

Knowledge transfer between and within alliance partners: Private versus collective benefits of social capital[☆]

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Received 1 April 2006; received in revised form 1 January 2007; accepted 1 January 2007

Abstract

This article examines the process through which multilevel network structures translate into knowledge acquisition from alliance partners. The degree of knowledge transfer a multidivisional company achieves from its network of alliance partners is determined not only by the organization's external network structure, but also by the structure of relationships among its business units. By distinguishing two perspectives on the distribution of social capital's benefits – private versus collective – this article's approach reconciles the competing views on what types of network structures create social capital, that is, the brokerage and closure views of the social network literature. Private benefits of brokerage and centrality are more beneficial in interfirm networks, whereas collective benefits provided by network closure and low levels of centralization are more beneficial in intrafirm networks.

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Keywords: Inter- and intrafirm networks; Knowledge transfer; Social capital; Strategic alliances

In recent years, the concept of social capital has become a strong pillar of research on social networks (Gulati, 1998; Koka and Prescott, 2002; Nahapiet and Ghoshal, 1998). The social capital concept builds on the assumption of potential benefits – such as access to and control over information flows – that can be derived from being embedded in a favorable social network structure (Bourdieu, 1986; Coleman, 1988, 1990). Previous

research examines related phenomena either by focusing on the external network of an organization (i.e., an organization embedded in a network of relationships with other corporations) or by focusing on the internal network of an organization (i.e., a business unit embedded in the social fabric of a multidivisional organization). As a consequence, two distinct research streams emerge. Unfortunately, this separation limits the understanding about interdependencies and interactions of inter- and intrafirm networks. While several authors emphasize the need to study such multilevel linkages (e.g., Adler and Kwon, 2002; Burt, 2000; Reagans et al., 2004; Reagans and Zuckerman, 2001; Woolcock, 1998), so far a systematic theoretical analysis of these phenomena is lacking.

This article examines how different configurations of inter- and intrafirm network structures influence the ability of a multidivisional organization to acquire knowledge from its alliance partners and to diffuse such knowledge across its business units. This article builds on the notion that the number and type of linkages, the overall network structure, and the nature of network partners determine access to and transfer of knowledge (Koka and Prescott, 2002). This access is crucial, as empirical

[☆] The authors gratefully acknowledge the valuable comments of Steven Floyd, Michael Lubatkin, and Melissa Schilling on earlier versions of this article. We are indebted to Editor-in-Chief Arch Woodside, Associate Editor Jean B. McGuire, and two anonymous reviewers for their constructive feedback. We also thank Diane Adams for her editorial assistance. A previous version of this article was presented at the Academy of Management Annual Meeting 2003 in Seattle, WA. The first author is grateful for a grant from the Swiss National Science Foundation (grant number PBSG1-101367) and a grant from the German Research Foundation (WA-2147/1-1) that supported this research.

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evidence shows that the extent of a unit's knowledge exchange with other units is positively associated with innovative capability (Andersson et al., 2002) and a higher level of productivity (Reagans and Zuckerman, 2001). Some business units, accordingly, have greater social capital "liquidity" than others due to their network position, allowing faster access to resources passed along their social ties (Oh et al., 2004). By examining density/structural holes, non-redundancy, and centrality as the key structural components of social capital (Zukin and DiMaggio, 1990), this article shows how the benefits of social capital in inter- and intrafirm networks are distributed among a firm's business units.

Theorizing on how the benefits of social capital are distributed shows that complex phenomena such as knowledge transfer from strategic collaborations cannot be fully understood by relying on one level of analysis. By examining the whole process through which structural social capital translates into the successful acquisition of external knowledge, the article hopes to raise awareness for and inspire more cross-level research on social networks.

This article contributes to the literature in three important ways. Prior research tends to investigate network linkages only in isolation, focusing exclusively on either interfirm linkages between the business units of independent organizations (e.g., Gulati, 1998; Rowley et al., 2000) or intrafirm linkages between a multidivisional firm's business units (e.g., Hansen, 1999, 2002; Tsai, 2000; Tsai and Ghoshal, 1998). Extending this research, this article examines interactions between inter- and intraorganizational networks by analyzing the entire process through which these network structures translate into the transfer of knowledge from alliances. Although similarities between the processes of inter- and intrafirm knowledge transfer exist, analyzing the context of knowledge acquisition from alliances and its subsequent intraorganizational diffusion leads to unique theoretical insights.

Second, this article highlights that the benefits of social capital are not distributed evenly between and within alliance partners. In particular, the article shows how a multidivisional firm might maximize the private benefits of social capital in its interfirm network, while maximizing the collective benefits in its intrafirm network. This configuration, in turn, would maximize the degree of knowledge transfer from alliance partners.

And third, employing the distinction between private and collective benefits offers an approach to reconcile the competing brokerage and closure views of social networks (e.g., Burt, 1992; Coleman, 1990). The former better explains the accruing of private benefits that are valuable in interfirm networks, whereas the latter better explains the accruing of collective benefits valuable in intrafirm networks.

This article is organized as follows. After defining the key concepts of inter- and intrafirm networks, social capital, and its private versus collective benefits, this article develops propositions about the impact of specific configurations of internal and external network structures on knowledge transfer from alliances. The article closes by discussing contributions to research and practice, and by outlining opportunities for future research.

1. Social capital between and within alliance partners

1.1. Knowledge transfer in inter- and intrafirm networks

In a successful knowledge transfer, the experience of one network actor affects another (Argote and Ingram, 2000). While individuals ultimately have to perform the transfer of knowledge, this article focuses on knowledge transfer between business units, extending the work of previous authors at this level of analysis (e.g., Hansen, 1999, 2002; Tsai, 2001, 2002). Recent studies extend the notion that firms improve their performance by cooperating with and acquiring knowledge from other organizations from the dyadic to the network level (e.g., Ahuja, 2000a; Bonner et al., 2005; Gulati, 1998; Knight, 2002; Liebeskind et al., 1996; Möller et al., 2005; Powell et al., 1996; Ritter and Gemünden, 2003; Shan et al., 1994). Not only have strategic alliances emerged and proliferated as interorganizational designs that enable firms to tap into external knowledge, resources, markets, and technologies (Baum et al., 2000; Inkpen and Dinur, 1998; Lavie et al., in press), but a firm's embeddedness in its network of alliances crucially influences its behavior and performance (Granovetter, 1985; Uzzi, 1996). Empirical studies support this argument and demonstrate the significance of selected network dimensions, such as relational and structural social capital, on knowledge transfer and subsequent firm performance (e.g., Andersson et al., 2002; Rowley et al., 2000).

While these external relationships permit a firm to access knowledge possessed by its alliance partners, they have only limited relevance to the subsequent transfer of this knowledge within the organization. Anecdotal evidence in the biotechnology and pharmaceutical industries suggests, for example, that large multidivisional firms often acquire new scientific and technical knowledge through their alliance networks, but fail to transfer and apply this knowledge to their business units (Ernst and Young, 2003). In a growing body of research, scholars argue that organizations transferring knowledge effectively from one business unit to another are more productive than organizations less able to perform this transfer (e.g., Gupta and Govindarajan, 2000; Hansen, 2002; Kostova and Roth, 2003). Such knowledge transfer among business units provides opportunities for mutual learning and intrafirm cooperation that stimulate the creation of new knowledge and contribute to the units' ability to innovate (Kogut and Zander, 1992; Tsai, 2001; Tsai and Ghoshal, 1998). As a consequence, both the fabric of the firm's external linkages to other firms and its internal linkages among its subunits determine the successful transfer of knowledge (Adler and Kwon, 2002).

The following discussion distinguishes two distinct types of networks: the *interfirm network* is composed of interorganizational ties between business units of independent organizations that are of strategic significance to the firm (Gulati et al., 2000). This article focuses on ties in the form of strategic alliances, which are defined as collaborative agreements between two or more firms that involve the exchange and sharing of multiple resources for the codevelopment of products, technologies, and services (Gulati, 1998). Therefore, the present

article conceptualizes the strategic alliance network of an organization – represented by linkages between business units of the focal firm and business units of its alliance partners – as its interfirm network.

Building on the concept that multidivisional firms are a network of capital, product, and knowledge relationships linking dispersed and relatively autonomous subunits (Ghoshal and Bartlett, 1990; Nohria and Ghoshal, 1997; Snow et al., 1992), this article defines the formal and informal linkages among the firm's business units as a firm's *intrafirm network* (Hansen, 1999). A key feature of an intrafirm network is that those business units that form the network belong to the same corporation.

1.2. Social capital: Benefits and mechanisms

Social capital has been broadly defined as the benefits that actors derive from their social relationships (Bourdieu, 1986; Coleman, 1988, 1990). In other words, the purposeful behavior of an actor – in the context of this article, the business unit – is influenced by the network of social relationships in which the unit is embedded (Uzzi, 1996). As previous research has shown, the sum of actual and potential resources embedded within, available through, and derived from that network has a decisive impact on the business unit's behavior and economic performance (Bolino et al., 2002; Nahapiet and Ghoshal, 1998).

The present article focuses on *structural social capital*, which refers to the structure of relations around the focal business unit and the configuration of relationships that make up the unit's network (Zukin and DiMaggio, 1990). This dimension highlights the extent to which business units are embedded in either densely or sparsely connected networks, and emphasizes their informational value (Gulati, 1998). Moreover, a structural view best illustrates the ability of business units both to appropriate (e.g., a resource-exchange network may be used for other purposes like gathering information or receiving advice) (Coleman, 1988) and to convert social capital (e.g., a specific network position can be converted into economic advantage) (Bourdieu, 1985). Two distinct perspectives in the literature address the question of how the benefits of structural social capital are distributed among business units.

One group of social network theorists emphasizes private benefits. This position advances the notion of social capital as a private good that primarily benefits the actors who possess such capital (Burt, 1992, 1997; Granovetter, 1973, 1985). Previous research has considered this form of social capital at the levels of the individual (Ahuja et al., 2003; Belliveau et al., 1996; Perry-Smith and Shalley, 2003; Seibert et al., 2001; Sparrowe et al., 2001), the group (Krackhardt, 1990; Reagans et al., 2004; Sparrowe et al., 2001; Tsai, 2001), the organization (Burt, 1992; Florin et al., 2003), and the industry (Baker, 1990; Gulati, 1995; Walker et al., 1997). Private social capital varies depending on individual position and positioning strategies, and mainly facilitates the pursuit of individual goals. While other actors might also benefit from such a private good, access is controlled by those who create the social capital (Leana and Van Buren, 1999).

Other researchers view social capital as a collective good and therefore emphasize its collective benefits. In this view, trust,

reciprocity, and strong social norms facilitate integration and cooperation, and effectively regulate cooperative social behavior (Fukuyama, 1995; Putnam, 1993). Collective social capital is therefore available to and benefits not only those actors that create this capital but also network members at large (Coleman, 1988; Lin, 2001). Indeed, social capital facilitates the pursuit of collective goals by allowing network actors to tap into resources without necessarily having participated in their creation (Kostova and Roth, 2003). The use of this type of social capital is not competitive; that is, one actor's use does not diminish its availability to others, but (unlike pure public goods) its use is exclusive since others can be excluded from a given network of relations (Adler and Kwon, 2002).

In addition to these two competing perspectives on the distribution of social capital's benefits, a similar division exists with respect to the types of network structure that actually create social capital. The *closure view* stresses the positive effect of densely embedded networks with strong and cohesive social ties on the production of social norms and sanctions that facilitate exchange of information, creation of obligations and expectations, and imposition of sanctions on those who fail to meet their obligations; in addition, closure fosters mutual trust among actors in the network (e.g., Coleman, 1988, 1990). In this view, closure provides the social cement that binds rational actors to one another in lasting, mutually beneficial ways. In contrast, the *brokerage view* claims that the benefits of social capital are the result of access to diverse sources of information and brokerage opportunities the lack of connection (i.e., a structural hole) creates between separate clusters in a social network (Burt, 1992, 2001). Central actors embedded in sparsely connected networks will enjoy efficiency and brokerage advantages based on their ability to arbitrage non-redundant information exchanges (Burt, 1992). The closure and brokerage views have different, even contradictory, normative implications (Walker et al., 1997).

Recent research seems to suggest, however, that private and collective forms of social capital are not necessarily at odds, but rather play different roles that are valuable for different populations and purposes (Burt, 2000). While a useful network configuration combines elements of closure and brokerage (Reagans et al., 2004; Reagans and Zuckerman, 2001), the optimal type and degree of social capital is likely to be contingent on the intent of the actors (Ahuja, 2000b), and elements of an enabling social structure for one set of actions may be disabling for others (Podolny and Baron, 1997; Sandefur and Laumann, 1998). Indeed, both Burt (1992) and Coleman (1990) agree that the question of whether a brokerage or a closure view is more beneficial becomes a question of whether actors compete on an individual basis or as classes of actors.

These distinct views on the distribution of social capital's benefits (private versus collective) and the phenomena that create these benefits (brokering versus cohesion) will serve as a basis to identify (1) those network structures that are most beneficial for business units in the context of interfirm collaboration, (2) those that are most beneficial for business units embedded within the context of a multidivisional organization, and (3) the most beneficial combination of both, that is, the optimal network configuration. In particular, the private benefits

of brokerage are of greater importance to the interfirm network between business units of independent organizations, whereas the collective benefits that network closure provides more important to the intrafirm network between a focal firm's business units. Several arguments corroborate this reasoning.

First, a special challenge for a multidivisional organization is to reap the benefits of its diverse knowledge structure by transferring and applying knowledge outside of its point of origin, as well as creating new knowledge by combining resources of several business units (Andersson et al., 2002; Ensign, 2001). This challenge requires an extensive and dynamic exchange of knowledge among business units that cannot be based only on private social capital benefits. Most authors therefore agree that increasing interdependence between business units within a corporation enhances the need for collective social capital (e.g., Coleman, 1990; Kostova and Roth, 2003). The interfirm network between organizations, in contrast, offers various temporally restricted access points to diverse external knowledge, where investments in collective social capital, that would benefit all network members equally, are less efficient for individual firms.

Second, the outcomes sought in intrafirm networks are collective rather than individual (Kostova and Roth, 2003), which limits the potential of the private benefits of social capital to facilitate knowledge transfer within the organization. For instance, cooperative, proactive, and discretionary behaviors directed toward the firm's collective goals are needed for the knowledge exchange and combination necessary to create intellectual capital (Nahapiet and Ghoshal, 1998). Moreover, interdependent viability between intrafirm business units (i.e., the requirement that exchanges are positive in outcome for the system overall rather than for each individual member of the system) enables organizations to enlarge the circle of exchange among its business units, thereby increasing social identification and encouraging norms of cooperation and risk-taking, which in turn has a positive impact on the performance of the organization as a whole. The outcomes desired in interfirm networks, in contrast, are individual in nature. Alliance partners are connected by an interplay of cooperation and competition, where the appropriation of the generated value is of foremost concern. Benefits might accrue to the organization that finishes this learning race first, as this firm is free to leave the alliance and deny its partner access to its know-how (Hamel, 1991; Khanna et al., 1998).

Third, the competitive, legal, and organizational barriers to knowledge sharing also differ between inter- and intrafirm networks. A formal organization implies a measure of closure created from explicit legal, financial, and social boundaries (Kogut and Zander, 1996). Although business units in the intrafirm network may compete, the risk of information leaks between units might not be a major concern since they share the same corporate roof (Tsai, 2002). A clear link between ownership and hierarchical power in an intrafirm network exists since legitimate authorities facilitate the resolution of disputes among business units (Podolny and Page, 1998). Interfirm network structures, in contrast, are inherently nonhierarchical (Inkpen and Tsang, 2005), lacking a legitimate organizational authority

to arbitrate and resolve disputes. Therefore, besides enabling access to external knowledge, network membership may also expose the firm to the risk of unwittingly transferring valuable knowledge and proprietary information to competitor firms in the network (McEvily and Zaheer, 1999). This threat is amplified by the ability of partners to unilaterally exit the alliance upon completion of their (learning) objectives (Khanna et al., 1998).

In summary, social capital from a private benefits or brokerage view explains the varying success of business units in their competitive rivalry; the actions and performance of units can be greatly facilitated by their direct and indirect links to other units in social networks. In the collective benefits or cohesion view, the social capital of a collectivity of units lies not in its ties to other external units, but in its dense, cohesive structure that facilitates the pursuit of collective goals (Adler and Kwon, 2002). These benefits of closure accrue to both individual business units and the organization as a whole.

2. Propositions

The next section proposes specific configurations of inter- and intrafirm network structures that are most beneficial for knowledge transfer from alliance partners. Guiding the arguments and propositions are the private versus collective benefits and brokerage versus closure views of structural social capital as outlined above. Fig. 1 highlights some of the relationships described below for illustrative purposes, and Table 1 provides a summary of the propositions.

2.1. Density/structural holes and non-redundant ties in inter- and intrafirm networks

Network density is the proportion of existing dyadic ties to all potential ties in a network (Kenis and Knoke, 2002; Tichy et al., 1979). Therefore, density is directly related to the number of contacts that a business unit possesses (Koka and Prescott, 2002). Network density, however, does not provide any insight as to the diversity of information that is exchanged, since an increase in the mere number of ties does not increase the effectiveness of the overall network. This article therefore examines network information diversity beyond the number of ties by also focusing on *structural holes* – which indicate a lack of connection between business units or clusters of units in the network – and on non-redundant ties. Structural holes present information opportunities that are exploited by those units bridging ties between otherwise disconnected units (McEvily and Zaheer, 1999).

In addition to information diversity in terms of structural holes between the contacts of a specific unit, the proposed framework also takes into account if a link to a contact is exclusive, that is, the only link to that contact (Goerzen and Beamish, 2005). A *non-redundant tie* is therefore a link that includes a previously unconnected business unit to the existing intrafirm network (for an example of a non-redundant tie see the link between BU4 and BU9 in Fig. 1; in contrast, one of the links of BU4 and BU1 with BU7 is redundant from the point of view

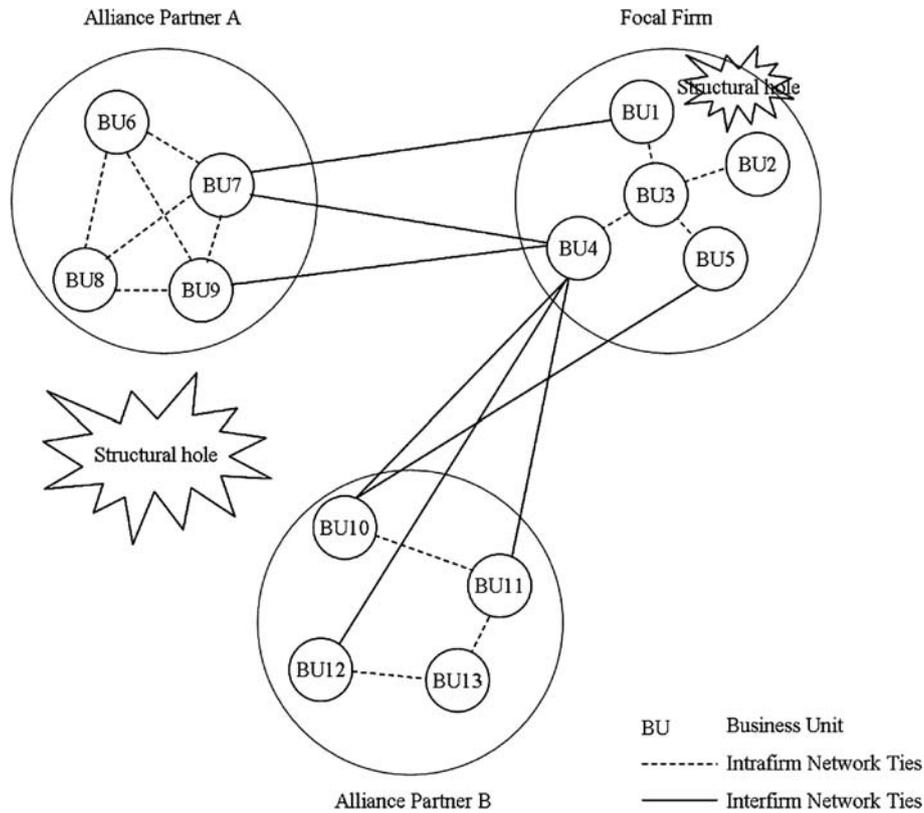


Fig. 1. Inter- and intrafirm network configuration.

of the focal firm). The present article discusses density/structural holes and non-redundant ties, first, with respect to the interfirm network and, second, with respect to the intrafirm network. The article then derives a proposition about their combined effect on knowledge transfer from alliance partners.

2.1.1. Interfirm networks

Previous research provides mixed evidence of the effects of interfirm network density and redundancy. Some arguments seem to support a beneficial influence of dense interfirm networks with redundant ties on cooperation and the transfer of knowledge (Williams, 2005). A variety of routes for knowledge flow maximizes the speed and ease of information transfer (Dyer and Nobeoka, 2000). Therefore, both the time required to transmit messages and the potential for distorted communication are less in high-density interfirm networks with shorter paths (Kenis and Knoke, 2002). Another advantage of a dense interfirm network with redundant ties, particularly in the face of technological uncertainty and change, is that business units have already allocated resources to maintain relationships with alternative external partner units, which represent options for dealing with environmental shocks that might render some relationships useless (Afuah, 2000).

Acknowledging these beneficial aspects, however, several disadvantages exist that may outweigh the positive effects. From an information point of view, a dense interfirm network is likely to drive the acquisition of indiscriminately large quantities of knowledge and information that may be redundant and

obsolete (Koka and Prescott, 2002). Moreover, due to information processing limitations and perceived confidence in capturing all relevant information, business units may limit their search horizon to their immediate network, which, in turn, may lead to sole reliance on largely similar and therefore redundant information (Levinthal and March, 1993).

Of more importance is that, as the interfirm network becomes denser, the communication structure of the network forms a mechanism for collectively monitoring and coordinating pressure on each business unit to match expectations. As a result, shared behavioral expectations among partner units are established that might produce strong constraints on an individual unit's actions (Rowley, 1997). A unit embedded in a dense interfirm network may therefore be compelled to adhere to norms and practices that meet the lowest common need of the network members. These practices and strategies, however, may not be the most suitable for every unit's circumstances (Ingram and Baum, 1997; Westphal et al., 1997). Consistent with this argument, Bae and Gargiulo (2004) find support for their

Table 1
Proposed network configurations

	Intrafirm network	Interfirm network
Density	+	-
Structural holes	-	+
Redundancy	+	-
Centrality/centralization	-	+

hypothesis that density of relationships among an organization's partner units is negatively related to the returns the organization obtains from its alliance network.

In situations where information diversity is essential, as in explorative learning, and where collective monitoring and coordinating pressures are unwanted, a dense network might be insufficient. In this case, networks of ties bridging structural holes are likely to be superior (Ahuja, 2000b; McEvily and Zaheer, 1999). A bridging tie is the sole path through which two units (and their direct partners) are joined in a network. The units on either side of the hole circulate in different flows of information. By spanning structural holes, business units can access a broader range of novel, unique, and non-overlapping sources of information (Burt, 1992). A brokering unit may ideally become the *tertius gaudens*, or the laughing third, that benefits from brokering the connection between otherwise disconnected units. These benefits emerge because the unit generates a constituency for new ideas that is derived from the synthesis of the diverse information clusters to which the unit has access (Burt, 2000). These units are thus able to incorporate diverse perspectives (Koka and Prescott, 2002), extend the scope of organizational learning (Liebeskind et al., 1996), and more easily acquire competitive capabilities (McEvily and Zaheer, 1999). Supporting these arguments, Zaheer and Bell (2005) find that, particularly in contexts where the speed of new product innovation is high and rapid response to market movements is imperative to firm success, a network rich in structural holes is likely to be more beneficial than one with closure.

In a similar manner, an interfirm network with high bandwidth (i.e., high in redundant ties to the same external partners) is inappropriate to gain access to diverse information. In addition to only providing redundant information that can be accessed via alternative ties, redundant ties – as any other ties – need resources to be developed and maintained (Hansen, 2002), which makes them an inefficient means to achieve information access. In contrast, firms can increase information diversity by connecting with previously unconnected partners, that is, by forming non-redundant ties, where the required investment is justified by the increased network reach. Accordingly, the advantages of having access to diverse and non-overlapping sources of knowledge via non-redundant ties and bridging relationships between disconnected contacts are crucial to a unit's acquisition of knowledge from its interfirm network partners.

2.1.2. Intrafirm networks

Whereas structural holes among the external partner units of the firm may be highly beneficial, a sparse network with multiple structural holes within the firm may signal that knowledge is shared inefficiently or is not widely available throughout the firm (Leana and Van Buren, 1999). A sparse intrafirm network full of structural holes may indicate a fractured organization unable to effectively work toward a common goal. With goal incongruence, however, the task of integrating specialized knowledge across units and combining existing knowledge with newly acquired information becomes problematic (Grant, 1996).

Some studies at the intraorganizational level find that high-performance work teams with moderately cohesive ties internally and many bridging ties to formal leaders in other groups (Oh et al., 2004), as well as business units with high internal density and wide external range finished projects faster (Reagans et al., 2004). However, if many individual units have disconnected contacts, and structural holes multiply, the lack of social closure might jeopardize the stability of the organization; the organization then begins to lose its identity as a coherent structure, and subunits refrain from investing in it. At the team level, for instance, Gabbay and Zuckerman (1998) show how excessive brokering by individual scientists hampers corporate innovation. Accordingly, structural holes within a firm weaken intrafirm communication and coordination, which in turn diminishes the ability of the whole firm to diffuse the knowledge gained through its interfirm network. The individual benefits of brokerage within the firm therefore negatively affect the whole firm.

Network density and the absence of structural holes, in contrast, provide the cohesion benefits of social capital, enabling the organization to pursue collective goals (Adler and Kwon, 2002). Network density fosters identification with the organization and mutual trust at the network level, which facilitates knowledge exchange and collective action (Reagans and Zuckerman, 2001). With dense formal and informal connections in place, new knowledge has a higher probability of survival and integration into an organization's knowledge base. Moreover, the shorter the path length of indirect relations in a unit's intrafirm knowledge network (i.e., the denser the network is), the more knowledge is obtainable from other units (Hansen, 2002). Dense intrafirm relations also decrease search time and costs by serving as direct-access channels through which both useful knowledge itself and information about opportunities for knowledge use can flow (Hansen, 1999). Another advantage is that dense relations among a business unit's contacts provide more reliable communication channels (Burt, 2000) that rapidly supply the unit with large quantities of knowledge from numerous sources that offer several alternative channels for filtering, assessing, and validating data quality and reliability. Dense intrafirm networks allow for a more effective and efficient transfer of knowledge, both in terms of explicit as well as tacit knowledge. Transfer biases leading to distortions in cause–effect relationships are more easily clarified with regards to the former. Moreover, processes of observation and imitation can unfold in such an appropriate setting with regards to the latter.

In contrast to the inefficiencies of redundant contacts in interfirm networks, an investment in the development and maintenance of redundant ties within the firm outweighs its cost. In the latter case, efficient access to diverse information is of less importance, and higher network bandwidth due to a number of similar links can enhance the speed and ease of information transfer. This, in turn, enables business units to access resources and knowledge from various internal partners and to diffuse the acquired knowledge throughout the organization.

2.1.3. Configurations

Where emphasis is on collective behavior, the structural autonomy derived from bridging structural holes may actually

diminish a unit's social capital. Indeed, Burt (1992: 45) suggests that actors with "relationships free of structural holes at their end and rich in structural holes at the other end are structurally autonomous" and are therefore "best positioned for the information and control benefits that a network can provide." Empirical research at the group level supports the argument that performance is maximized when in-group closure is high and structural holes and non-redundant contacts beyond the group are many (Burt, 2001).

High density, the absence of structural holes, and the existence of redundant ties in an intrafirm network provide social capital's cohesiveness benefits within an organization — essential for the organization as a whole to profit from the transfer of knowledge from its alliance network (Burt, 2000; Gargiulo and Benassi, 2000; Podolny and Baron, 1997). Interfirm network structures, in contrast, determine the appropriation of benefits by individual firms more competitively (Hamel, 1991; Khanna et al., 1998), which necessitates a reexamination of beneficial network configurations. In this case, a lower degree of density and a higher number of structural holes and non-redundant contacts in the interfirm network provide cost-effective access to diverse knowledge and new opportunities—resources required for competitive action (Adler and Kwon, 2002). Consequently, while brokerage across structural holes is the source of added value, internal closure (i.e., density and redundancy) can be critical to realizing the value buried in the structural holes (cf., Burt, 2001).

Thus,

Proposition 1: A sparse interfirm network with the focal firm bridging a large number of structural holes, complemented by a dense intrafirm network with a lack of structural holes maximizes the knowledge a multidivisional organization gains from its networks. Specifically, this configuration maximizes the private benefits obtained from the interfirm network and the collective benefits obtained from the intrafirm network.

Proposition 2: A large number of non-redundant external contacts, complemented by a large number of redundant internal contacts maximizes the knowledge a multidivisional organization gains from its networks. Specifically, this configuration maximizes the private benefits obtained from the interfirm network and the collective benefits obtained from the intrafirm network.

2.2. Centrality in inter- and intrafirm networks

Whereas density is a form of closure in which business units are equally connected, centrality occurs when a minority of units stands apart as the source of closure (Burt, 2000). The network literature distinguishes between the macrolevel property of *network centralization* — defined as the extent to which relations are concentrated among a few units — and the egocentric concept of unit centrality. The degree of a unit's *centrality* depends on the extent to which various resources flow to and from a particular unit; therefore, centrality characterizes a specific unit's power relative to other network units (Freeman, 1979). As an analytical class, centrality captures aspects of a business unit's visibility or popularity, as indicated by the unit's involvement in direct and indirect relations (Kenis and Knoke, 2002).

Previous research acknowledges three distinct types of centrality (e.g., Brass and Burkhardt, 1993; Rowley, 1997). *Degree centrality* (i.e., a unit's number of direct ties to others) implies that units are well connected and have access to many alternative sources of knowledge and other resources. *Closeness centrality* (i.e., the sum of a unit's shortest paths [geodesic] to all others) influences the unit's independent access to different points in the network. Whereas closeness centrality represents the extent to which a unit can avoid the control of others, *betweenness centrality* (i.e., the frequency with which a unit falls on the geodesic paths between pairs of other units) determines the unit's ability of controlling others, or of increasing the dependence of others on the unit. More specifically, betweenness centrality determines the extent to which a unit controls other units' access to various regions of the network. Betweenness centrality is most appropriate for assessing the ability of social units to control information and knowledge flows across networks (Freeman, 1979) and is the focus of this article.

2.2.1. Interfirm networks

At the interfirm level, network centrality enables the central unit to gain independent access and control over alternative knowledge sources and thereby acquire systemic power and obtain political support. Considered from a resource dependency perspective (Emerson, 1962; Pfeffer and Salancik, 1978), centrally located business units have greater access to, and potential control over, relevant resources — such as information and knowledge — by creating asymmetrical resource dependencies.

On one hand, central units create dependency for others by having the option to withhold, disclose, and modify information and, hence, influence other external units' attributes and perceptions of the common environment. Such a unit also creates more attention among advantageous partners in its interfirm network. Allying with well-linked and, consequently, highly visible partners yields signaling benefits, making a central unit more attractive to a third-party network. These attention and signaling effects in turn enhance the likelihood of the unit's inclusion in new opportunities (Burt, 2000). In support of this argument, Podolny (1994) finds that, especially in situations characterized by high uncertainty, organizations rely on structural position as a tangible basis for discriminating among potential transaction opportunities.

On the other hand, while centrality creates resource dependencies for others, their independent access to other units makes central units less dependent on others (Brass and Burkhardt, 1993). In addition to increasing a central unit's control over information flow, centrality also increases structural autonomy; that is, the degree to which a unit is free to pursue its own goals (Floyd and Wooldridge, 1999). A centrally located unit that directs, concentrates, and legitimates information received by others enjoys the advantage of having its interests represented in a positive light, at the right time, and in the right places.

From a learning perspective, network centrality increases a central unit's knowledge of its interfirm network power distribution and the accuracy of its assessment of the political landscape (Burt, 2000). This, in turn, enables the unit to better

control and exploit worthwhile opportunities for knowledge transfer. At the same time, centrality also reflects the total experience of the focal unit in cooperating with other external units. Therefore, the more central a unit is, the stronger the unit's collaborative experience in how to extract value from these relationships (Gulati et al., 2002). In support of the above arguments, Powell et al. (1996) empirically demonstrate that a central position in interfirm learning networks for biotechnology startups is related to their rapid subsequent growth. Similarly, Zaheer and Zaheer (1997) find that the degree of centrality of banks in their information networks is positively related to their market influence.

In conclusion, high network centrality implies a high position in the status hierarchy and a high degree of independent access to valued resources and other network members. The individual benefits of a unit's centrality in the interfirm network therefore positively impact its ability to acquire knowledge from its alliance partners. In order to capitalize on these opportunities, a unit has to actively pursue a positional advantage either by forging links to gain a central position within the network or by aligning itself with a central member of the interfirm network.

2.2.2. Intrafirm networks

One could argue that the same benefits of unit centrality in the interfirm network could be found in the intrafirm setting. A business unit occupying a central intrafirm network position may gain a competitive advantage in the marketplace because of its exclusive access to and control over other units' knowledge. Tsai (2001), for instance, finds a significant positive relationship between a unit's centrality in its intrafirm network and its innovative capability, although he was unable to find support for the relationship between centrality and performance. A central unit, he argues, can sustain complex relationships between other units, which increases its propensity to form new intrafirm linkages. This effect may modify the existing social structure and generate new opportunities for productive knowledge exchanges among units.

Whereas intrafirm unit centrality may have private benefits for the central unit, these effects need to be re-evaluated in terms of an organization's ability as a whole to benefit from knowledge acquisition through its interfirm network and to create high levels of collective benefits. More specifically, central or hierarchical coordination between units tends to fail when transferring knowledge, particularly noncodifiable and complex knowledge (Grant, 1996). Several arguments support that argument. On one hand, although new information and knowledge may be acquired by one unit within the organization, the acquired knowledge might be more profitably deployed by another unit; therefore, knowledge must be shared in order to be used most profitably. A higher level of centrality, however, reduces a business unit's incentives to form intrafirm ties and transfer knowledge (Tsai, 2002).

On the other hand, innovative units that do not occupy a central position may lack the organizational authority to access key knowledge resources necessary to ensure the success of their projects, as the resources and skills are located in different units throughout the company. As a result, whereas a central unit's

reputation may be enhanced by its strategic location in the intrafirm network, no guarantee exists that this position leads to the inflow of knowledge most valuable to the unit, let alone an outflow of knowledge most valuable to the broader organization and to the unit most able to use it. In line with these arguments, Sparrowe et al. (2001) find a high degree of centralization in a work group's advice networks to be negatively related to group performance. Intrafirm networks with a low degree of centralization, in contrast, foster interdependence, which encourages cooperation since exchange partners share control over outcomes.

2.2.3. Configurations

In the complex interplay between inter- and intrafirm networks, the centrality of a particular business unit may have conflicting effects. A firm faces trade-offs between centrality benefits for individual units versus centralization disadvantages for the organization as a whole. As outlined above, a business unit that occupies a central position in its interfirm network enjoys significant access, control, and status benefits. According to Burt (1997), these benefits reinforce each other and accumulate over time. At the intrafirm level, however, the advantages of network centrality for an individual unit may be outweighed by disadvantages for the firm as a whole, such as inefficiencies in resource allocation, lack of coordination, and failure to distribute information and knowledge. As a result, high centrality of a focal firm's business units in the interfirm network and a low degree of centralization of the intrafirm network enhance the ability of the focal firm as a whole to successfully transfer knowledge from its alliance network. Thus,

Proposition 3: A central position of an organization's business units in the interfirm network, complemented by a low degree of centralization of the intrafirm network maximizes the knowledge benefits a multidivisional organization gains from its networks. Specifically, this configuration maximizes the private benefits obtained from the interfirm network and the collective benefits obtained from the intrafirm network.

3. Discussion

3.1. Theoretical contributions and implications

The theoretical analysis presented in this article suggests that the degree of knowledge transfer that a multidivisional organization gains from its participation in a strategic alliance network depends not only on the type and quality of its external relationships to alliance partners, but also on the internal relationships among its own business units. Both networks need consideration for an adequate understanding of knowledge acquisition, as well as subsequent knowledge distribution. Certain configurations of these two networks of relationships support knowledge transfer more successfully than others, and a beneficial network position for an individual business unit might be detrimental to the organization as a whole. Thus, in order for a firm to benefit from its alliance network, an organization needs to develop a common strategic agenda to encourage cross-unit cooperation (Lovas and Ghoshal, 2000). Intrafirm closure, in particular, generates solidarity benefits that are required among

units in the intrafirm network, whereas brokerage and centrality creates information and power benefits that are beneficial for a unit's position in its interfirm network. The propositions that were developed outline how a multidivisional firm can maximize the private benefits of structural social capital in its interfirm network, while maximizing the collective benefits in its intrafirm network.

This article further adds to the theoretical debate about reconciliation of the brokerage and closure views (e.g., Rowley et al., 2000) by differentiating between external and internal knowledge transfer as well as between private and collective social capital benefits. With regard to external knowledge transfer, a centrally located unit bridging structural holes between non-redundant contacts offers the highest private benefit due to its access to diverse sources of information and to many brokerage opportunities (Ahuja, 2000b; Gargiulo and Benassi, 2000). Consequently, the brokerage view dominates when organizations have to search for and obtain information beyond their knowledge domain. With regard to internal knowledge transfer, however, the closure view prevails with its emphasis on collective benefits accruing from cohesive social ties and the positive effects of densely embedded relationships (Koka and Prescott, 2002), as well as its advantages for the preservation and maintenance of resources (Lin, 2001). Indeed, any assessment of the validity of the brokerage or closure view needs to be related to the clarification and specification of the dependent variable, as in this case, multilevel knowledge transfer.

This article also contributes to the growing body of multilevel research where two or more levels of analysis are theoretically linked to better explain relevant phenomena. Whereas the literature on multilevel research is dominated by a focus on the levels of individuals and organizations (Klein et al., 1999), the presented arguments encompass the intra- and interfirm levels. Given the argument that these levels differ in the impact of various forms of social capital on knowledge transfer, the discussion presented here highlights the importance of investigating the connections among cross-level network phenomena for exposing complex network dynamics in organizational settings (Brass et al., 2004).

The present article further contributes to the research on competition in alliance networks. Some authors conceptualize strategic alliances as learning races in which partners often engage in opportunistic attempts to outlearn each other (Hamel, 1991; Khanna et al., 1998). The firm that acquires knowledge faster than its alliance partner will most likely win this collaborative competition and reap the greatest benefits. In multi-partner alliances and alliance networks, however, the learning outcome is influenced not only by the speed of knowledge acquisition, but also by the actual opportunities and abilities of each firm to gain access to knowledge sources. If, for example, a unit's non-central position in a strategic alliance network limits its opportunity to acquire new knowledge, then learning processes – no matter how fast – are limited. On the other hand, if learning opportunities created by an external network position proliferate, then a slower learning process might be less detrimental and can be offset by a larger opportunity set. Firms then might neutralize relative disadvantages of learning speed

through a more central network position or vice versa. Speed and network position, therefore, are dependent on each other and jointly determine the final outcome in learning races.

The framework presented here also has implications for the exploration versus exploitation debate (Levinthal and March, 1993; March, 1991). Firms engaged in explorative efforts through an alliance network must be careful not to extend their external mode of structuring relationships to their internal network (Rowley et al., 2000). Indeed, the optimal network structure for exploration (in terms of external knowledge acquisition) requires a different social setting than that for exploitation (in terms of internal knowledge transfer). If firms want to benefit most from their learning endeavors, they must organize their external and internal networks in a complementary pattern. This task is likely to be difficult, however, due to potential role conflicts and the opposing requirements of both networks. This interpretation is consistent with Dyer et al. (2001) and Kale et al. (2001, 2002), who identify firms' creation of a dedicated alliance function – with the responsibility of capturing, sharing, and disseminating alliance management expertise derived from previous experience (Kale et al., 2001, 2002) and of supporting and coordinating the formation of the organization's external and internal linkages – as a major contributor to alliance success. Such activities might lead to the emergence of alliance-related routines, which may transform into an alliance capability as a valuable, rent-generating factor (Khanna et al., 1998).

3.2. Managerial implications

Managers can shape networks into favorable contexts for future action (Coleman, 1990; Galaskiewicz and Zaheer, 1999; Madhavan et al., 1998; Ritter and Gemünden, 2003). Although current social networks are passive manifestations of earlier, often exogenous actions, managers can maneuver strategically to secure key positions in their industry network, such as entering into alliances that provide access to knowledge, key technologies, or other resources. The two types of networks, however, differ in the degree of discretion they grant managers to actively influence network structures. In an intrafirm network, for example, hierarchical intervention or units' own initiatives can easily establish connectivity. Many facets of organizational life, such as people exchanging ideas and ongoing formal and informal conversations, are collective investment strategies for the institutional creation and maintenance of dense networks of social relationships (Nahapiet and Ghoshal, 1998). Connectivity in an interfirm network is not as easily established since relationships have to cross organizational boundaries (Inkpen and Tsang, 2005). In spite of these challenges, inter- and intrafirm networks can serve as strategic resources that managers can purposefully design and develop over time to meet their objectives. The proposed network configurations might provide some suggestions on how to approach that task.

3.3. Limitations and future research

The arguments in this article focus on configurations of intra- and interfirm networks and their impact on knowledge transfer.

The theorizing presented above emphasizes these two levels of analysis. Given that different levels of analysis, such as the individual or industry level, might offer unique insights, examining configurations of social capital at other levels of analysis and comparing arguments and findings across levels would be valuable.

In addition to the direct effects outlined above, the balance between private and collective social capital inherent in different network combinations might be influenced simultaneously by more than one network characteristic. For instance, a high degree of interfirm network density augments the ability of alliance partners to constrain the focal business unit by collectively monitoring, forming coalitions, and coordinating pressure. High centrality, on the other hand, increases a business unit's structural autonomy and thereby enhances its ability to resist its partners' constraints (Rowley, 1997). A central business unit can therefore only leverage the private social capital in its interfirm network if this centrality advantage is not offset by the collective social capital of densely connected partner units. The ability of one network characteristic to alleviate the negative or to enhance the positive effects of another characteristic also extends to the intrafirm network. Confronted with a centrally located business unit that abuses its position to obtain individual gains, densely connected units could exert their collective social capital to restrict that unit's structural autonomy. Future research examining potential interaction effects of network characteristics on knowledge transfer would therefore be valuable.

Since both external and internal relationships influence the success or failure of knowledge transfer, the employed logic for structural social capital might apply to other related constructs. For example, concentrating on the dimensions of structural social capital and outlining its effect on the degree of knowledge transfer from strategic alliance networks does not clarify the relative impact of this dimension (and its configurations) as opposed to other social capital dimensions. Relational social capital – such as trust through strong ties – might compensate for a lack of structural social capital. When network-level trust between units is absent due to sparse network relationships, dyad-level trust arising from strong ties between individual business units could facilitate the creation of social capital. Moreover, if trust is an effective mechanism for reducing governance costs and improving cooperation between organizations (e.g., Newell and Swan, 2000), what happens if a low degree of intrafirm trust collides with an interfirm relationship characterized by strong trust? Or, looking at strategy process research, what impact would varying combinations of consensus or cognitive and affective conflict have on the outcomes of alliance networks?

Some boundary conditions and contingencies occur for the theory this article presents. Some outcome relationships are contingent on various organization, industry, and alliance-specific factors, such as unit interrelatedness, industry context, and contractual type (e.g., joint venture, strategic alliance, R&D agreement). Among strategic alliances, significant differences in alliance type may influence the appropriateness of certain network configurations (for an alliance typology see, for example, Lubatkin et al., 2001). Concerning the intrafirm network, the

benefits of internal knowledge transfer are contingent on the relatedness of the business units. Whereas a completely diversified organization may benefit solely from financial economies, increasing relatedness will make knowledge transfer among business units more valuable and facilitate the creation of synergies (Inkpen and Tsang, 2005). For example, when business units are self-sufficient and focus mainly on their local markets, such as in multinationals (Bartlett and Ghoshal, 1989), fewer benefits accrue from enhancing knowledge transfers between units. In transnational companies, however, the business units are generally linked in an international network of resources that is likely to profit from conditions favorable to knowledge transfer.

Prior research on interfirm networks also indicates that the relationship between social capital and outcomes, such as firm performance, is contingent on industry context (Rowley et al., 2000). Hagedoorn and Duysters (2002) empirically demonstrate that in a dynamic industry environment, “learning strategies” associated with exploratory networks appear to have a greater impact on technological performance than “efficiency strategies” associated with exploitative networks. The positive effect of bridging structural holes may be less pronounced in industries characterized by relatively complete networks, where having non-redundant ties to relative isolates does not provide additional benefits (Zaheer and Zaheer, 1997). Future research could examine these and other contingency factors that might moderate the relationships between social capital and outcome variables, and thereby apply the proposed model to different organization and industry contexts.

The focus of this article is on the ability of organizations to gain access to and transfer external knowledge from their networks to strategic alliance partners. This knowledge access could be complemented by the participation of firms and their employees in other interfirm cooperations, such as technical committees (e.g., Rosenkopf et al., 2001), professional associations (e.g., Swan et al., 1999), jointly authored technical papers (e.g., Liebeskind et al., 1996), informal resource exchanges (e.g., Bouty, 2000), interlocking board directorships (e.g., Haunschild, 1993), and ownership links (e.g., Kogut and Walker, 2001). Even more important, the current literature on social networks rarely considers more than one network (Gulati, 1998). How different networks interact, however, may affect firm performance, and may therefore provide a fertile area for future research. Gulati and Westphal (1999), for example, find that board interlocks influenced the likelihood of alliance formation. Future research could reveal the impact of multiple types of interfirm networks on knowledge transfer and interfirm learning.

Another limitation of the proposed framework is its static view. The framework ignores the evolutionary process through which the external and internal networks of a firm arise, and the subsequent impact of this formation on the capabilities of an organization to acquire and diffuse information and knowledge (Tsai, 2000). Powell et al. (1996), for instance, find that biotechnology firms with more networking experience gained more knowledge, had more diverse network portfolios, and became more central in collaborative networks over time.

Although a large amount of evidence exists for the gains associated with brokerage, these benefits will disappear as more and more organizations build bridges across the same structural hole (Burt, 2000; Walker et al., 1997). When firms exploiting structural holes control information opportunistically, an incentive for connected firms at the receiving end exists to forge links around the former (Gnyawali and Madhavan, 2001). This path to an equilibrium, where the value of bridging the hole is equal to its cost, is substantially longer if the industry is subject to continuous change. In this situation, knowledge quickly becomes out-of-date, and alliance networks of organizations with more structural holes possess an advantage in identifying and developing more rewarding opportunities (Burt, 2000). Firms with reputations as aggressive learners, however, may have difficulty forming new alliances because substantial information and knowledge acquisition by one partner may cause a breakdown of the bargaining relationship between the partners (Hagedoorn and Duysters, 2002; Inkpen and Dinur, 1998). The same situation may be found in a firm's intrafirm network; the stronger the knowledge monopoly, the higher the probability that the dependent business units will try to change the network structure to overcome this monopolistic situation.

In conclusion, while dyadic alliances pose a significant challenge for an organization, participation in a strategic alliance network even increases the demands of knowledge transfer from alliance partners. Firms have to find a favorable position in their external network of cooperating organizations as outlined in the propositions above, and also manage the internal relationships between their business units so that they complement and support each other. This challenging managerial task, however, offers a broad set of opportunities that are otherwise beyond the reach of an organization. Firms that are able to shape the configuration of their external and internal relationships in a manner not easily imitated or substituted might gain sustainable competitive advantages.

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