, this is only half the picture. One also has to understand the unique maintenance costs associated with friendship relationships. That is, despite the obvious advantages of closed friendship DBS ties, several studies also highlight that individuals in friendship relationships often feel obligated to help others even at the cost of taking an excessive amount of time from their own work (Ingram & Zou, 2008). This is something that supervisors may not appreciate (Methot et al., 2016). Also well-intentioned helping behavior can be depleting (Barnes et al., 2008; Lanaj, Johnson, & Wang, 2016). Even more to the point here, failing to help a friend who is part of a closed triad is punished more severely versus one in an open dyad, making helping behavior feel even less discretionary than would normally be the case (Goh et al., 2014).

Moreover, the strong negative reaction from friends in a closed triad when their help requests are unheeded becomes especially likely when one is surrounded by an ever increasing number of close friends distributed widely across the organization. Thus, beyond the social maintenance costs, at some point, it becomes difficult or impossible to meet the conflicting needs of friends when one friend can only be accommodated at the expense of another. Indeed, Simmel (1950) recognized that “in such a case, the third, whom love or duty, fate or habit have made equally intimate with both, can be crushed by the conflict – much more so than if he himself took sides” (p. 150), such that this situation often causes the third party to experience “the most painful dualism of feelings” (p. 151). This could lead to indecision and inaction that negate the benefits of even a moderate number of closed friendship-based DBS ties (Phillips & Lord, 1986).

Finally, whereas appropriable DBS ties have potential value for both one’s team and the individual engaging in the behavior, there may be heightened perceived conflict of interests between the would-be boundary spanner and the team that quickly reduces the marginal value and quickly increases the marginal cost of closed friendship-based DBS ties. Along these lines, Pillemer and Rothbard (2018) suggested that although appropriable for the instrumental purpose at times, “friendship can be at odds with core aspects of organizational life...when instrumental and affective goals ‘blend’ in a given context” (p. 637). At some point, the supervisor might question the allegiance of the boundary spanner to the formal team, and may see excessive levels of DBS as personal enrichment on the part of the boundary spanner. Thus, whereas it takes fewer closed friendship-based DBS relationships to derive the marginal benefits (e.g., knowledge transfer) relative to closed task-oriented DBS ties; it also takes fewer closed friendship-based DBS relationships to start incurring the elevated marginal costs (e.g., social constraints).

Taken together, this leads to three hypotheses:

*Hypothesis 1:* There will be an inverted U-shaped curvilinear relationship between the number of closed task-oriented DBS ties and perceptions of informal leadership.

*Hypothesis 2:* There will be an inverted U-shaped curvilinear relationship between the number of closed friendship DBS ties and perceptions of informal leadership.

*Hypothesis 3:* The apex of the inverted U-shaped curvilinear relationship between the number of closed friendship DBS ties and perceptions of informal leadership occurs at a lower value relative to the apex of the inverted U-shaped curvilinear relationship between the number of closed task-oriented DBS ties and perceptions of informal leadership.

## Method

### Research Setting

We test our hypotheses in the context of a large-scale, \$800 million scientific project aimed at constructing the United States' next-generation linear particle accelerator (the Facility for Rare Isotope Beams – FRIB). The Nuclear Science Advisory Committee (NSAC) has endorsed the FRIB as one of the highest priorities for advancing nuclear science in the United States. Representing a collaborative effort between the United States Department of Energy Office of Science (DOE-SC) and a large Midwestern university, the FRIB is a critical enabler for scientific initiatives seeking to understand the fundamental forces of nature by studying their instantiation in nuclear particles (York et al., 2009). We obtained institutional review board (IRB) approval from Michigan State University (IRB#12-112), protocol title: “Formal and Informal Boundary Spanning in Multiteam Systems: Triadic Influences on Knowledge Generation and Innovation in Scientific Teams (CGA 123349).”

In terms of its formal structure, this organization is composed of three levels that include (a) work teams (i.e., individual contributors and line managers), (b) divisions comprised of section managers, and (c) representatives of the top management team. Figure 1 (Appendix A) shows a simplified illustration of the sampled organization. Specifically, the “work teams” at the bottom produced physical products or provided services. Work teams consisted of several *Team Members* who did the work and a *Line Manager* who supervised the work and had some formal authority related to team tasks. These teams focused on the accomplishment of core operational-level production or service tasks and were responsible for developing ideas for improvements in their production or service process. Line Managers, as well as Team Members, set goals, inspected each other's work, and worked together to resolve problems, with the Line Manager resolving any irreconcilable disagreements when it came to goal setting or problem solving.

One-level above this were the “division management teams” comprised of *Section Managers* who executed managerial-level tasks and were responsible for coordinating the subunits. Section Managers and Line Managers worked together to set goals and resolve problems in the division; however, the Section Managers had the formal power to resolve any irreconcilable disagreements among the Line Managers. Although Line Managers were formal leaders of their “work teams,” none of them had any authority relative to another Line Manager. Thus, when Section Managers evaluated the informal leadership of these individuals, they considered how each Line Manager served as an informal leader for their Line Manager peers.

At the top of the organization was a single “top management team.” This team was comprised of the *Project Manager*, who supervised this team comprised of *Division Directors*. This team met to make decisions about the organization’s strategic objectives and assess the state of the organization related to those objectives. Although Division Directors were formal leaders of their own Divisions, when it came to influencing the other Division Directors, they had no formal authority. However, some Division Directors were still perceived as being particularly influential in the top management team, demonstrating informal leadership for their peers.

In terms of operationalizing the construct of informal leadership, a participant’s informal leadership was evaluated with reference to a team where they held no formal authority. Although Line Managers, Section Managers, and Division Directors were formal leaders in the teams they supervised, they had no authority within their own higher-level teams. Consistent with our definition, influence they displayed among their peers at this level was considered informal leadership. That is, similar to how individual contributors’ informal leadership was rated with reference to the work teams, Line Managers’ informal leadership was rated with reference to the sections that they belonged to, Section Managers were evaluated relative to other managers in the division, and Division Directors were assessed with reference to the top management team. As such, the conceptualization and the operationalization of informal leadership were aligned.

We should note that, for ease of exposition, we have depicted the organizational structure in a very formal manner. However, due to the evolving nature of the work taking place, there were opportunities for DBS and informal leadership. Thus, this setting is well suited for examining our research question because organizations engaged in knowledge-intensive work (e.g., large-scale scientific collaborative projects such as FRIB) are characterized by (a) flatter organizational structures, (b) fewer hierarchical authority relationships, and (c) rapid and potentially disruptive technological change. Collectively, these attributes provide a context that foreshadows the attributes of other knowledge-intensive organizations in other domains.

In addition, FRIB draws upon the interdisciplinary efforts of individuals from a wide variety of occupational specialties. Formal job titles range from generic jobs typically found in almost all organizations (Human Resource Administrator, Financial Analyst, Travel Coordinator) to specialized jobs found in few other organizations (Rare Isotope Beam Physicist, Ion Source Physicist, and Cryogenic Engineer). These factors create a complex task environment that requires individual skill specialization and adaptive structural interdependence.

Organizations charged with the realization of large-scale scientific projects, such as FRIB, engage an evolving set of highly specialized individuals for the construction, utilization, and maintenance of an integrated system of historic complexity. Such an environment is highly unpredictable and dynamic; therefore, the timely access to relevant, valuable knowledge is a key factor for unit and system performance. Under these conditions, we argue that social influence disproportionately accrues to individuals when (1) they are perceived to have well-established relationships with sources of valuable knowledge outside the focal unit and (2) these relationships support knowledge transfer that allows them to distinguish themselves through the provision of unique expertise and guidance as it pertains to integrative problem solving. Together, this suggests that effective DBS is valuable to the supervisor (and potentially visible) in a way that promotes perceptions of informal leadership status.

## Sample

To accurately specify our network boundary and capture the entirety of the FRIB organization, our research team worked with the organization's leadership to ensure we had a complete roster of FRIB employees. This resulted in the recruitment of 181 full-time employees from 55 different teams ( $M = 5.74$ ,  $SD = 3.69$ ). Of the 181 individuals, 82% ( $N = 149$ ) chose to participate, of which 25% percent were female. The average age was 42.6 years ( $SD = 11.9$ ) and the average organizational tenure was 3.5 years ( $SD = 3.4$ ). In addition, 77% of the respondents classified themselves as Caucasian, with other respondents identifying as Asian (16%), Hispanic (3%), and African American (1%). In terms of educational background, 83% of the participants had achieved at least a bachelor's degree and 42% had achieved a graduate degree. In terms of the nature of the occupations, 66% of the respondents worked in a scientific division, while the remaining respondents were from business support divisions. Lastly, 33% of the respondents had managerial titles (e.g., Line Managers, Division Directors) whereas 67% were team members with no formal leadership responsibility.

## Procedure

In order to enhance engagement, prior to the official launch of the study, we scheduled one-on-one meetings with managers across the organization. After discussions with managers, we then set up meetings with all full-time employees, where we explained the purpose of our research, emphasizing its potential importance for improving the conduct of large collaborative science in general, as well as the potential for contributing to their own professional development. At Time 1, we officially invited all 181 identified individuals to participate in this study, provided access to questionnaires, guaranteed confidentiality, and assured that their participation was voluntary. The questionnaires included items related to demographic information, as well as sociometric surveys. Due to the size of this organization, we followed procedures and suggestions outlined by Kossinets (2006) and Reagans, Zuckerman, and McEvily (2004). Specifically, we collected sociometric data using a hybrid fixed roster and free recall method (Wasserman & Faust, 1994) and we worked with a subject matter expert at FRIB to validate documented team boundaries to reduce cognitive load and help ensure complete coverage.

With this procedure, we first presented the respondents with a list of all teams at FRIB outside their own, and then asked them to indicate whether they interacted with anyone from any of those teams. If the respondent checked an external team, we then presented a full list of members from that team (in addition to the members of their own team) so they could choose specific people. After this process was complete, we also provided a free response section where a participant could write in up to 15 additional individuals, ensuring that less salient DBS relationships were included in a participant's responses (Ferligoj & Hlebec, 1999). As such, these procedures are complimentary in that the free-recall response provides a backup by ensuring that important DBS relationships that, for some reason, were not captured by the fixed roster were included (Holland & Leinhardt, 1973). In the end, this procedure reduced the roster from all FRIB personnel to a shorter, but still accurate list of potential contacts for each respondent. In all, 149 out of 181 individuals (82.3%) completed the relational (network) survey.

Immediate supervisors provided a rating of the informal leadership for each of his/her subordinates at Time 2, approximately one year after the initial survey. We considered supervisors as the ideal source of this criterion for multiple reasons. First, the purpose of the study was to investigate the implications of DBS activities for *individual actors* (i.e., those engaging in DBS). For the actors involved, the immediate supervisor's perception is the most important because the supervisor's opinions directly determine individuals' assignments, raises, promotions, and other career-related outcomes. Second, supervisors have a better "big picture" view of which team members are affecting the whole team relative to peers who have a more limited, local (e.g., dyadic) perspective with respect to influence (Lanaj & Hollenbeck, 2015; Wellman, 2017). Because DBS directly relates to *inter-team* coordination and collaboration that reflects a broad organizational context, a fellow team member may not directly benefit from the focal person's DBS efforts (and is thus less likely to appreciate the leadership implications of the DBS behavior). Third, the increased demands for inter-team coordination and collaboration in contemporary organizations often call for more boundary spanning behavior than can be executed by the formal leader working alone (Cross et al., 2016). Thus, formal leaders are in a unique position to appreciate the importance of appropriately managing DBS relationships.

In fact, in cases where there may be collaborative overload, team members who choose to engage in DBS may be instrumental in reducing the formal leader's burden. As a result of this behavior, the formal leader may see this individual as a valued informal leader. On the other hand, if formal leaders are not facing collaborative overload, this "help" may be perceived as unnecessary, and DBS might even be perceived as a distraction at best or a usurpation of authority at worst. Thus, the leader's resulting perceptions regarding the team member's informal leadership are central when it comes to addressing problems related to collaboration overload.

Together, 132 out of the 149 employees who had completed the relational survey also received external ratings of informal leadership. This set of 132 individuals comprised our final sample for data analysis. Using *t*-test comparisons between the 132 respondents and non-respondents, we found that there were no significant demographic differences between the 132 and the 149 set of individuals. Taken together, we collected data from multiple sources (i.e., subordinates' self-reports of social networks, as well as supervisors' ratings of informal leadership) at different time points in order to reduce common method variance concerns.

## Measures

As we noted, we used the hybrid fixed roster and free recall method to first establish who had relationships with whom. We tasked respondents to characterize whether the person identified in the first stage of the procedure was (a) someone with whom they exchanged work-related information and/or (b) someone whom they considered a friend (or neither). Thus, a person could describe their tie to others as a task-oriented DBS tie, a friendship DBS tie, or both.

Task-oriented ties needed to be confirmed in the sense that a task-oriented relationship between individual *i* and individual *j* occurred only when (a) individual *i* gave work-related information to *and* received work-related information from individual *j* and (b) individual *j* gave work-related information to *and* received work-related information from individual *i*. Like task-related ties, the operationalization of friendship in this study required mutual agreement, and hence, the purported friend had to confirm the tie. That is, if individual *i* indicated individual *j*

was his or her friend, then individual  $j$  had to also name individual  $i$  as being his or her friend as well. Using confirmed reciprocal ties is a conservative approach, and ensures the meaningfulness of the relationships. It also creates consistency between the operationalization and the conceptualization of Simmelian closed ties (Simmel, 1950). Further, this operationalization also helped limit detrimental effects from inaccurate reporting.

**Closed DBS ties.** Because we are interested in ties that bridged different teams, we defined closed DBS ties as occurring when (a) individual  $i$  and individual  $j$  are in different teams, (b) they have a reciprocated, confirmed tie, and (c) both have a reciprocated, confirmed tie in common with at least one other individual in a team different from both individual  $i$  and individual  $j$ . Two closed DBS tie measures (task-oriented and friendship relationships) were calculated for each individual.

**Open DBS ties.** We defined open DBS ties as occurring when (a) individual  $i$  and individual  $j$  are in different teams, (b) they have a reciprocated, confirmed tie, and (c) neither have a symmetric tie in common with any other individual in a team different from both individual  $i$  and individual  $j$ . In addition, we also considered boundary spanning relationships realized through a single intermediary as Open DBS ties when boundary spanners and intermediary did not have a tie in common with any other individual. Similarly, separate task-oriented and friendship-based measures were calculated for each individual.

**Informal leadership.** Immediate supervisors rated each individual's standing as an informal leader on a scale (1 = *strongly disagree*, 5 = *strongly agree*) using six items ( $\alpha = .88$ ) adapted from prior research (Kent & Moss, 1990; Taggar, Hackett, & Saha, 1999; see Appendix B). As discussed above, a given participant's informal leadership was rated with reference to the team where they held *no* formal authority.

**Job performance.** Although our primary dependent variable was informal leadership, in order to test the construct validity of that measure, we also had the supervisors evaluate the job performance of the individuals they supervised. These measures should converge at a low level, but also display some level of discriminant validity. We measured job performance using ten items ( $\alpha = .90$ ) adapted from Tsui, Pearce, Porter, and Tripoli (1997). Sample items include "this person performs the job well" and "this person is very efficient".

**Control variables.** Because being a supervisor might influence the number of ties one has and one's informal leadership influence, we controlled for managerial status. We obtained participants' managerial status from the organizational chart in place when the study took place. Additionally, in order to be consistent with prior work on closed DBS ties (Tortoriello & Krackhardt, 2010), we controlled for team size, organizational tenure, job tenure, and age. Finally, to remove the confounding influence of other aspects of one's social network, we controlled for the number of open ties and the number of closed triads within teams.

### **Analytic Strategy**

We use a hierarchical regression analysis to test our hypotheses in Stata (2019). To account for non-independence associated with unobserved group effects, we clustered observations by the formal groupings when estimating standard errors (McNeish, Stapleton, &

Silverman, 2017; Rogers, 1993). To reduce nonessential collinearity, we standardized all DBS measures prior to creating the quadratic terms (Cohen, Cohen, West, & Aiken, 2003), which implies that each measure was centered around the respective sample means. Because one of the purposes of this study is to demonstrate that not all DBS ties are created equal, we included both closed and open DBS ties in our primary analysis. Specifically, as shown in Table 2, we entered the theoretical control variable (i.e., managerial status) in Model 1. In Model 2 we entered the first-order terms, including closed task-oriented DBS ties, closed friendship DBS ties, open task-oriented DBS ties, and open friendship DBS ties, as predictors of supervisory ratings of informal leadership.

In Model 3, to test our hypothesized curvilinear effects, we entered the quadratic term for each of these four variables into the regression equation. As such, the first three models (steps) represent the full model tests. We also conducted multiple robustness checks. In Model 4 we examined the effects with additional controls. In Model 5 we removed open DBS ties as predictors and reran analyses with only closed DBS ties. In Model 6, we compared and contrasted the effects of closed DBS ties with the effects of closed *intra-team* ties. Finally, we included all controls in Model 7. Together, in line with prior scholarly work cautioning about the wanton inclusion of control variables (Becker, 2005; Carlson & Wu, 2012), with Models 4 – 7, we demonstrated that our results are robust to the inclusion or exclusion of those controls.

## Results

### A Priori Hypothesis Tests

Table 1 presents descriptive statistics among the study variables. We note that in terms of convergent and discriminant validity, the leader's judgment regarding the focal person's informal leadership shared 54% of the variance with the person's job performance. Given the high Cronbach's alphas for both scales, this suggests that the constructs of informal leadership and job performance were related, but not redundant judgments.

Table 2 reports the results from the hierarchical regression analyses used to test our hypotheses. Specifically, consistent with our theoretical justification for inclusion, Model 1 shows that the control variable "managerial status" accounted for 7.4% of the variance in informal leadership ratings. In addition, Model 2 shows that none of the linear effects for DBS ties were significant. Nor did they collectively explain any meaningful additional variance ( $\Delta R^2 = 0.7\%$ , *n.s.*) beyond the control variable.

In contrast, consistent with our hypotheses, Model 3 (Table 2) shows that the quadratic terms for closed task-oriented DBS ties and closed friendship DBS ties were both significant and negative. Specifically, Hypothesis 1 predicted an inverted U-shaped relationship between the number of closed task-based DBS ties and informal leadership perceptions. The results indicated that the standardized coefficient for the quadratic term relating closed task-oriented DBS ties was  $\beta = -.17$  ( $p < .01$ ). Hence, Hypothesis 1 was supported. Similarly, in Hypothesis 2, we predicted an inverted U-shaped relationship between the number of closed friendship DBS ties and informal leadership perceptions. The results indicated that the standardized coefficient for the quadratic term of closed friendship DBS ties was  $\beta = -.12$  ( $p < .01$ ). Thus, Hypothesis 2 was supported. Additionally, the quadratic DBS terms collectively explained a statistically significant



amount of incremental variance over Model 2 ( $\Delta R^2 = 8.1\%$ ,  $p < .05$ ). As shown in Model 3, none of the linear or quadratic terms of open DBS ties were significant. In contrast, the quadratic terms of closed DBS ties were significant and negative. Collectively, this supports the assertion that the embedding structure of the DBS relationships – not just the number – is critical.

Additionally, we conducted a series of supplemental analyses to provide further confidence in the results. First, to be consistent with prior work on the effects of closed DBS ties (Tortoriello & Krackhardt, 2010), we added four additional control variables (i.e., team size, organizational tenure, job tenure, and age). Results indicate that the curvilinear effects of closed DBS ties were robust to these controls (Model 4, Table 2). Second, given that we asserted that primarily closed (rather than open) DBS ties will influence informal leadership; we removed open DBS ties in Model 5 and reran the analysis with closed DBS ties only. The results indicated that the curvilinear effects of closed DBS ties on informal leadership were robust to the removal of open DBS ties (Model 5, Table 2). Third, we compared and contrasted closed *DBS* ties with closed *intrateam* ties. The results indicated that the effects of closed DBS ties held when controlling for intrateam ties (see Model 6, Table 2), further indicating the unique effect of closed DBS relationships. However, whereas closed task-oriented intrateam ties did not seem to have a substantial impact on informal leadership, unexpectedly, informal leadership appeared to benefit from an increasing number of closed friendship intrateam ties. Finally, our hypothesized effects were robust to inclusion of all the evaluated control variables simultaneously (Model 7, Table 2). Together, these results demonstrated the importance of closed DBS ties and provide additional support for our proposed theoretical mechanisms.

To further facilitate interpretation of these findings, we plotted the curvilinear effects of closed task-oriented DBS ties in Figure 1, where it is evident that the number of ties is positively related to supervisory ratings of informal leadership up to a point (calculated to be 24.5 ties using the equation below), beyond which, the relationship becomes negative. Similarly, we plotted the curvilinear effects for closed friendship DBS in Figure 2. As shown, the number of ties is also positively related to supervisory ratings of informal leadership up to a point (calculated to be 3.1 ties using the equation below), beyond which, the relationship becomes negative.

Further, in Hypothesis 3 we proposed that the apex for the inverted-U relationship occurs at a smaller number of ties in the case of friendship-based DBS relationships relative to task-oriented relationships. The computation of the optimal  $X$  for a quadratic regression equation estimated using standardized data is given as  $(\frac{-B_{1,2}}{2B_{2,1}}) \times SD + \bar{X}$  (Cohen et al., 2003), where  $B_{1,2}$  represents the standardized coefficient for the linear term and  $B_{2,1}$  represents the standardized coefficient for the quadratic term. Using this equation to estimate the location of each apex, we calculated a location difference of -21.4 ties.

We tested the significance of this difference using bootstrapping resampling techniques to calculate the confidence interval for the difference score of the optimal number of closed friendship DBS ties and the optimal number of closed task-oriented DBS ties. Specifically, we used the regression coefficients estimated for each of the 10,000 bootstrap resamples to calculate the location of the apexes for both closed task-oriented DBS ties and closed friendship-based DBS ties. We then calculated the difference score between the two apex locations for each bootstrap sample and constructed a 95% confidence interval of the differences. The resulting

confidence interval [-34.49, -10.50] was in the hypothesized direction and excluded zero, indicating the optimal number of closed friendship DBS ties occurred at a lower value relative to the optimal value for closed task-oriented DBS ties. Thus, Hypothesis 3 was supported.

### **Post-Hoc Analyses: Does Every Supervisor Value Informal Leadership Equally?**

Clearly, formal leaders seem to confer informal leadership on individuals who engage in the appropriate level of effective DBS. These results are consistent with our theorizing that increased inter-team coordination demands in contemporary organizations require significant boundary-spanning activities that often go beyond what a formal leader can effectively manage. In such contexts, DBS helps relieve formal leaders' burden and contributes to team success.

This line of reasoning also suggests, however, that informal leadership on the part of subordinates should be more valuable to leaders who may be struggling to effectively manage their own widespread boundary spanning requirements. In line with recent arguments by Hollenbeck and Wright (2017) regarding data that is rare or costly to collect, we conducted supplementary, post hoc analyses to learn as much as possible from this unique data set. Specifically, we considered whether the burdens imposed by maintaining numerous formal ties do indeed influence the extent to which informal leadership perceptions seem to matter to supervisors when it comes to ratings of employee performance.

To test this assertion, we conducted regression analyses evaluating the extent to which an employee's informal leadership and a supervisor's formal ties interacted to predict the supervisor's ratings of employee job performance. As shown in Table 3 (Model 2), the results indicate that, informal leadership was, on average, positively related to job performance ( $\beta = .49$ ,  $p < .01$ ). Further, as shown in Model 4, the strength of this relationship differed for different supervisors such that the number of formal ties a supervisor had moderated the relationship between ratings of informal leadership and job performance ( $\beta = .08$ ,  $p < .05$ ). Specifically, the positive relationship between informal leadership and job performance was stronger for supervisors who had many formal ties relative to supervisors who had fewer formal ties.

To aid in the interpretability of our results, we plotted this interaction in Figure 3. As shown there, whereas the overall pattern of results was consistent with our theorizing in terms of the strength of the relationships, there was an unexpected nuance when it came to specific points along the lines. Specifically, rather than differentially rewarding team members for engaging in high levels of informal leadership, heavily burdened managers seemed more inclined to punish team members who *failed to engage in DBS* when it came to performance evaluations.

## **Discussion**

Discretionary boundary spanning (DBS) and informal leadership are increasingly important in knowledge-intensive organizations due to their flatter structure, flexible workflow, and collaborative nature (Carter, DeChurch, Braun, & Contractor, 2015). As boundary spanning activities become increasingly demanding within organizations employing team-based structures, research suggests that boundary spanning can no longer be considered the exclusive domain of formal leaders (Zhao & Anand, 2013). Rather, the presence of DBS increases access to external information and expertise in a timely fashion and may alleviate the burden placed on supervisors,

who are generally formally responsible for such activities (e.g., Marrone et al., 2007). However, despite the evidence that boundary spanning is beneficial for collective success, knowledge regarding its implications for the individuals who carry out these activities is limited.

Our results revealed several key insights with respect to DBS. First, we conceptually and empirically differentiated between closed and open DBS ties, extending STT (Simmel, 1950) to provide a theoretically relevant way to distinguish important, but previously overlooked structural nuances when it comes to boundary spanning. We theorized that in the context of knowledge-intensive organizations, an isolated DBS connection may be insufficient for successfully transferring complex and specialized information, and instead, effective DBS may require cohesive closed ties. Due to their mutually reinforcing nature, closed DBS ties provide stronger conduits for the transfer and translation of implicit knowledge relative to standalone, open DBS ties. However, closed DBS ties are also more constraining. Empirically, our findings supported our arguments, showing that there were potential benefits and costs associated with having closed DBS ties. In contrast, neither form of open DBS ties triggered robust positive or negative outcomes when it came to ratings of informal leadership.

Second, beyond relational structure, the nature of relationships also matters. Whereas both closed task-based and closed friendship-based DBS ties influenced informal leadership in a similar manner (i.e., an inverted U-shaped relationship), there were significant differences in the optimal number of closed DBS ties for different types of relationships. Specifically, there were informal leadership benefits attributable to having (a) a *moderate* number of closed task-oriented DBS ties, and (b) a *small* number of closed friendship DBS ties, and beyond these points, additional ties were detrimental to one's perceived informal leadership status.

Third, in our supplemental analyses, we showed that certain types of relationships *did not seem to influence* perceptions of informal leadership. This included all types of open ties that seem to be too weak to trigger either the costs or benefits of DBS, as well as *closed task-oriented triads within teams*. This latter result suggests that the information that individuals within the same team hold is likely to be more redundant and less useful relative to the information held by members of different teams. In contrast, informal leadership did benefit from an increasing number of *closed friendship triads within teams*. This unexpected difference might be due to the fact that unlike task-oriented ties, friendship ties within the team might lead individuals to go above and beyond their formal job description to help their friends.

Finally, to confirm our arguments about the benefits of effective DBS and informal leadership perceptions, we examined which leaders place a particularly high value on informal leadership. Our results indicated that, although all supervisors appreciate informal leadership, the relationship between supervisors' ratings of informal leadership and job performance was particularly strong for supervisors burdened with many formal ties themselves. This reinforces our logic that formal leaders who may be experiencing "collaborative overload" (Cross et al., 2016) are likely to place additional value on effective informal leadership.

However, although our initial expectation was that heavily burdened leaders would *reward* individuals who they viewed as informal leaders; this was not precisely the case. Instead, the nature of the interaction suggested that formal leaders who were experiencing collaborative overload *punished* those who failed to exhibit informal leadership via lower evaluations of

overall job performance. Thus, paralleling our arguments that closed structures can make seemingly discretionary boundary spanning ties effectively less discretionary, it appears that when formal leaders are heavily burdened with collaboration requirements, informal leadership may also be less discretionary than it might seem from one's official job description.

### **Theoretical Implications**

This study makes several theoretical contributions to the literatures on teams, leadership, and social networks. First, with respect to the teams literature, we were able to explain a great deal of variance in evaluations of informal leadership attributed to boundary spanning using just *two* basic forms of reciprocal boundary spanning relationships measured via two continuous variables – task-oriented and friendship ties. In terms of theoretical parsimony, this stands in stark contrast to existing approaches that pile taxonomy on top of taxonomy in their efforts to conceptualize boundary spanning activity.

Specifically, there are at least 20 different taxonomy proposals in the literature that attempt to classify boundary spanning behavior. These include Ancona and Caldwell's (1988) three sets of fifteen activities (i.e., scout and ambassador activity, sentry and guard activity, and presence or absence of immigrants, captives, and emigrants); Adams' (1980) five classes of boundary activities (i.e., transacting input acquisition and output disposal, filtering inputs and outputs, searching for and collecting information, representing the organization, protecting and buffering the organization from external threats and pressures); Marrone's (2010) three categories (i.e., representation, coordination of task performance, and general information search); and Drach-Zahavy and Somech's (2010) four categories (i.e., bringing-up borders, buffering, scouting, and coordinating). Qualitative methods have proposed even more overlapping sets of activities with different labels, such as Harvey and colleagues' (2014) adopting, soliciting, framing, adapting, and influencing (for other taxonomies proposed by using a qualitative method, see Alexander et al., 2016; Colman & Rouzies, 2019; Wang et al., 2019).

Clearly, there is a severe lack of theoretical consensus concerning the classification systems employed within this literature, and empirically, no one has competitively tested any of these frameworks against one another. This has resulted in a considerable amount of unwarranted construct proliferation, and one wonders whether measures derived from any of these taxonomies would provide incremental variance explained beyond task-oriented and friendship-oriented ties when it comes to predicting informal leadership and job performance. Our theoretical approach may help the boundary spanning literature shift from a tradition of generating a seemingly never-ending series of idiosyncratic taxonomic structures, to instead, viewing different typologies as examples of boundary spanning behaviors that can be measured via continuous scales. This would set the stage for using dimension-reduction techniques (e.g., factor analysis or multidimensional scaling) or theory-pruning techniques to reduce and rationalize this conceptual space (Leavitt, Mitchell, & Peterson, 2010).

Second, while there is a clear consensus in the literature that boundary spanning promotes team outcomes, as we documented here, there is very little consensus regarding the impact that DBS has on the individual actors actually engaging in this behavior. Given the potential significance of DBS to collective outcomes in contemporary work contexts, the lack of theoretical clarity regarding the expected consequences for boundary spanners is troubling.

Consistent with this view, Marrone (2010) called for future research to examine how, why, and under what conditions there will be positive or negative outcomes for those who choose to engage in this behavior. Our research answers this call, and our application of STT identifies the relational variables that matter and do not matter when it comes to this question.

Third, with respect to the leadership literature, given the increasing demands on formal leaders in the workplace (both scheduled and unplanned), team members who step up and exhibit informal leadership may be crucial to team success. Indeed, accumulated evidence indicates that distributed leadership in the team enhances team effectiveness, performance, and innovation (Carson et al., 2007; Wang et al., 2014; Zhu et al., 2008). Thus, given the importance of informal leadership to teams and organizations (Zhang, Waldman, & Wang, 2012), as well as the explosion of research interest in this topic (Acton et al., 2019), understanding the predictors of one's informal leadership has far-reaching implications. For example, our results show that perceived *failure* to engage in informal leadership elicited punishment from heavily burdened formal leaders, so clearly, individuals can benefit from better managing these perceptions.

Finally, when it comes to contributing to social network theory, early *conceptual* attempts to leverage STT formally stated that there are costs associated with these kinds of ties. For example, Krackhardt (1999) suggested that Simmelian ties can be the “*ties that torture*”. However, *empirical* research based upon that theory has employed a linear model focused solely on the benefits of those ties (e.g., Tortoriello & Krackhardt, 2010). In this study, we rectified this theoretical-empirical disconnect and demonstrated that the theory is correct in the sense that one can become far too embedded. That is, whereas a small or moderate number of closed DBS ties may create a base of informational and social support that promotes perceptions of informal leadership; large numbers of closed DBS ties seem to work against such perceptions.

Further, in their research, Tortoriello and Krackhardt (2010) did not distinguish between task-oriented and friendship ties, but this was a critical differentiation in our study. The negative effect for a large number of closed DBS ties was especially powerful when it came to friendships, where the “pain point” occurred at very low levels. That is, as an individual's number of closed DBS friendship ties increases, the interpersonal needs of various cliques quickly outweigh their incremental informational value (e.g., as few as three such ties according to our results).

### **Practical Implications**

Our results also have practical implications for modern organizations. The FRIB is dedicated to pushing the frontiers of nuclear science and achievements, and this field is increasingly generated by teams and multiteam systems rather than individual scientists working alone (York et al., 2009). As an institution conducting large-scale collaborative research, FRIB is a clear example of a knowledge-intensive organization. This context places a great deal of value on coordinated effort rather than individual effort, and hence, informal leadership is critical.

As noted earlier, the FRIB represents an \$800-million investment. Due to the expense, the U.S. Department of Energy builds a new accelerator only once every 20-25 years. Due to the expense and timing, the director of this facility noted to us, “this specific accelerator has never been built before and will never be built again.” Because of changes in technology over time, as

well as the unique role played by each new accelerator in the overall portfolio of federally-funded accelerators, it is very difficult for organizational designers to know *in advance* how to precisely structure such an organization, making emergent DBS and informal leadership central to long-term success. Whereas other organizations may not share the extreme level of novelty that characterizes FRIB, most knowledge-intensive organizations regularly face a number of challenges (e.g., technology changes, regulatory imperatives, competitive actions, market shifts) that create similar levels of uncertainty that can only be overcome with effective DBS.

However, one cannot manage what one cannot measure, and although every organization has plotted and published its formal structure in fine detail in the form of an organization chart, few organizations plot out their informal structure in the same manner. The failure to routinely assess the informal structure is a serious impediment to managing the boundary spanning function, especially in a context where the number of closed ties matters more than simple counts of dyadic ties. Although most organizations could quickly tell you the “span of control” for one manager versus another, few could even speculate on – let alone report on – the number of closed friendship or task-oriented DBS ties that were present across individuals. Thus, organizations that can capture their informal structure and use this information to manage DBS may accrue some degree of competitive advantage (Hollenbeck & Jamieson, 2015).

Turning to the individual-level, unlike organizations, individuals might actually be able to provide direct assessments of the dyadic ties they have across the organization (and indeed do this as part of any relational survey). Yet, they may not know how to interpret their relational patterns. Thus, the same informal structure depictions provided to help organizations manage DBS could also help individuals’ professional leadership development. Although people may be aware of their triadic friendship ties, they are likely clueless with regard to the number of closed task-oriented ties they have and how that compares to others. If the personal goal is to strengthen one’s role in the organization over time, some individuals may need to increase their closed task-oriented DBS ties, while at the same time, not increasing their triadic friendship DBS ties.

Obtaining information on existing informal relationships could also add value at the team level in the context of composing new teams or revitalizing existing teams. When making staffing decisions, going beyond the consideration of typical, job-analysis derived attributes (e.g., past work experience, education, skills, etc.) to incorporate DBS potential could be valuable. As we have demonstrated, whereas some individuals are engaged in too few DBSs, limiting their ability to contribute to the organization, other individuals may become trapped in DBS positions that overtax their interpersonal capabilities and leave them with little recourse. By expressly considering both of these prospects when designing a new team (or redesigning an existing one), organizations can help ensure individuals’ DBS profiles are robust but not overwhelming, maximizing the informational and social benefits of DBS.

### **Limitations and Directions for Future Research**

We believe the present study has multiple strengths including: (a) the use of multiple sources of data, (b) the separation of measures across time, (c) the satisfactory response rate (82.3%) to the relational survey, (d) the differentiation and assessment of both friendship and task-oriented boundary spanning relationships, (e) the robustness of our results to both the inclusion and non-inclusion of a large set of control variables, (f) the assessment of DBS ties in a

relatively large organization, (g) the use of a hybrid roster method for comprehensively tapping ties across this large organization, and (h) the use of a sample of highly educated and specialized people working in a knowledge-intensive organization at the extreme cutting edge of innovation.

Still, this work has limitations. First, although many of the characteristics of this organization make it an ideal setting for studying DBS, the nature of work associated with constructing a linear particle accelerator is unique compared to other organizations. However, our focus was on testing *theoretical predictions* generated by STT, and that theory makes no explicit statements suggesting that it would not apply in this context. Thus, this was a legitimate context for testing our extension of STT. Still, there may be contexts where these theoretical conclusions may be different, and thus, more research is needed in different organizations.

Second, although FRIB represents a fascinating research context, the downside of working with such a facility is that we had to be very judicious with our data collection choices to minimize employee time commitment. Indeed, building a new linear accelerator is one of the greatest challenges in all of particle physics, and science in general, and given the intense focus and time pressure faced by the institution, we were limited in this context and could not “over-survey” these scientists, engineers and administrators. Admittedly, this study would have been more rigorous if we had been able to capture the mediating mechanisms that we alluded to when discussing why closed DBS ties were so important. Still, there is value in documenting the distal relationships in this critical context, and the practical and applied implications of these distal relationships are important even if the ultimate micro-mediation has yet to be established.

Third, although we collected our independent variables at Time 1 and our dependent variable at Time 2, we acknowledge the possibility that the causal order could be more complex than what we imply. Although our *measured* dependent variable cannot go back in time and affect the *measured* independent variables, the study is unable to examine the potential reverse causality between unmeasured perceptions of one’s informal leadership at Time 0 and DBS at Time 1 or unmeasured DBS at Time -1 and unmeasured informal leadership at Time 0. We encourage future research to use designs that allow an examination of the dynamic and reciprocal causality between DBS and informal leadership (Matusik, Hollenbeck, Matta, & Oh, 2019).

Finally, because (a) formal leaders are in a unique position to evaluate the criticality and utility of DBS, (b) supervisors’ perceptions are valuable when it comes to individual outcomes, and (c) the need to avoid common method bias, we believe that supervisory ratings of informal leadership were consistent with our theorizing and the best method for our purposes. Nevertheless, formal leaders are clearly not the only source, and future research should go beyond supervisor ratings of informal leadership and include peers where possible.

### Conclusion

Organizations in knowledge-intensive industries are increasingly employing fluid, team-based structures to organize work. Accordingly, boundary spanning has increasingly become a dynamic, emergent activity where individuals who may not have formal authority step up and engage in *discretionary* boundary spanning (DBS) activities. The findings of our study show that a moderate number of closed task-oriented DBS ties, and a small number of closed friendship-oriented DBS ties, can provide informal leadership benefits. However, we also provide evidence

that large numbers of such ties generate costs for aspiring informal leaders. Failing to manage this “dark side” of DBS may impose a limit on what otherwise would be the organization’s most effective source of informal leadership – and perhaps even – the organization’s most effective source of future formal leadership.

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Table 1  
*Descriptive Statistics and Correlations*

Variable	<i>M</i>	<i>S.D.</i>	1	2	3	4	5	6	7	8
1. Closed Task-oriented DBS Ties	7.34	9.74								
2. Closed Friendship DBS Ties	1.11	2.07	.34**							
3. Open Task-oriented DBS Ties	44.05	28.15	.67**	.28**						
4. Open Friendship DBS Ties	6.64	7.45	.40**	.68**	.31**					
5. Closed Task-oriented Within-team Ties	0.60	1.25	.10	-.04	.24**	-.03				
6. Closed Friendship Within-team Ties	0.67	1.31	-.11	-.14	-.19*	-.14	.18*			
7. Managerial Status	0.35	0.48	.42**	.45**	.28**	.39**	-.11	-.24**		
8. Informal Leadership	3.66	0.77	.17	.16	.14	.17	.04	.08	.27**	(.88)

*Note.* *N* = 132 (listwise); reliabilities on diagonal, when applicable.

\*  $p < .05$ ; \*\*  $p < .01$

Table 2  
*Results of Hierarchical Regression Analysis Predicting Informal Leadership*

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Closed Task-oriented DBS Ties		.02 (.12)	.60* (.24)	.65** (.22)	.21 (.12)	.62* (.25)	.64* (.24)
Closed Friendship DBS Ties		-.003 (.09)	.23 (.15)	.19 (.16)	.20 (.13)	.26 (.15)	.23 (.16)
Open Task-oriented DBS Ties		.03 (.09)	-.33 (.17)	-.32* (.16)		-.32 (.17)	-.30 (.16)
Open Friendship DBS Ties		.04 (.07)	-.09 (.11)	-.12 (.12)		-.09 (.10)	-.12 (.11)
Quadratic Term of Closed Task-oriented DBS Ties			-.17** (.06)	-.18** (.05)	-.08* (.04)	-.18** (.06)	-.19** (.06)
Quadratic Term of Closed Friendship DBS Ties			-.12** (.05)	-.11* (.05)	-.10* (.04)	-.14** (.05)	-.12* (.05)
Quadratic Term of Open Task-oriented DBS Ties			-.18 (.09)	-.18 (.10)		-.21* (.09)	-.22* (.10)
Quadratic Term of Open Friendship DBS Ties			.12 (.06)	.11 (.07)		.12* (.06)	.11 (.07)
<i>Control Variables</i>							
Managerial Status	.21** (.07)	.18* (.08)	.18* (.08)	.19* (.10)	.18* (.08)	.21** (.08)	.22* (.10)
Team size				-.03 (.08)			-.06 (.07)
Organizational tenure				.04 (.08)			.04 (.08)
Job tenure				.02 (.10)			-.004 (.09)
Age				-.05 (.09)			-.01 (.10)
Closed Task-oriented Intra-team Ties						-.03 (.06)	-.03 (.07)
Closed Friendship Intra-team Ties						.16* (.07)	.17* (.08)
$\Delta R^2$		.007	.081*	.024	-.041	.037	.063
$R^2$	.074**	.081	.162**	.186**	.121*	.200**	.225**

*Note.*  $N = 132$  for Models 1 – 3 and Models 5 – 6.  $N = 121$  for Models 4 and 7 that added extra control variables. Standardized coefficients are presented. Robust standard errors are shown in parentheses. All first-order terms are standardized; second-order terms were created from standardized first order terms. Model 3 is our primary model. Incremental R-squares ( $\Delta R^2$ ) in Models 4 – 7 were computed with Model 3 as the basis.

\* $p < .05$ ; \*\* $p < .01$

Table 3

*Supplemental Analysis Results Predicting Job Performance*

Variable	Model 1	Model 2	Model 3	Model 4
Managerial Status	.07 (.07)	-.07 (.04)	-.06 (.04)	-.07 (.04)
Informal Leadership Perceptions		.49** (.04)	.48** (.03)	.46** (.03)
Supervisors' Formal Ties			-.05 (.05)	-.06 (.05)
Informal Leadership × Supervisors' Formal Ties				.08* (.04)
$\Delta R^2$		.537**	.005	.015*
$R^2$	.011	.548**	.553**	.568**

*Note.* Standardized coefficients are presented, and robust standard errors are shown in parentheses. All first-order terms are standardized; the product term was created from standardized first order terms.

\*  $p < .05$ ; \*\*  $p < .01$

Figure 1

Relationship between the Number of Closed Task-Oriented DBS Ties and Informal Leadership

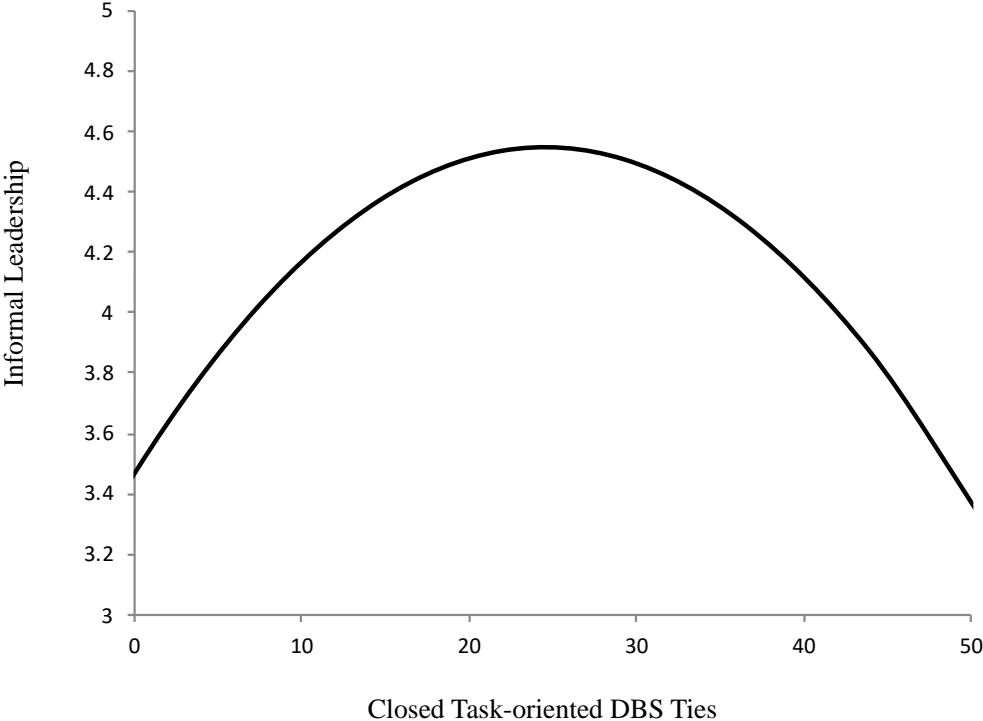




Figure 2

Relationship between the Number of Closed Friendship DBS Ties and Informal Leadership

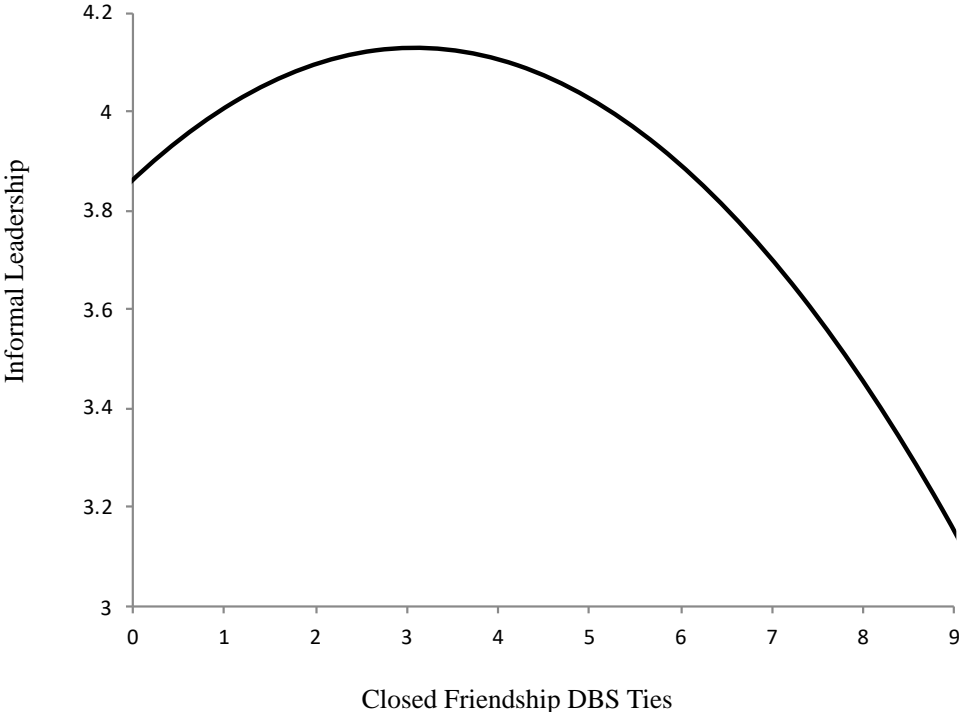
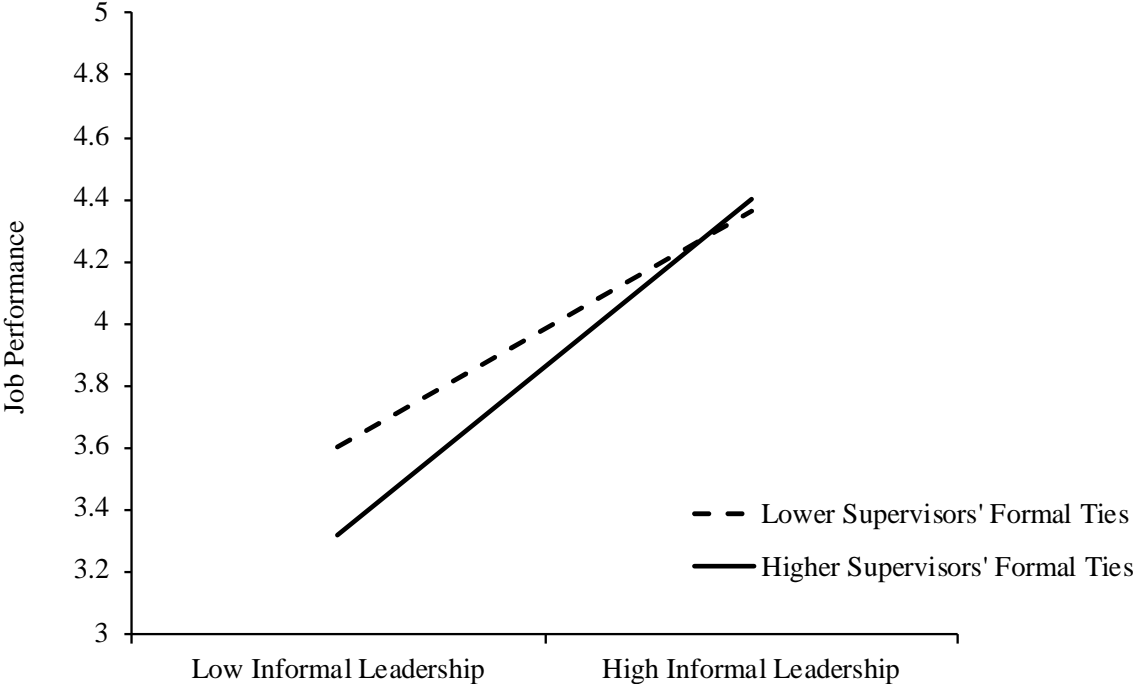


Figure 3

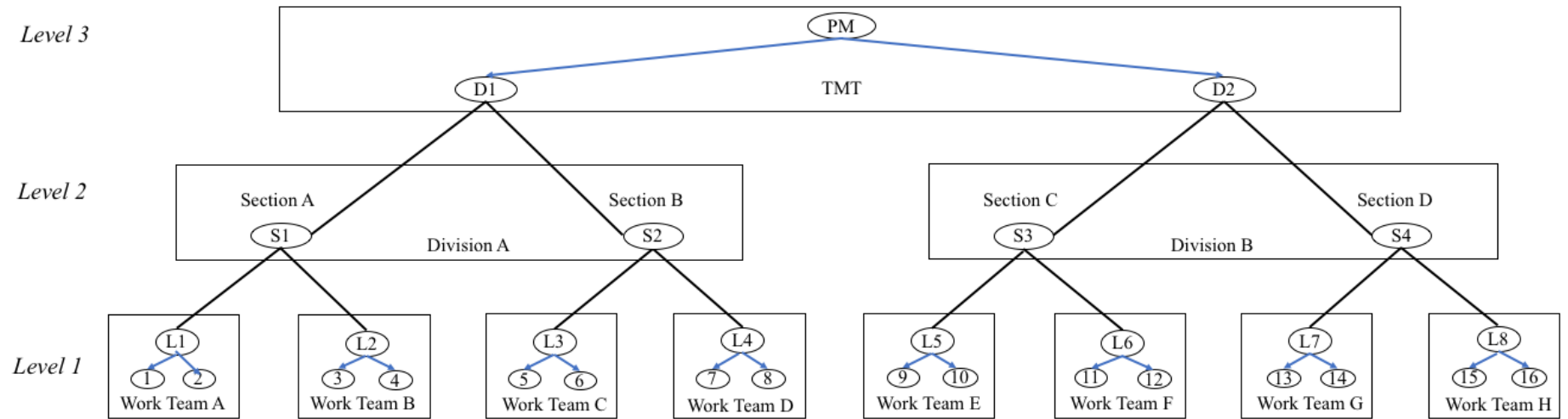
Interaction between Subordinates' Informal Leadership and Supervisors' Formal Ties Predicting Subordinate Performance Evaluation



Appendix A

Figure A1

A Reduced Illustration of the Sampled Organization



(L represents Line Manager, S represents Section Manager, D represents Division Director, PM represents Project Manager)

## Appendix B

### Items and Validity Evidence for the Informal Leadership Measure

#### Informal Leadership

**Instructions:** Please rate the extent to which you agree with each statement.

1. This person is very influential within the workgroup
2. This person has emerged as an informal leader of the workgroup
3. This person often provides direction to other workgroup members
4. This person is good at managing conflict
5. This person is always helping out others in the workgroup
6. People often seek this person out for advice

(Anchors: 1 = *strongly disagree* to 5 = *strongly agree*)

**Validation Evidence:** As noted earlier, when *conceptualizing* informal leadership, we followed Schneier and Goktepe's (1983) formal definition of informal leadership, referring to a team member's demonstrated influence in the team that cannot be attributed to formal authority.

To help ensure construct validity, we drew heavily on research that follows this tradition in measuring informal leadership with a broad approach that includes both perceptions of specific, prototypical leader activities, in addition to a generalized assessment of informal leadership. This perspective advocates for the inclusion of specific leader behaviors to help mitigate concerns that general attributions can be unduly influenced by irrelevant attributes of the person being evaluated (e.g., gender, minority status), but is also broad enough to capture larger prototypes. In particular, we based our measure on one recently employed by Lanaj and Hollenbeck (2015), as well as related work by Kent and Moss (1990) and Taggar, Hackett, and Saha (1999) that epitomize this tradition.

As alluded to above, all three perspectives incorporate general leadership items, asking the extent to which the focal individual would be expected to "assume a leadership role" (Kent & Moss, 1990); "exemplifies strong leadership" and "assumes leadership" (Taggar et al., 1999); and "exhibits leadership in the team" and "assumes leadership in the team" (Lanaj & Hollenbeck, 2015). Thus, we also included a similar general leadership item.

In addition, the measure tapped into more specific, prototypical leader activities that focus on exerting influence and providing meaningful advice (e.g., "influence group goals and decisions" Kent & Moss, 1990; "influences the team" Lanaj & Hollenbeck, 2015; "synthesis of ideas", "participation in team problem solving" Taggar et al., 1999), providing direction (e.g., "leads the conversation in the team" Lanaj & Hollenbeck, 2015; "goal setting/achievement" Taggar et al., 1999), intrateam conflict resolution (e.g., "strategy to address conflict" Taggar et al., 1999), and helping teammates (e.g., "team citizenship" Taggar et al., 1999).

Building on these common themes, and in light of the critical role that context plays for assessing leadership effectiveness (Oc, 2018), we also sought input from subject matter experts at FRIB to ensure that our measure would have face validity and reflect these prototypical

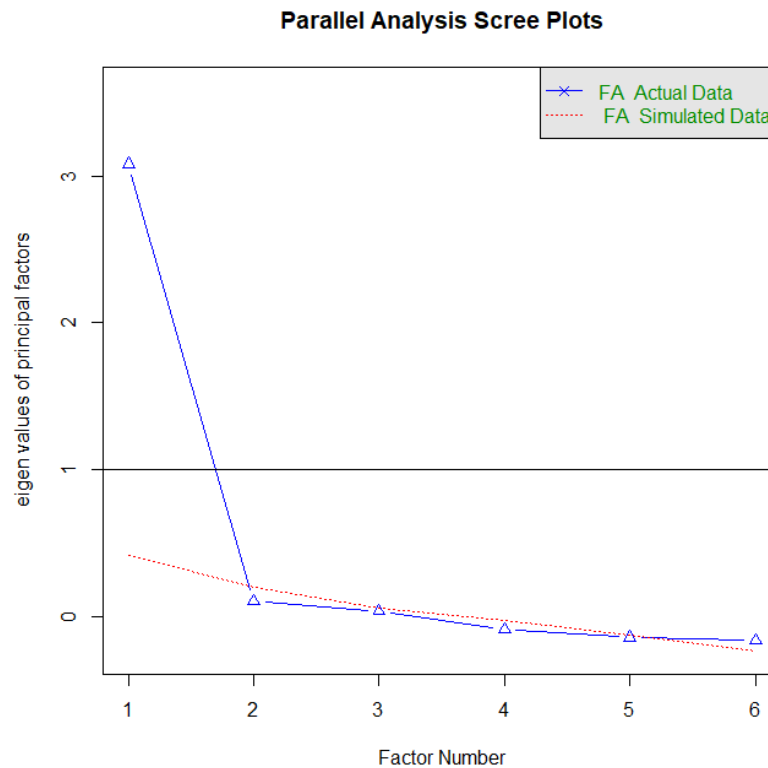
informal leadership activities in a manner appropriate for their context. Based on several interviews with members of the top management team at FRIB, we selected six items reflecting the intersection of theoretically (and empirically) established informal leadership conceptualizations that also hold relevancy for the FRIB context. In other words, consistent with the foundational work in this arena, we worked to ensure the measure incorporates specific, relevant leadership behaviors in addition to an overall global evaluation in order to reduce bias associated with individual characteristics. As a result of this process, we assessed informal leadership using the six items listed in the beginning of this appendix.

In addition to utilizing items adapted from established measures, we performed an exploratory factor analysis (EFA) to further validate the scale. Because of the nested nature of our data, it was necessary to account for non-independence when performing this analysis. As we were primarily interested in the within (as opposed to between) group nature of the relationship, we partitioned the observed covariance matrix into its within and between components and then calculated the pooled (i.e., group-size weighted average) within group correlation matrix to use as the input for a single-factor EFA (e.g., Lemos, Gore, Puga-Gonzalez, & Shults, 2019).

As shown below, the results of a parallel analysis performed on this data indicated the presence of a single factor, which is consistent with previous conceptualizations of informal leadership.

*Figure B1*

Parallel analysis for informal leadership measure



As detailed below, when a single-factor EFA was specified, the item-factor correlations varied from .81 to .55, all well above the .32 threshold generally recommended for interpretation (Tabachnick & Fidell, 2019). More specifically, three of the loadings exceeded the threshold for being considered excellent, two fall into the very good category and the remaining item demonstrated a good degree of association (Comrey & Lee, 1992; Tabachnick & Fidell, 2019). Collectively, this factor explained 52% of the variance in the items. Thus, the EFA analysis supports the expected unidimensionality of our measure, further contributing to its construct validity.

*Table B1*

Informal leadership EFA factor loadings and communalities

Item	Item-Factor Loadings (correlations)	$h^2$
1.	.81	.66
2.	.66	.44
3.	.80	.64
4.	.55	.30
5.	.67	.45
6.	.80	.64

In addition to construct validity, our supplemental analysis provides an avenue to assess concurrent validity. Specifically, consistent with the data presented in Table 3, we demonstrate that informal leadership is meaningfully related to, yet distinct from, a generalized performance measure. That is, the measures of informal leadership shared 54% of the variance with the measure of job performance, indicating that this was an important predictor of job performance, however, far from being the same construct. Also, the fact that the measure of informal leadership interacted with the number of formal ties held by the supervisor reinforces the conclusion that informal leadership represents a unique construct related to but distinct from performance. In sum, on the basis of the process used to derive the measure and the subsequent empirical evidence, we believe that our measure is a valid representation of our conceptualization of informal leadership.



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