Tracing Structure, Tie Strength, and Cognitive Networks in LMX Theory and Research

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Abstract

This chapter reflects on the growing relationship between Leader-Member Exchange (LMX) theory and research and social network analysis. We first discuss the themes of structure and tie strength in relation to several of the theoretical formulations of LMX theory that have served as the foundation for subsequent research. This section proceeds chronologically, beginning with the earliest work on the Vertical Dyad Linkage (as the LMX perspective was initially known) and concluding with recent empirical research integrating LMX and social networks. Our goal is to provide a narrative review of the development of the themes of structure and tie strength within the LMX literature. We then turn to recent developments in the field in which LMX differentiation figures prominently both theoretically and empirically, and engage in a close critical reading of this work from the perspective of cognitive social networks. We conclude by summarizing the opportunities for future research that emerge from our narrative and conceptual analysis.

KEYWORDS: Leader-Member Exchange, Vertical Dyad Linkage, Social Networks, Cognitive Networks

Introduction

This chapter offers a discussion of LMX theory in relation to three themes that are central to social network analysis: the importance of informal social structure, the nature and

dimensionality of dyadic relationships ("tie strength"), and mental representations of social structure (cognitive social networks).

The structural theme pinpoints the importance of the configuration of relationships within which nodes (individuals, groups and/or organizations) are embedded. Borgatti, Mehra, Brass, and Labianca (2009) nicely summarize this theme: "Whereas traditional social research explained an individual's outcomes or characteristics as a function of other characteristics of the same individual (p. 894), in social network analysis "a node's outcomes and future characteristics depend in part on its position in the network structure" (p. 893). Hence the prevalence of centrality in its various forms in many applications of network theory to leadership research (e.g., Balkundi, Kilduff, & Harrison, 2011; Goodwin, Bowler, & Whittington, 2009; Mehra, Dixon, Brass, & Robertson, 2006; Venkataramani, Green, & Schleicher, 2010; Sparrowe & Liden, 2005).

Tie strength refers to the quality of the relationship between two contacts and, as such, is a dyadic-level construct. Granovetter's (1973) preliminary definition of tie strength is "a (probably) linear combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie" (p. 1361). His counter-intuitive hypothesis was that weak rather than strong ties are important for outcomes - for example, in finding a job (Granovetter, 1974). Strong ties, in contrast to weak ties, are associated with the formation and maintenance of trust, loyalty and interpersonal support between leaders and members (Brass & Krackhardt, 1999). This is not to say, however, that tie strength is wholly independent of informal social structure. As Granovetter has pointed out, it is weak ties - not strong ties - that bridge to distant social locales. Or, in Burt's (1992) unique terminology, "the

causal agent in the phenomenon is not the weakness of a tie but the structural hole it spans" (p. 27).

That tie strength and LMX are both dyadic level constructs brings them readily into partial alignment with one another, even though the primary conceptualization of LMX - be it unidimensional (negotiating latitude, as in Dansereau, Graen, & Haga, 1975) or multidimensional (contribution, loyalty, respect and liking, as in Liden & Maslyn, 1998) - differs from the dimensions specified by Granovetter (1973). The fundamental question that we wish to explore is whether to conceptualize LMX relationship quality within a nomological network of hierarchical relations, or to find an alternative conceptualization that is not hierarchy specific. Why? Because a hierarchy-free conceptualization makes the leader-member dyad commensurate in its dimensions to non-hierarchical dyads, as one finds in much social network research.

Less well developed is the relationship between the structural theme of network theory and LMX research, in part because much of LMX research has focused on the antecedents and outcomes of dyadic relationship quality independent of the networks in which those dyads are embedded. Although scholars (Sparrowe & Liden, 1997; 2005) have noted how early expressions of LMX theory implied an appreciation for how resources flow through the formal organizational structure (e.g., Graen, Cashman, Ginsburg, & Schiemann, 1977), we will demonstrate in this review that several of the major expressions of LMX theory over the past four decades touch on this theme.

Our third theme, cognitive networks, is gathering growing interest in applications of social network theories to organizational phenomena (see Brands, 2013 for a review of this work). Cognitive networks are mental representations of individuals' social networks in which there are actors ("nodes") and the relationships among them ("ties"). In contrast to 'actual'

networks in which each actor ("ego") reports his or her relationship with other actors ("alters"), in cognitive networks those ties among alters' contacts are as perceived by ego. A cognitive social structure, then, combines actual relations with perceived relations into a three-dimensional network (Krackhardt, 1987). Whether the network as perceived by ego (the cognitive network) accurately reflects what his or her alters themselves report (the "actual" network") becomes a matter of theoretical and empirical interest. Cognitive networks have not been explored previously in LMX research, but we suggest that leaders' and members' cognitions about the quality of their own dyadic relationships, as well as how they mentally represent 'in-groups' and 'out groups,' are cognitive social structures. Thus - to anticipate what follows - at the group level, the mental representations of LMX differentiation offer a touchstone for dialog with the theory underpinning cognitive social networks.

We begin with an analysis of the themes of structure and tie strength in relation to several of the theoretical formulations of LMX theory that have served as the foundation for subsequent research. This material proceeds chronologically, beginning with the earliest work on the Vertical Dyad Linkage (as the LMX perspective was initially known) and concluding with recent empirical research integrating LMX and social networks. Our goal is to provide a narrative review of the development of the themes of structure and tie strength within the LMX literature. We then turn to recent developments in the field in which LMX differentiation figures prominently both theoretically and empirically, and engage in a close critical reading of this work from the perspective of cognitive social networks. We conclude by summarizing the opportunities for future research that emerge from our narrative and conceptual analysis.

Uncovering Tie Strength and Informal Structure in LMX Research

The Leader-Member Exchange (LMX) perspective is represented by an extensive stream of research over the past decades. Much of that research is empirical, but there have been a number of theoretical articles that both summarize what has been done in the past and break new ground for work in the future. We rely primarily on several of these comprehensive theoretical formulations of LMX in tracing our themes of informal structure and tie strength. In understanding the initial formulations of Leader-Member Exchange theory (then, the Vertical Dyad Linkage) we draw from two sources: Graen et al. (1977) and Cashman, Dansereau, Graen, and Haga (1976). Reflecting on a decade of research, Dienesch and Liden (1986) sought to reconceptualize the nature and dimensionality of the dyadic relationship and, in 1987, Graen and Scandura imagined dyadic relationships beyond the vertical dyad thus introducing the concept of a "dyadic network." Graen and Uhl-Bien (1995) developed this concept in greater detail in "Stage 4" of their model of relationship-based leadership, explicitly linking dyadic relationship quality among individuals to the network of task interdependencies through which they perform the work. Shortly thereafter, Sparrowe and Liden (1997) put forward a model specifying how LMX and social networks jointly contribute to member assimilation in organizations. These theoretical formulations have been followed in the last decade by several noteworthy empirical efforts linking LMX and social networks.

Structure and Tie Strength in the Vertical Dyad Linkage: Graen et al. (1977) and Cashman et al. (1976)

The historical basis for exploring the relationship between leader-member exchange (LMX) and social network analysis can be located in the early expressions of the predecessor to LMX, the "Vertical Dyad Linkage" (VDL) model of leadership. The notion of the "Vertical Dyad," borrowed from Likert (1961), refers to a "linking pin" in a vertical chain of relationships

spanning members, their leaders, their leaders' leaders ('bosses') and so forth on up to the top that define the hierarchy of an organization. Likert had suggested that effective leaders display both effective upward influence with their bosses and a supportive downward leadership style with their members (as cited in House, Filley, & Gujarati, 1971, p. 422). When discussing the results of their study of members, leaders and bosses in a university setting, Graen, Cashman, Ginsburg, and Schiemann (1977) conclude as follows: "Thus, leaders in higher-quality linking pins, having established *strong ties* with their bosses, are in better positions to facilitate the accomplishments of their members" (p. 503, emphasis ours).

In Cashman et al. (1976) this "linking pin" framework was joined to the distinctive insight of VDL research, namely, that leaders differentiate in the quality of the relationships they form with their members into in-groups and out-groups. These differentiated VDLs, when organized hierarchically, map the "organizational understructure" through which resources flow. Thus, "[m]embers whose superior can command greater resources are likely to experience fewer organizational problems and thereby report greater satisfaction with their work situation than members who are not as fortunate [. . .] The chief assumption here is that responsibility and authority flow more readily through In-group VDLs than through Out-group VDLs" (p. 282-283). Figure 1 represents a network of vertical dyads as imagined by Cashman et al.:

—————— Insert Figure 1 About Here ——————

From a network perspective, it is interesting to note several features of this network. First, it is obviously "vertical" in the sense that the important ties follow the formal organizational hierarchy. (With apologies to Krackhardt and Hanson, 1993, this is not the

"company behind the chart;" it *is* the chart!) The absence of horizontal ties from boss to boss, supervisor to supervisor, and member to member makes apparent that the linkages in the organizational understructure are organized hierarchically into a network. Further, applying the logic of dyadic relationship quality - the benefits of "in" dyads versus the costs of "out" dyads - it appears that the third member from the left is in a terrific position whereas the member farthest to the right is in desperate straits (!). And that is precisely the point: even in its earliest formulation, LMX theory recognizes the significance of not only the immediate vertical dyad, but also those once, twice, or three times removed for member outcomes.

With few exceptions, this point seems to have been quickly forgotten. Much of the empirical research that followed within the VDL and, subsequently, LMX perspectives has engaged in uncovering the antecedents and outcomes of the quality of the relationship between leaders and members within dyads and not in relation to entire chains of linkages. This emphasis can easily be seen by looking forward to the comprehensive review of LMX research by Liden, Sparrowe, and Wayne (1997) and the meta-analysis of Gerstner and Day (1997); although both mention an emerging interest in the potential interplay between LMX and social networks, the preponderance of the empirical research reviewed in these articles takes the leader-member dyad as its primary unit of analysis. But this is not to say that the network orientation was completely lost in the theoretical developments within the LMX domain. It re-emerges in the work of Graen and Scandura (1987), to which we will turn after examining the next chronological development in LMX theory.

Refining the LMX Relationship: Dienesch and Liden (1986)

The emphasis in Dienesch and Liden (1986) is on two concerns: re-envisioning the nature of the LMX relationship from a unidimensional to a multidimensional construct, and offering a

model of the process through which LMX develops. Although the core linking pin idea whereby relations beyond the immediate dyad matter is given passing notice - "it has been shown that leaders who do not have a good relationship with their immediate superior tend to have less to offer subordinates than leaders who have cultivated good relationships with their immediate superiors" (p. 630) - the possibility that other dyads, indeed entire networks, might be important is not addressed. The focus is not on the structure of dyadic relationships, but the dimensionality (nature and strength of ties) of leader-member relationships.

What Dienesch and Liden (1986) contribute in terms of tie strength is potentially significant for relating LMX and network perspectives. Previous work conceptualized the dyadic relationship in relation to the "negotiating latitude" (e.g., Dansereau et al., 1975) accorded to members by their leaders; Dienesch and Liden proposed that the relationship be conceptualized in terms of three related dimensions, loyalty, contribution, and affect (liking). In a subsequent effort to develop a measure of multi-dimensional LMX, Liden and Maslyn (1998) added a fourth dimension, professional respect. What is interesting about this development for our theme of tie strength is this: whereas "negotiating latitude" is intrinsically hierarchical in concept (what the leader grants to the member), the multidimensional construct taps relationship quality in more general terms. One can easily imagine coworker relationship quality being understood in relation to the contribution offered by each partner, the loyalty each shows towards the other, the extent to which each respects the other, and the degree to which each likes the other. The multidimensional model thus applies equally well to horizontal as to vertical relationships, and so offers a single operationalization of tie strength that could be applied to both vertical and horizontal relationships in explaining the relative impact of various forms of ties on outcomes. We return to this opportunity in our conclusion as an occasion for future research.

Dyadic Networks and Relationship Quality in Graen and Scandura (1987)

Graen and Scandura (1987) is a constructive formulation of a theory of "dyadic organizing" that brings into an integrated conceptual framework the key ideas of VDL and LMX research. The 'building blocks' of interlocking dyads remain, but they are placed within the context of "unstructured problems" whereby organizational members exchange their cooperation - e.g., "contributions" - in solving such problems for discretionary resources - "inducements" - offered by their managers (p. 177-179). This interplay of inducements and contributions is the process whereby differentiated roles emerge within groups. When leaders have discretionary resources to offer as inducements, and members possess the capabilities and motivation necessary to "collaborate successfully on an unstructured task," the two exchange partners are likely to engage in role negotiation. Absent managers' discretionary resources, and/or members' ability and willingness to cooperate, "little role emergence can take place" (p. 186).

The 'dyadic structure' that emerges from role-making processes is conceptualized by Graen and Scandura (1987) as two dimensional: relationship *quality* and *coupling*. (See Figure 2.)

—————— Insert Figure 2 About Here ——————

LMX *quality* includes the extent to which leaders and members show loyalty, support and trust towards each other. LMX *coupling* - as in 'loosely' versus 'closely' coupled - reflects the extent to which leaders delegate to members, granting them "a great deal of latitude" (p. 192) in how they accomplish their work. LMX develops through a role making process in which leaders offer discretionary inducements and members reciprocate with contributions. As the member

demonstrates greater contributions, the leader grants increasing latitude, until the mature phase of the LMX relationship when the role making process has reached the routinization stage and become loosely coupled; that is, "[t]he member needs less direction ("initiation of structure") to complete the assignment than at earlier phases" (p. 192).

Graen and Scandura's (1987) two-dimensional formulation bears reflection in light of the contemporaneous developments concerning the nature and dimensionality of LMX (e.g., Dienesch & Liden, 1986). Graen and Scandura emphasize that the relationship quality emerging from the 'coupling' during the role-making process precedes and so is the foundation for relationship quality. LMX development is not simply a process of acquaintance and growing familiarity; rather, trust and loyalty follow from role-taking (leaders 'sampling' members' responses to inducements), role development, and role routinization. Further, and in opposition to Dienesch and Liden (1986), the one relational attribute that Graen and Scandura expressly exclude is affect (1987, p. 191); high quality LMX might be a "strong tie" (Graen et al., 1977, p. 503) but high quality LMXs are not friendship ties.

With respect to structure, Graen and Scandura's (1987) formulation of the nature and development of LMX initiates a modest revision of the close alignment of the organizational understructure and the formal organizational hierarchy characteristic of the Vertical Dyad Linkage approach (Cashman et al., 1976). Modest is the appropriate adjective because Graen and Scandura are definitive in their claim that "[c]learly, dyadic organizing is a within-unit phenomenon" (p. 197). They also affirm the importance of vertical dyads: "In terms of resource dependency, the quality at the linking pin between upper and lower dyads in the management hierarchy appears to be critical" (p. 199). But there is also a point where Graen and Scandura

sever the bonds between the ‘organizational understructure’ and the hierarchy represented in formal organizational chart and this development occurs in their discussion of dyadic networks:

> It should be noted that any focal actor can share a large number of different dyads. Each engages only a part of the focal actor’s personality and comprises only a part of his or her environment. The total set of all relevant dyads for a focal actor within an organization is conceptualized as a dyadic network. Such a network may include dyads to which the focal actor is not a member (e.g., the one immediately above in the hierarchy). The referent is clearly the individual’s and not the organization’s dyadic network (pp. 202-203).

This assembly of dyadic relations is now understood by Graen and Scandura to encompass not only a member’s formal (hierarchical) relations but also - at least potentially - those relations that are informal as well. Further, these relations can be “mapped conceptually and empirically [. . . so that . . .] an understructure can be made visible and analyzable. This understructure represents a hidden face of social organization” (p. 202), and is illustrated in Figure 3.

—————— Insert Figure 3 About Here ——————

The relations on the left show the focal individual (focal), his or her superior (boss), and several members (M1 - M3). The relations on the right represent those individuals not vertically connected to the focal individuals, but with whom he or she interacts. They include a person at the same level in the hierarchy (peer), the peer’s boss (shared with the focal), another contact higher in the hierarchy (Z), and several of the peer’s subordinates (M4-M5). Graen and Scandura’s interpretation of this network holds that the relationships with Peer and M3 are the

most relevant because they are "sharing dyads with multiple connecting dyads" whereas person Z is least relevant because he or she is "distantly connected with only a single connection" (p. 202).

From the network analysis perspective, the idea that the structure and quality of informal relationships beyond the vertical dyad matter for outcomes is hardly novel. Within the LMX literature, however, it represents a distinctively different take on the way the original insight about linking pin relationships is understood. This insight is reflected in Scandura's (1988) dissertation research in which managerial outcomes are related not only to LMX and mentoring relationships, but also to what she terms "professional networking" relationships that include peers, subordinates, and other ties within and beyond the organization. Measures included both networking behavior (a twelve item self-report measure) as well as an ego-network measure tabulating both the number and strength of ties. Although the empirical results were mixed, it is clear that the theory and empirical tests relating networks and LMX to managerial performance and career outcomes in Scandura's dissertation represents a significant (and under-recognized) advance in integrating the two perspectives.

Aligning Networks with Task Interdependencies: Graen and Uhl-Bien (1995)

The next significant development in the formulation of LMX theory is that of Graen and Uhl-Bien (1995), who organized the history of LMX research into four stages: "Stage 1 is the discovery of differentiated dyads; Stage 2 is the investigation of characteristics of LMX relationships and their organizational implications (e.g., outcomes of LMX); Stage 3 is the description of dyadic partnership building; and Stage 4 is "the aggregation of differentiated dyadic relationships to group and network levels" (p. 225). It is Stage 4 that is of interest here.

Building on the idea of "network assemblies" in Graen and Scandura (1987), Graen and Uhl-Bien (1995) describe how these networks emerge from differentiated dyadic relationships as follows: "The leadership structure [. . .] emerges from the enactment of formally defined roles by organizational members [. . .] who develop a network of relationships based on mutual dependencies" (p. 234). Key here is to realize that the dependency in question is task related; the leadership structure is 'mapped' onto the task structure of the organization: "Stage 4 involves investigating patterns of relationship quality within the leadership structure, taking into consideration the criticality of relationships for task performance, as well as the effects of differentiated relationships on each other and on the entire structure" (p. 234). At the group level of analysis, relating dyadic relationship quality and task interdependence involves understanding the antecedents and outcomes of differentiation; that is, "how higher-quality and lower-quality exchanges are aggregated within a single work unit and what their combined effect is on group-level work processes and outcomes" (p. 234). Extending beyond the group to organizational level, the central question becomes "What are the critical task networks and what kinds of relationships are necessary for effective enactment of these networks?" (p. 235). Finally, at the level of multiple organizations, the central question posed at Stage 4 of the Graen and Uhl-Bien framework is: "Are individuals who are effectively positioned within the organizational structure (e.g., who have high-quality relationships with critical others) more effective in external relationships, in what way, and how does this affect organizational performance?" (p. 235).

The core idea of Graen and Uhl-Bien's (1995) "Stage 4" is that dyadic ties are important for group and organizational outcomes to the extent that they link individuals who are critical in the network of task interdependencies. This idea is novel in that it no longer takes for granted the importance of the vertical (leader - member) dyad and, instead, brings task interdependence and

criticality into the picture. It also has considerable intuitive appeal because insofar as separating task-relevant from other ties would seem to be important in modeling how networks shape performance. Nevertheless, it has not been the subject of empirical work with the LMX literature - perhaps because of methodological limitations in modeling relationships between networks with the techniques traditionally used in LMX research. Network analysis, however, has well-established theory and methods for such analyses (Krackhardt & Carley, 1998). We sketch the implications of this idea for future research in our conclusion.

Tie strength is not addressed in depth in the Graen and Uhl-Bien formulation of LMX at "Stage 4," but it is a primary focus in Stages 1 and 2 where differentiated relationship quality and its outcomes are emphasized. Nevertheless, it plays an important role. If the dyadic ties linking individuals together reflect high quality relationships ("strong ties") then the work will flow effortlessly through the network of task interdependencies.

Locating the 'Exchange' in LMX and Extending the Domain Beyond the Dyad: Sparrowe and Liden (1997)

Sparrowe and Liden (1997) bring LMX and social network theory together under a larger narrative, adapted from early LMX theory (Cashman et al., 1976), that recounts how members enter an organization, are 'sponsored' by their leaders, and subsequently are 'assimilated' - i.e., gain legitimacy as influential 'players' (Burt, 1997) or withdraw. What social network theory contributes to this narrative is as follows: During the 'Initial Relationship Development' phase, contacts shared by the leader and new member may function as a "cue that anchors perceptions of similarity and frames expectations about future exchange" (Sparrowe & Liden, 1997, p. 534), thereby affecting the initial development of LMX quality. Subsequently, during the 'Sponsorship' phase, leaders incorporate members into their networks of trusted relationships -

and the extent to which a given member is incorporated is a function of the exchange quality she or he enjoys with the leader. Sponsorship grants members the legitimacy through which they develop their own networks beyond those shared with their leaders. Finally, during the 'Assimilation' phase, members reciprocate by incorporating their leaders into their own networks, such that "leaders can be expected to benefit from the social resources and relationships derived from members' networks, just as members benefited from their leaders' networks under sponsorship" (p. 542).

Sparrowe and Liden's (1997) model of the interplay of LMX and social network during the dynamics of the assimilation process draws primarily on the structural theme in social network theory. They do, however, address the nature of the dyadic relationship by portraying it in relation to reciprocity; specifically, to Sahlins's (1972) reciprocity continuum. The conceptual logic relating exchange theories and various conceptualizations of LMX is developed in detail in Liden et al. (1997). What is important for our purposes is to grasp the implication of this approach; the advantage Sparrowe and Liden claim is that, unlike other conceptualizations that are somewhat specific to the vertical dyad, the reciprocity continuum can be applied to "the entire domain of exchange relationships in which LMX relationships are embedded" (1997, p. 526). Although not explicitly stated as such, this advantage suggests that exchange quality in leader-member dyads and tie strength in larger informal networks could share a common operationalization in reciprocity. Empirical research (Uhl-Bien & Maslyn, 2003) has confirmed that the dimensions of reciprocity identified by Sahlins cluster in ways that are consistent with LMX theory.

Structure and Tie Strength: Recent Empirical Research

The recent decade has seen a number of empirical explorations of how social network theories and methods enable the understanding of LMX, its antecedents, and its outcomes in ways that move 'beyond the dyad' in ways presaged by earlier theoretical work. We next identify the central empirical contributions of this work.

Sparrowe and Liden (2005) offer empirical support for several of the central propositions of their earlier theorizing. Members, they find, gain influence not only because they enjoy high quality LMX relationships but also through their central positions in the advice network. The relationship between centrality and influence, in turn, depends on sponsorship: the extent to which a member is part of his or her leader's inner circle of trusted contacts. Further, the outcome of sponsorship depends on the leader's own advice network centrality. Where leaders are high in advice centrality, sponsorship enhances the relationship between members' own centrality and influence. However, when leaders are low in advice centrality, sponsorship is detrimental: being in these leaders' inner circles decreases the relationship between a member's own advice centrality and his or her influence.

If relationship quality is shaped by the social context beyond the dyad, then this would imply that the antecedents of LMX established in previous research should be examined in light of leaders' and members' social networks. Goodwin et al. (2009) explore how antecedents of LMX quality are shaped by network centrality. With respect to members, they show that the relationship between the leader's frequency of interaction and the member's perceptions of LMX is moderated by the leader's centrality. With respect to leaders, they show that the relationship between the similarity a leader has with a member and the leader's perceptions of LMX quality is moderated by the member's centrality.

Venkataramani et al. (2010) offer three contributions to understanding how LMX should be understood as extending beyond the dyad. The first involves elaborating the mediating role played by members' perceptions of their leaders' status. Leaders who are central in peer networks and who enjoy high quality vertical relationships are accorded greater status by their members and establish higher quality relationships with them. Second, the mediating role of status perceptions (and LMX) extends to members' discretionary attitudes and behaviors, supporting the idea that "leader's perceived status and member's LMX [. . .are . . .] the intervening variables that transmitted the effects of leader's social ties onto member outcomes" (p. 1079). Third, these perceptions of status are especially important to members who themselves are low in centrality within the group in forming LMX quality: "when members are well-connected within their own peer network, they have alternative sources of some valued resources, such as social support, information, and informal status within the group" (p. 1080).

These three studies can be seen as empirical elaborations of ideas either implicit or explicit in the earlier theoretical formulations of LMX theory; Venkataramani et al. (2010) echoes (Graen et al., 1977) by building on the importance of networks that surround leaders for members; Goodwin et al. (2009) demonstrates that leaders' and members' network centrality shape the exchange processes that lie at the core of LMX; and Sparrowe and Liden (2005) tease out the interplay of LMX and networks in the emergence of influence through sponsorship.

Social Networks And LMX Differentiation

Within the LMX perspective, research in the past decade has begun to move beyond its prior emphasis on the dyad. This work is motivated in part by the nature of LMX itself: just as differentiation has important implications for member outcomes at the dyadic level, so also

should it have important implications at the group level. Recent research thus has begun to examine LMX differentiation, operationalized as the mean and/or variability in LMX, as a group level construct affecting team outcomes (e.g., Boies & Howell, 2006; Liden, Erdogan, Wayne, & Sparrowe, 2006) as well as a contextual factor that impacts member outcomes (e.g., Erdogan & Bauer, 2010; Henderson, Wayne, Shore, Bommer, & Tetrick, 2008; Liao, Liu, & Loi, 2010;Tse, Ashkanasy, & Dasborough, 2012;). Moving from the dyadic to the group level of analysis affords a novel opportunity for dialog with social network analysis because differentiated LMX relationships can be understood as a hub-and-spoke network structure with ties of varying strength. This is a dialog still in its infancy, and so much of what follows is intended to build a foundation for future research at the intersection of LMX and social network theories.

An initial expression this dialog (Sparrowe, 2014) has pointed out that LMX differentiation research, by focusing on the hub-and-spoke network of dyadic relations with the leader, overlooks ties among members. From the social network perspective, this is a critical omission because the ties among members are important for understanding the informal social structure of the group. Evenly distributed ties among members would describe a cohesive informal structure, whereas clustered ties would suggest cliques or even opposing subgroups. Focusing only on group mean and variance is likely to mask these important differences and their potential impact on individual and group outcomes. An important exception to this approach is that of Li and Liao (2014), who modeled four configurations of LMX differentiation: shared, bimodal, minority and fragmented - each affecting performance through its effects on coordination. Although this study suggests that there are traces of different informal structures in dyadic ties, focusing solely on leader-member relations cannot capture informal social structure with the same breadth as social network approaches.

Variations in the Psychological Experience of LMX Differentiation

In furthering this dialog between LMX and social network theory our interest lies in the psychological processes whereby differentiation affects individual [and group] outcomes. We first take up the question of members' experience of differentiation as it has been formulated in the literature in four ways: (a) Perceived LMX Differentiation (PLMXD), which refers to a member's perceptions of the distribution of LMX relationships within the group (Hooper & Martin, 2008; Swaab, Emery, & Booth, 2014); (b) Relative LMX (RLMX), which refers to a member's position relative to other members of the group (Henderson et al., 2008; Hu & Liden, 2013); (c) LMX Social Comparison (LMXSC), which refers to the subjective ratings by individuals of their LMX compared to the LMXs of coworkers and distinct from 'actual' differentiation (Vidyarthi, Liden, Anand, Erdogan, & Ghosh, 2010); and, (d) LMX Relational Separation (LMXRS), which reflects a member's disparity from others in the group (Harris, Li, & Kirkman, 2014). After introducing these variations on LMX differentiation we consider their implications from the perspective of social networks.

PLMXD, RLMX and LMXSC derive their theoretical foundations from social comparison theory. In the case of PLMXD, Hooper and Martin (2008) hold that differentiation engenders social comparison which result in perceptions of unfairness. They demonstrate empirically that members' perceptions of differentiation have negative effects on satisfaction and well-being, even as individual LMX is positively related to these outcomes. Similarly, proponents of RLMX hold that LMX differentiation "creates a psychological boundary for interpersonal comparison that may lead each employee to be aware of her or his relative standing in a workgroup. Thus, an employees' relative standing of her or his LMX relationship (RLMX; defined as an employee's LMX quality relative to the average LMX quality of others within a

workgroup) may also influence her or his work attitudes and behaviors" (Tse et al., 2012, p. 354).

Empirically, RLMX has been shown to be related to in-role and extra-role performance through self-efficacy[1] (Hu & Liden, 2013), to job performance through social identification with the group (Tse et al., 2012), as well as to in-role performance and to the sportsmanship - but not helping - dimensions of citizenship behaviors through psychological contract fulfillment (Henderson et al., 2008). LMXSC was introduced as the psychological representation of RLMX: "we argue that actual differences in LMX between a focal individual and coworkers (RLMX) influence focal employees' subjective perceptions of these differences in LMX (LMXSC)" (Vidyarthi et al., 2010, p. 850) and thus are expected to mediate the relationships between RLMX and outcomes. This expectation finds significant empirical support: LMXSC fully mediates the relationship between RLMX and OCBs, and partially mediates the relationship between RLMX and in-role performance (Vidyarthi et al., 2010).

Where PLMXD, RLMX and LMXSC differ lies in their respective operationalization and measurement. PLMXD requires respondents to count the number of group members who have LMX quality ranging in five steps from very poor to very good (Hooper & Martin, 2008). Based on the assumption that members seek objective information in forming social comparisons (Hu & Liden, 2013), RLMX was operationalized as the difference between a member's score and the average LMX for the group. In Henderson et al. (2008), RLMX was computed as the difference between the member's LMX and the group mean, whereas Hu and Liden (2013) employed response surface modeling to tease out the effects of the components of RLMX simultaneously. Consistent with the psychological nature of the LMXSC construct, Vidyarthi et al. (2010) developed and validated a six-item scale in which respondents compare themselves to other

members; e.g., “I have a better relationship with my manager than most others in my work group” (p. 853).

LMXRS, in contrast to the other three variations on LMX differentiation, draws from the group engagement model (Tyler & Blader, 2000; 2003). This view holds that leaders, through the differentiated relationship they form with members, foster relative standing within the group (Harris et al., 2014). In contrast to RLMX, what matters is not the sign or direction of the difference but the absolute value because, following a distinction made by Harrison and Klein (2007), LMXRS is a measure of separation rather than disparity (Harris et al., 2014). This distinction becomes clearer when the computation of LMXRS is understood: the formula, derived from Tsui, Egan, and O’Reilly (1992), takes the difference of one member’s LMX score from every other member’s LMX, squares each of those scores, sums them, and then takes the square root of the sum and divides it by the number of members in the group. In Harris et al’s model, LMXRS moderated the relationships between LMX and performance and turnover intentions at the individual level, and LMX differentiation moderated the relationships between LMX and performance and LMX and turnover intentions.

The empirical support for these elaborations on LMX differentiation offers impressive empirical evidence for the value of moving beyond the individual leader-member dyad and modeling the larger context of leader-member relations within the group. That these constructs are closely related conceptually, but independently explain incremental variance in outcomes - as in Harris et al. (2014) - is especially interesting. What is distinctive about these constructs is how each seeks to illuminate the psychological or cognitive processes underlying the effects of LMX differentiation, be it through social comparison or assessments of relative standing and the group engagement model. Both psychological processes, we would point out, require members

to form mental representations of the quality of the relationships other members enjoy with the leader, and it is those representations that serve as the reference point for determining one's position relative to others. The question then becomes one of where these representations of the relationships other members form with the leader stand with respect to structure. Are they social networks? And, if so, how might social network theory inform and illuminate our understanding of LMX differentiation and its role as a contextual factor?

Mental Representations of LMX Differentiation as Cognitive Networks

In the most basic sense these representations are networks insofar as they have the requisite features of nodes (the leader and the members of the group) and ties (the dyadic relationships linking members to the leader). Because the ties between other members and the leader are as perceived by the focal member ("ego" in social network parlance), these are cognitive networks (Krackhardt, 1987) as opposed to "actual" networks in which ties are reported by the other members themselves. The difference between cognitive networks and "actual" networks is a topic of emerging interest in social network research; especially in relation to the possibility that cognitive networks often do not perfectly represent actual ties or the strength of ties (Brands, 2013). An individual might perceive a tie where one does not exist, or fail to recognize an existing tie. Some scholars have attributed inaccuracy in network perceptions to the workings of systematic biases, such as a propensity to see balance in relations among friends (Krackhardt & Kilduff, 1999) and to group contacts into clusters ("small worlds") to a greater degree than what is actual (Kilduff, Crossland, Tsai, & Krackhardt, 2008).

In addition to the emphasis on accuracy, a second important development in the understanding of cognitive networks is the realization that they are *activated* representations of social structure. The distinctions among the potential, activated, and mobilized networks are

helpful here. The potential network includes "full set of contacts people have at their disposal;" the activated network includes "the subset of the potential network that actually comes to mind in a given situation;" and, the mobilized network "is the subset of the activated network that people actually solicit resources from" (Smith, Menon, & Thompson, 2012, p. 68). Following Smith et al.'s logic, the activated network includes who 'comes to mind' when individuals mentally represent a subset of their full set of contacts. Further, the potential network lies largely beneath conscious awareness, but can be made accessible through priming. The 'name generator' items on social network surveys that invite respondents to identify their friends, neighbors, or contacts "with whom you have discussed important matters" are examples. But networks are activated 'in the wild' as well in response to threats, such as the imminent loss of one's job (Smith et al., 2012) or impending organizational restructuring (Srivastava, 2014). A clear implication for understanding network accuracy is that virtually all activated networks are inaccurate in the sense that they are incomplete representations of the potential network. But that is only part of the story. Other factors may shape activated network representations in systematic ways; for example, when facing job threat, high status individuals activated larger networks than low status individuals (Smith et al., 2012).

As Brands (2013) points out, "[i]mplicit in the work on systematic bias in network perceptions is the assumption that accurate perceptions of networks are somehow advantageous" (p. S93). In part, this assumption reflects a necessary condition if individuals are to reap benefits from their brokerage networks: "those who have an accurate understanding of the relationships around them are better equipped to deploy social strategies that involve, for example, playing one individual off against another" (p. S93). There is empirical evidence supporting this assumption. Krackhardt (1990) has demonstrated that organizational members whose perceptions

of advice networks are accurate are seen as more powerful than their peers. The converse also finds empirical support: individuals can benefit from the inaccuracy in the network perceptions of others; Kilduff and Krackhardt (1994) have shown that being perceived as having highly placed friends enhances reputation for performance, whether or not one actually has those friends.

Evaluating Variations from the Cognitive Network Perspective

Thus, given this background, we suggest that when a member mentally represents the leader-member relations within the group, this is an activated cognitive network. The strength of each tie in this activated network - that is, the LMX quality - is what she or he perceives and may or may not reflect what either the leader or member would themselves report. Further, it is a subset of the potential group network because it omits ties among members. With these ideas in mind, we return to each of the variations of LMX differentiation.

PLMXD. The primary feature of note about PLMXD is that it is based on the focal member's activated network of leader-member relations rather than other members' self-reports of LMX quality. The measure itself, in which respondents identify how many members fall into one of five categories of relationship quality, is not particularly fine-grained. Even so, it could be used to estimate the mean and variation in LMX for each member and those values could be evaluated for consistency or agreement. If members' own self-reports of LMX quality also were available, it would be possible to create an 'actual' network of LMX relations to which each member's cognitive network could be compared. Perhaps accuracy would be related to individual outcomes, or perhaps the overall accuracy within the group would be related to group-level outcomes.

RLMX. Research modeling LMX differentiation by means of RLMX follows its original formulation in Graen, Liden, and Hoel (1982) in which a focal member's own LMX score is subtracted from the mean value of LMX in the group (as in Henderson et al., 2008; Hu & Liden, 2013; Tse et al., 2012;). The resulting RLMX value serves as a proxy for the member's own assessment of her or his relative standing with the leader through social comparison. Several questions about the formulation of RLMX can be raised from the cognitive network perspective introduced above. The first concerns the assumption that the social comparison process engaged by the focal member is based on accurate information about the dyadic relationship quality of others. Given the growing evidence of bias in the perceptions of networks - and here, differences in tie strength - whether this assumption holds is an empirical question that deserves exploration.

The second question concerns the referent of social comparison, the average LMX for the group. Even if it were assumed that members' cognitive network perceptions accurately reflect actuality, how the 'average' is represented by the focal member needs clarification. Is this a matter of explicit mental arithmetic, or is there a more intuitive process at play? This question goes unanswered in Tse et al. (2012) and Henderson et al. (2008); only Hu and Liden (2013), attempt an answer: "people tend to choose the 'average' or the whole team as the referent point and evaluate whether they are better than or worse than average" (p. 132). If there is low LMX differentiation in the group then perhaps the focal member would easily estimate the average because the group to which she or he belongs can be perceived in its entirety and mentally represented as a whole. But if there is high differentiation, would that also be the case? Under high differentiation, there is no 'actual' or 'objective' average afforded to the perception of the focal member; at best, she or he would have to serially represent the relationship quality of each dyad and then estimate the average.

Further, Hu and Liden (2013) hold that this evaluation of relative standing can occur unconsciously as when "seeing other teammates laughing and happily talking with the leader may send subliminal signals of the quality of others' relationships with the leader and implicitly affect the focal employee's evaluation of the self" (p. 133). This assertion does not sound like explicit mental arithmetic performed upon accurate perceptions of actual dyadic relations. It suggests instead the activation of cognitive networks in which the focal member's relative status within the informal hierarchy of differentiated LMX relationships is already represented.

If it is difficult to imagine members computing the group LMX means through mental arithmetic to arrive at their RLMX, then it is even more difficult to imagine how they determine their LMXRS. Clearly, LMXRS is intended to serve as a proxy for a psychological process through which a sense for one's relational separation is determined. Harris et al. (2014) interpret this process in relation to the group engagement model, such that what matters is not the degree of disparity in social comparison but the degree of separation from the group with which a member would identify. In terms of operationalization, however, the crucial difference between RLMX and LMXRS can be illustrated with a figure representing two networks of LMX relationships.

——- Insert Figure 4 About Here ——-

In Figure 4a, Member 3 (M3) has a LMX score of six, well above the other members all of whom have LMX scores of two. In Figure 4b the situation is reversed; M3 has a LMX score of two whereas the other members have LMX scores of six. The interesting question then becomes, how is psychological response of Member 3 in these two conditions to be interpreted? In Figure

4b, M3 has the lowest RLMX score (-3.20) and the highest LMXRS score (1.60); both scores would suggest lower performance and higher turnover intentions relative to other members of the group. But, in Figure 4a, Member 3 has the identical LMXRS score (1.60) and yet the highest RLMX score (+3.20), and there the predictions diverge completely. Although Harris et al. (2014) conducted supplementary analyses in which LMXRS explained variance in outcomes when controlling for RLMX, it remains difficult to sort out these differences at the conceptual or theoretical level.

The cognitive social network perspective may shed some light on these questions. In network terms, the psychological experience of LMXRS is that of being a social isolate - that is, having substantially fewer ties or no ties at all within a salient social group - and the outcomes of such isolation. Consistent with Harris et al.'s (2014) interpretation of the group engagement model, being an isolate reflects social distance regardless of the direction (positive or negative). Being granted high standing relative to other members through the quality of the relationship with the leader may be of marginal value if it isolates the member from the all the other members. Even if the other members all have low LMXs, it is an in-group of one. However, more so that in the case of RLMX, the absence of any mention of the structure of the ties among members makes this interpretation more speculative than it needs to be. Although the leader can affect standing through the quality of relationships she or he fosters with members, the group engagement model is about identification and cooperation with the group. Knowing what the ties are among members is crucial for understanding the informal structure of identification. Figure 5 is intended to clarify the importance of ties among members in understanding social isolation. Figures 5a and 5b are the same hypothetical group from Figure 4a; differentiation is relatively low (four of the five members have LMX scores of 2.0), and the fifth member has a high LMX

score that makes her a social isolate in the network of leader-member relations. Figures 5a and 5b add possible ties among the members of the group. For the sake of discussion, assume that these ties reflect high quality social exchange relationships (e.g., trust or friendship).

——- Insert Figure 5 About Here ——-

In Figure 5a, representing M3's activated network of her group, finds herself to be an isolate over against a clique within the group - and this is in spite of the fact that she enjoys high LMX relationship. She is in the leader's "in group" but is not in the group, and so, following Harris et al.'s (2014) logic, would be unlikely to engage in discretionary cooperation (i.e., OCBs) with other members. Now consider Figure 5b, which in terms of leader-member relations is identical to Figure 5a, and so the values of RLMX and LMXRS for every member are identical in each. But M3 is clearly in a different situation. She may be an isolate in Figure 5a, but she certainly is not in Figure 5b where she is not confronting a clique.

The same overall pattern holds where M3 has a low LMX but all her peers have high quality relationships; Figures 5c and 5d add ties among members to Figure 4b. In Figure 5c, M3 finds herself in the midst of a cohesive group in spite of her low LMX score. Another member, M5, is the social isolate. And in Figure 5d, M3 is truly among the "outs" - both vis-à-vis the leader network and among the other members of her group. LMXRS alone cannot account for these differences; nor, for that matter, can RLMX. The scores on those constructs are identical for every member in each of the hypothetical groups in Figure 5.

LMXSC. The approach to LMX Differentiation as a context factor taken by Vidyarthi et al. (2010) initially appears to resolve the problematic relationship between actual relations, as

reflected in RLMX, and the psychological evaluation of one's standing vis-a-vis the leader relative to others in the group. It achieves this by modeling LMXSC - intended to be a psychological evaluative state - as a mediator; that is, as the outcome of social comparison processes. The wording of five of the six items in the LMXSC scale explicitly requires the respondent to engage in comparison; e.g., "I have a better relationship with my manager than most others in my work group" and "Relative to the others in my work group, I receive more support from my manager" (p. 853).

The fact that LMXSC fully mediated the relationship between RLMX and OCBs certainly speaks favorably for this approach. However, some issues related to RLMX and social comparison that deserve further reflection. For RLMX to serve as the exogeneous factor in a causal sequence it is necessary to assume that members activate an accurate mental representation of the dyadic relationship quality of others. As we have discussed, that assumption is open to empirical verification. Second, to answer scale items "relative to others" in the group need not require mental arithmetic to compute a mean, but it does involve calling up a mental representation of one's place vis-a-vis the leader relative to other members. We speculate here, but it seems plausible that the cognitive network activated in responding to the scale items itself bears information about the focal member's status. No explicit calculation would be required; status shapes the form and structure of cognitive networks when activated (Smith et al., 2012). This possibility deserves empirical examination. Insofar as the network correlates of status include in-degree (prestige) and betweenness centrality (brokerage), it would be important to model the network within the group in its entirety.

Conclusion and Directions for Future Research

By tracing the themes of tie strength and structure in the primary expressions of LMX theory as well as related empirical work we believe we have brought the two perspectives into greater alignment. Our close reading of recent work on LMX differentiation from the perspective of cognitive social networks finds areas of both agreement and disagreement. Four different opportunities for further research have emerged; we briefly summarize each below.

Hierarchy-Free Conceptualization of Tie Strength.

Although there are important conceptual similarities between LMX quality and tie strength, the two are operationalized differently. In social network analysis, tie strength is often measured with a single item tapping one of the dimensions identified by Granovetter in his seminal work (Granovetter, 1973). LMX, in contrast, is typically measured by a multi-item scale. LMX-7 (Graen & Uhl-Bien, 1995), one of the more frequently used scales, has items that are specific to the hierarchical leader-member relationship. The LMX-MDM scale (Liden & Maslyn, 1998) is not hierarchical in nature, but consists of twelve items. Although it is feasible to design a study with both LMX and social network data, each must be operationalized using its native measure as in Venkataramani et al. (2010) or Goodwin et al. (2009). A full integration of LMX and network approaches would be enhanced by genuine commensurability of their respective measures. It may be feasible to develop an abbreviated measure of relationship quality that correlates highly with the LMX-7 and LMX-MDM as well as with the dimensions of tie strength identified by Granovetter (1973).

Not Just Actors and Ties, but Multiple Networks.

The idea developed by Graen and Uhl-Bien (1995), whereby dyadic networks develop in concert with task interdependencies, parallels work by Krackhardt and Carley (1998) in which networks are specified to reflect not only relations among individuals but also among tasks and

knowledge. There are thus actor by actor networks, task by task networks (task interdependence), and knowledge by knowledge networks (knowledge interdependence). More interesting still, there are actor by knowledge networks (who knows what) and actor by task networks (who does what), as well as task by knowledge (what must be known to perform a task) networks. Using meta-matrix techniques implemented in the Organizational Risk Analyzer software package (Carley, Pfeffer, Reminga, Storrick, & Columbus, 2013), these multiple networks can be evaluated simultaneously to produce a large number of social network indices and statistics. This approach is well-suited for testing the implications of the interplay between dyadic relationship quality and task criticality identified by Graen and Uhl-Bien (1995).

Theorizing About and Modeling Entire Networks.

Our close reading of the research on RLMX and LMXRS points to the importance of theoretical development and empirical tests that take into account the full context of social relations among members, and not just those ties vis-a-vis the leader. This is not meant to imply that activated cognitive networks with only leader-member ties are uninformative! The empirical support found for understanding important member outcomes through modeling RLMX (Henderson et al., 2008; Hu & Liden, 2013; Tse et al., 2012) and LMXRS (Harris et al., 2014) clearly indicates that these constructs illuminate the effects of LMX differentiation. Activated cognitive networks of leader-member relations show evidence of being highly salient. At the same time, however, the perspective taken by social network theory would be skeptical of the claim that the structure and strength of ties between the leader and members fully captures the social context. And, while the leader-centric view represented in RLMX and LMXRS is consistent with early formulations of the Vertical Dyad Linkage (Graen et al., 1977; Cashman et al., 1976), subsequent developments in LMX theory by Graen and Scandura (1987) and Graen

and Uhl-Bien (1995) recognize the importance of understanding 'horizontal' and other ties within and beyond the immediate group. Similarly, empirical work like that of Venkataramani et al. (2010), Goodwin et al. (2009) and Sparrowe and Liden (2005) point to the value of looking beyond the leader-member dyad in order to illuminate member outcomes.

Cognitive Networks and Accuracy.

Using the average of other group members' own self-reports of LMX quality as a proxy for the focal member's referent in social comparison processes is not an unreasonable approach in light of the practical difficulties involved in gathering cognitive network data. But, in the case of RLMX research, it makes sense to argue that perception is reality - or, at least the reality that matters for understanding the member's own social comparison processes. As we have discussed in the foregoing, research (Brands, 2013) has demonstrated that activated cognitive networks display systematic biases. Our suggestion is not that accuracy become the gold standard. Rather, what would be helpful in future research would be a more complete understanding of the nature of mental representations of social networks as well as greater insight into the nature and origins of biased perceptions. To what extent are these 'biases' actually heuristics that evolved for navigating complex social relations, in the same way that many cognitive 'biases' actually are evolved heuristics designed to facilitate 'fast and frugal' decision-making (Gigerenzer & Goldstein, 1996)? Modeling the activated cognitive networks, rather than relying on 'actual' relations as proxies for members' own mental representations, would bring our empirical work closer to the phenomenon we are attempting to understand.

Endnotes

1. In Hu and Liden (2013), self-efficacy partially mediated the relationship between RLMX and in-role performance, but fully mediated the relationship between RLMX and OCBs.

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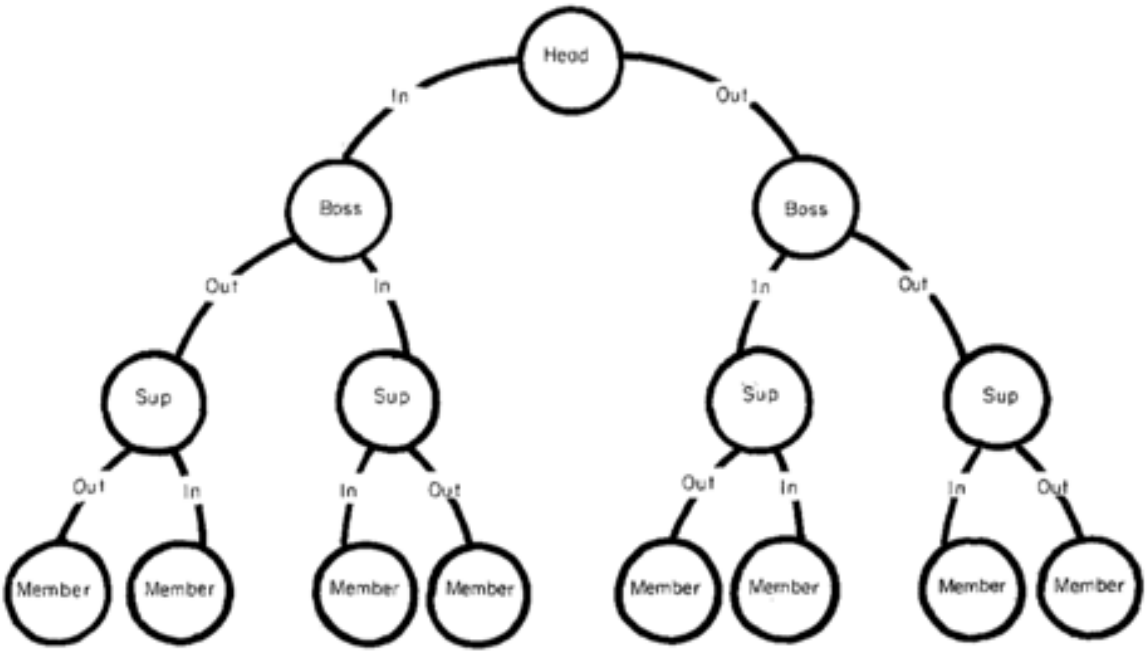
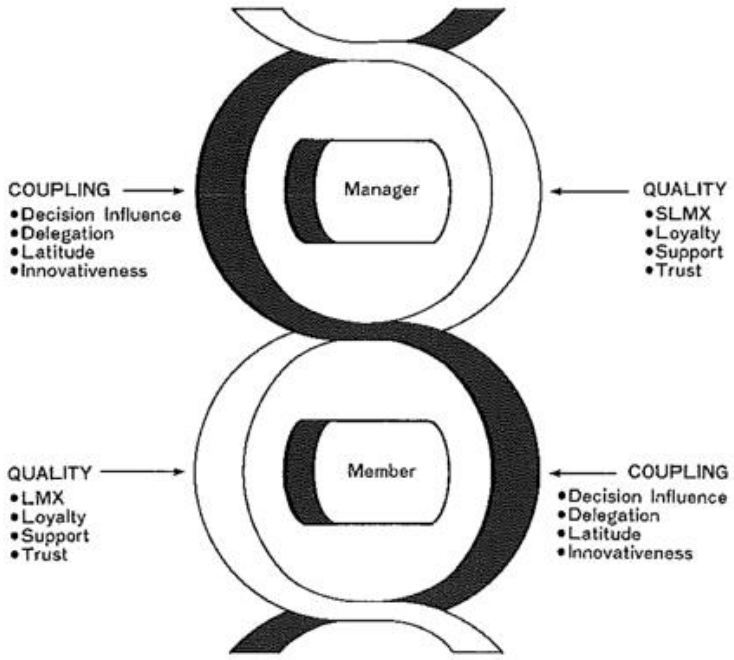
Figure 1: The Organizational Understructure



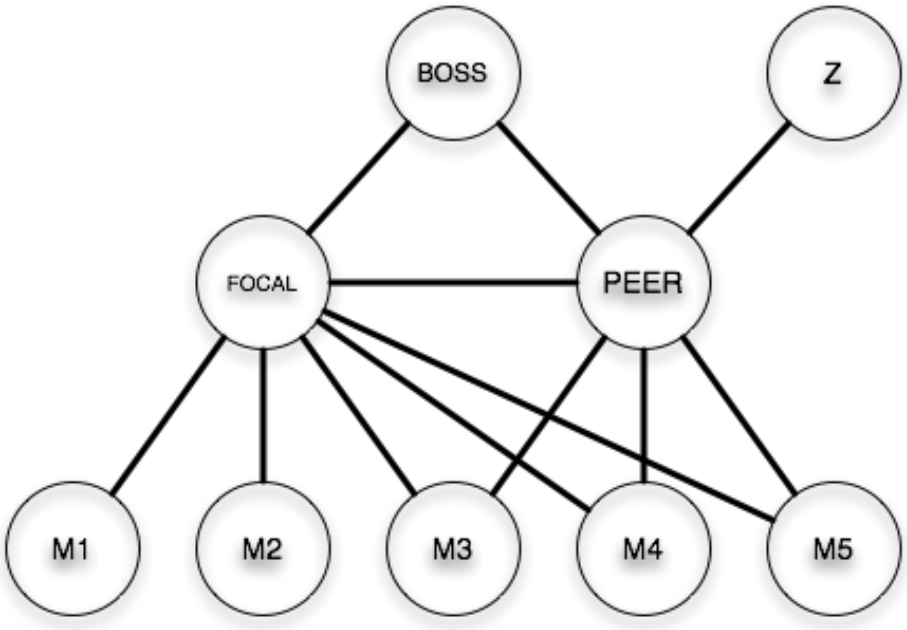
Reprinted from Cashman et al., 1976 (p. 282)

Figure 2: Two Dimensions of LMX, Quality and Coupling



Reprinted from Graen and Scandura, 1987 (p. 192)

Figure 3: Dyadic Assemblies and the Organizational Understructure



Adapted from (Graen and Scandura, 1987 (p. 203)

Figure 4: Contrasting RLMX and LMXRS, Two Cases

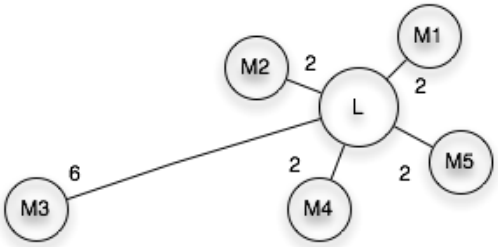


Figure 4a

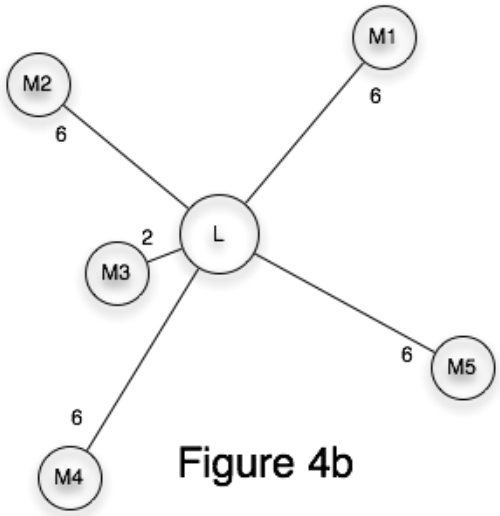


Figure 4b

Values Represent LMX Scores

Figure 5: Adding the Missing Links Among Members

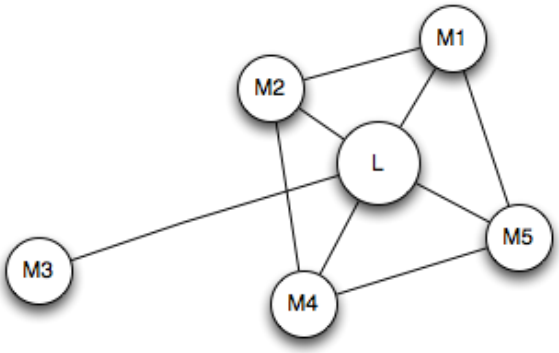


Figure 5a

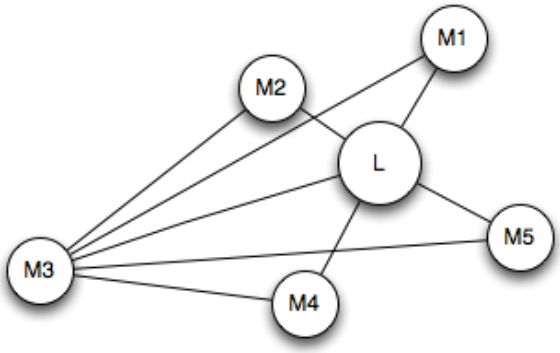


Figure 5b

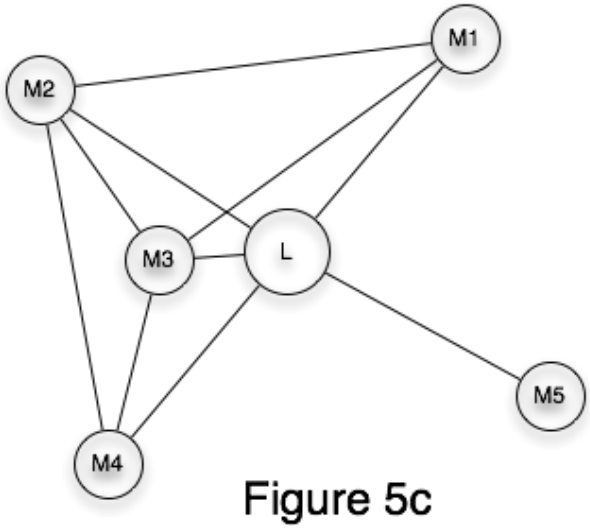


Figure 5c

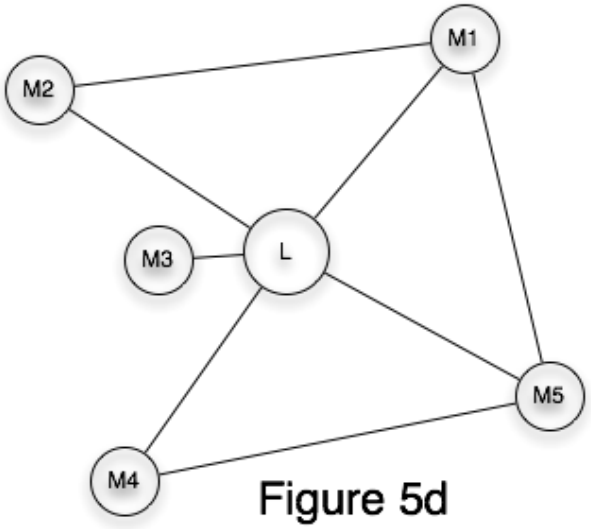


Figure 5d