# Social Networks, the *Tertius Iungens* Orientation, and Involvement in Innovation[1]

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## Abstract

This study introduces the *tertius iungens* orientation, a strategic, behavioral orientation toward connecting people in one's social network by either introducing disconnected individuals or facilitating new coordination between connected individuals. The *tertius iungens* mechanism contrasts with the *tertius gaudens* mechanism emphasized in structural holes theory that concerns the advantage of a broker who can play people off against one another for his or her own benefit. A multi-method study finds that a *tertius iungens* orientation, dense social networks, and diverse social knowledge predict involvement in innovation. *Tertius iungens* activity is examined as a social mechanism central to the combinative activity at the root of innovation within the firm.

Innovation is crucial to organizational growth and competitiveness (Schumpeter, 1942; Van de Ven, 1986; Tushman and Moore, 1988; Jelinek and Schoonhoven, 1990) and has attracted an extraordinary amount of research. Key managerial questions about the innovation process and how it happens remain unanswered. Van de Ven and Rogers (1988: 648), citing Coleman's pioneering work on mechanisms, suggest that specification of mechanisms is the first requirement for a theory of innovation:

> [The theory] should explain how structure and individual purposive action are linked at micro and macro levels of analysis. The dominant paradigm of social science rests on the firm belief that any macro theory of organizational innovation must be grounded in the purposive actions and ambitions of individuals (Coleman, 1986).

The importance of specifying the social processes associated with innovation is identified in the renewed emphasis in social theory on mechanism-based theorizing (Hedstrom & Swedberg, 1998).[2] According to Hernes, "A mechanism is not so much about 'nuts and bolts' as about 'cogs and wheels'… -- the wheelwork or agency by which an effect is produced" (1998: 74).

The champion literature (e.g., Schon, 1963; Howell & Higgins, 1990; Day, 1994) illustrates the strengths and weaknesses of innovation research in the absence of a mechanism orientation. This literature illuminates how advocacy is often critical to innovation but often confounds individual champion roles with social processes. The wide variety of fixed role categories (e.g., idea generators, champions, gatekeepers, boundary spanners, sponsors, coaches, and mentors), with often overlapping or contradictory specifications (Howell & Higgins, 1990), often obscure potentially common processes of advocacy. An emphasis on social process redirects our

[2] Hedstrom and Swedberg explicitly identify Simmel's *tertius gaudens,* to which the *tertius iungens* is meant as an alternative, as an example of a mechanism.

attention from static roles to fundamental mechanisms that allow for the application of collective action and advocacy to different situations.

This study of innovation activity in an automotive design context defines innovation as a process of making new social connections between disparate people (and the ideas and resources they carry) so as to produce novel combinations. I start from this assumption of innovation as combination to better understand the micromechanisms that enable people to become involved in innovation within firms. The idea that innovation involves a process of socially facilitating combinations and connections was pioneered by Schumpeter in his book "The Theory of Economic Development" (1934). Schumpeter wrote:

> To produce other things, or the same things by a different method, means to combine these materials and forces differently … Development in our sense is then defined by the carrying out of new combinations (1934: 65-66)

Schumpeter (1934: 81, 83) further emphasizes the innovation process and not the innovator (or entrepreneur in Schumpeter's terminology) specifying entrepreneurship as a "type of conduct" rather than a particular role occurring within and outside organizations: "… whatever the type, everyone is an entrepreneur only when he actually "carries out new combinations."

Recent treatments of innovation follow and support Schumpeter's focus on social combination as the basis of innovation. Kogut and Zander (1992) argue that firms deter imitation through a combinative capability to generate new innovation from existing knowledge. The authors suggest that such a dynamic combinative capability is embedded in social relationships that permeate the firm without offering concrete examples of such a capability at the microsocial level. Other innovation work suggests how such socially situated recombination might occur. Brown and Duguid (1991) employ Julian Orr's ethnographic data to explore how critical firm

learning and innovation occur within "extremely influential interstitial communities." Henderson and Clark (1990) argue that product design is reflected in the social relationships and patterns of action within the firm and suggest that architectural innovation and radical innovation are both a function of the ability of individuals within the product design process to break from established patterns of action in order to introduce new combinations of components (architectural innovation) or new linkages between core concepts (radical innovation). Similarly, Dougherty (1992) found that successful product development involved the violation of routines prescribing narrow roles and limited relationships between different departments and thought worlds. She found that innovation requires "*collective action*, or efforts to create shared understandings from disparate perspectives (Dougherty, 1992: 195)." Most recently Hargadon (2003: 24) describes recombinant innovation as innovation "that recombines objects, ideas, and people that emerged and evolved elsewhere." These approaches share a common approach to innovation as emerging out of the active combination of people, knowledge, and resources achieved through shared understanding and collective action.

This study then starts from a focus on the central process of innovation, particularly within firms, as one of combination. Starting from a combinative perspective I propose two antecedents of innovation well-studied in the social network literature – density, or the absence of structural holes, and knowledge. Dense networks present the optimal conditions for the exchange of ideas and collective action necessary for innovation in complex organizations. Knowledge provides the raw material that is the source of ideas and the social intelligence by which to implement them.

I introduce a third antecedent, *tertius iungens* activity, as a social mechanism central to the combinative activity at the root of innovation.[3] Correspondingly, the *tertius iungens* orientation is a strategic, behavioral orientation toward connecting people in one's social network by either introducing disconnected individuals or facilitating new coordination between connected individuals. This social mechanism is central to collaborative work of organizational innovation but has not yet been concretely specified at the microsocial level. The *tertius iungens* mechanism also represents an alternative social network mechanism neglected in social network theories that take competition and separation as a point of reference instead of collaboration and coordination.

The empirical analysis in this article examines the independent predictive power of the *tertius iungens* strategic orientation, social network density, and social knowledge on innovation involvement and suggests a number of insights about the social processes that surround innovation. Participant observations gathered during a year-long ethnography that preceded the survey study are presented to further develop the nature of the *tertius iungens* orientation. Implications of the study on innovation and social networks, as well as for social skill and agency within firms are presented.

[3] *Tertius iungens* (YUNG-gains) is based on the Latin verb iungo which means to join, unite, or connect. In early Latin, it means literally to yoke, harness, or mate and serves as the root of such words as junta and yoga. In one context it is used in the phrase "to throw a bridge over a river." In later Latin it seems to be used in a more metaphorical sense, "to unite" or "to form" (as in a friendship.) Cicero uses the term “iungere amicitiam cum aliquot,” that is, "to form a friendship or alliance with another.”

## THEORY AND HYPOTHESES

### The *Tertius Iungens* Strategic Orientation

The emphasis here on combination, particularly the joining of people, holds a certain tension with the strategic separation among parties emphasized by structural holes theory (e.g., Burt, 1992; Burt, 2000) in the social networks literature. A structural hole exists between two people if they are not connected to each other, but share a tie with a common third party. Structural holes theory suggests unique ties to other individuals or firms provide superior access to information and greater opportunities to exercise control. Burt argues that social networks rich in structural holes present opportunities for using a *tertius gaudens* strategy by which an actor positioned between two disconnected parties can manipulate or exploit those parties to the actor's benefit. Burt (1992) draws on Simmel's (1950) concept of the *tertius gaudens* to explain the social activity that occurs around structural holes. Simmel (1950:154-162) argued that the introduction of a third party fundamentally alters the social dynamics of dyadic ties. Simmel (1950) called one particular triad type the *tertius gaudens* or "the third who enjoys," (Wolff, 1950:154) based on the inherent benefit of a position between two disconnected parties. These two parties, because of their unfamiliarity with each other, can be manipulated to the third party's benefit. Burt argues that low-density egocentric social networks rich in structural holes present opportunities for advantage through the *tertius gaudens* strategy.

Baker and Obstfeld (1999) suggest that the *tertius gaudens* explains only one entrepreneurial strategy that they term a disunion strategy, and suggest an alternative, a "union" or what I call a *tertius iungens* strategy – Latin for "the third who joins or unites". In this case, ego "closes" the gap between disconnected alters by bringing them together. This alternative dynamic

corresponds with another of Simmel's triad types overlooked by Burt, the third party who acts as a mediator, or "non-partisan," to create or preserve group unity: "The non-partisan either produces the concord of two colliding parties, whereby he withdraws after making the effort of creating direct contact between the unconnected or quarreling elements; or he functions as an arbiter who balances, as it were, their contradictory claims against one another and eliminates what is incompatible in them" (Simmel 1950:146-147).

Simmel's mediator or "non-partisan," offers an alternative to the *tertius gaudens* that merits further examination and development. Much of Simmel's above description, for example, assumes adversarial tension with references to "colliding parties," "quarreling," "contradictory claims," or incompatibility. I argue such adversarial tension characterizes only one set of conditions that might surround the uniting that the *tertius iungens* may instigate. A substantial portion of *tertius iungens* activity addresses a coordination problem in the absence of adversarial tension and competing claims. Parties may be indifferent to one another's interests, oblivious to other potentially commensurate interests, or even share common interests without being tied together for the purposes of a given project. Simmel's reference to "unconnected" elements therefore also bears closer scrutiny. Innovations form around projects that represent combinations of people, ideas, and resources. Parties may be unconnected in the sense of being completely unacquainted with one another or, alternatively, may have previous strong or weak ties along a variety of dimensions but be unconnected in relation to a given project or initiative. The absence of coordination between previously tied individuals may arise from cognitive gaps (Baker, 2000: 142) that arise from incomplete interpersonal knowledge. This suggests that

*tertius iungens* actors may operate within sparse networks or dense networks of already related nodes unmobilized for a specific effort or initiative.

I define the *tertius iungens* orientation as a strategic, behavioral orientation toward connecting people in one's social network by either introducing disconnected individuals or facilitating new coordination between connected individuals. The use of the term "orientation" suggests a construct of medium specificity between a highly specific attitude (e.g., toward a task) and a more general personality trait (Frese and Fay, 2001.) A "strategic orientation" refers to the preferred means for approaching problems in a social context (Higgins, 1998; Levine, Higgins, & Choi, 2000). After Simmel's conception of the non-partisan, *tertius iungens* activity is a social mechanism by which actors bring forth such combinations and recombinations.

Specification of the *tertius iungens* orientation is at variance with more structurally deterministic renderings of social networks that hold that structure alone determines action and defines personality. An extreme version of such a position holds that to specify a network assumes pursuit of the opportunities afforded by such a network. Social network research has often neglected the individual differences that might determine the value of various social networks (Emirbayer and Goodwin, 1994; Mehra, Kilduf, and Brass, 2001) and an account of agency that factors in both social structure and individual difference. Important alternatives to this neglect of the individual (Brass & Burkardt, 1993; Ibarra, 1993a; Ibarra, 1993b; Galaskiewicz and Wasserman, 1994; Kilduff and Krackhardt, 1994; Marsden and Friedkin, 1994; Mehra, Kilduf, and Brass, 2001) consider individual differences in concert with social network variables. Consistent with this line of work, I argue that structure affords opportunities but does not dictate

action and that characteristics of nodes as well as networks are important in the consideration of such action. I argue further, that the signature of the innovator is not located solely or even primarily in the structure of the network but in the strategic orientation of the node toward action.

The *tertius iungens* orientation is a strategy for action neglected or underdeveloped in previous social network-based accounts of agency. Generally, the process of connection is underspecified as some form of "bridging" or "brokerage" without attention to the underlying micromechanisms. The idea of bridging is often associated with Granovetter's pioneering work on weak ties. Granovetter suggested that weak tie bridges often connect people to novel sources of information and resources pointing out that while strong ties typically lead to dense networks with redundant information, weak ties are often unencumbered by the redundancy associated with such closure. While there is, as Granovetter points out, a greater likelihood of a B-C tie when two pre-existing strong ties pre-exist (Figure 1A) than with a preexisting strong and weak tie (Figure 1B), there is also, by extension, a wider variance as to whether A in Figure 1B might close the C-B weak tie leg by introducing C to B. That variance is in part a function of A's discretion and skill – their strategic orientation to selectively join others together.

Granovetter's ultimate focus, however, is on bridges as conduits of information and resources only, and he does not address the circumstances and theoretical implications under which A might introduce a weakly-tied C to B. To forge and maintain weak-tie bridges as a source of unique information and resources is a qualitatively different network phenomenon than to introduce a weakly tied node to someone else. A weak tie bridge alone does not imply or entail

coordinated action. It is the choice of the *tertius iungens* to introduce B and C into a "weak tie triad" (Figure 1B) or to re-introduce previously tied actors for the purposes of a new project (Figure 1C and 1D).

Attending to the underlying strategic orientations like the *tertius iungens* clarifies the multi-dimensional nature of brokerage. Brokers may engage in four broker strategies: 1) coordinate action or information between distant parties who have no immediate prospect for direct introduction or connection, 2) actively maintain and exploit the separation between parties – the *tertius gaudens* orientation, 3) introduce or facilitate preexisting ties between parties where the coordinative role of the *tertius iungens* subsequently recedes in importance, and 4) introduce or facilitate interaction between parties while maintaining an essential coordinative role over time. The *tertius iungens* orientation construct draws an important distinction between the first two cases where separation is maintained and the latter two to which it refers. Note also that the distinction between the first two cases and the latter pair is one between networks in equilibrium and those undergoing some form of change.

Accounts of agency and brokerage are incomplete, vague, or even confusing because of a lack of attention to the different dynamics across these four types of brokerage. Marsden's (1982: 202) definition of brokerage – a mechanism "by which actors facilitate transactions between other actors lacking access to or trust in one another" – tends to emphasize the first two brokerage strategies. Gould and Fernandez's (1989) definition of brokerage – facilitating transactions or resource flows – and their brokerage typology emphasize the first two brokerage strategies with vague suggestions of the first *tertius iungens* strategy, but does not explicitly address the role

brokers may play to connect parties. The authors' position with respect to such introductions is made explicit in Fernandez and Gould (1994: 1457): "our conception [of brokerage] … does not permit the endpoints of the brokerage relation to be directly connected." These authors present static typologies that assume cross-sectional glimpses of social networks in equilibrium. Brokerage is understood to facilitate transaction and resource flows but not as a means of establishing relationships. As a consequence the authors don't speak to the dynamics of social network emergence and change, and the mechanisms by which such change might occur.

Qualitative and anecdotal data on brokering varies widely as to the brokerage strategies depicted. Despite his emphasis on the *tertius gaudens* logic of action, Burt (1997) speaks to *tertius iungens* behavior as well describing, for example, entrepreneurial managers who identify opportunities to add value within an organization and get the right people together to develop these opportunities. In his description of biochemist Alejandro Zaffaroni, Burt (2000: 227) describes how Zaffaroni brings people together and "institutionalizes his bridges." Hargadon and Sutton's (1997) concept of technology brokering, illustrated by the manner in which the product design firm IDEO moved knowledge between industries and clients while keeping clients separate and distinct, tends to emphasize the first two brokerage strategies. Hargadon's (2002) more recent work on technology brokering suggests a "building" step where brokers may create networks around innovations that is consistent with the two *tertius iungens* strategies. Hargadon notes, for example, how the design firm Design Continuum introduced Reebok to a manufacturer who subsequently supplied air bladders for Reebok's Pump™ basketball shoes. DiMaggio's (1992) description of the way in which Paul Sachs brokered between the museum, university, and

finance worlds to help create the Museum of Modern Art is most consistent with the second *tertius iungens* strategy.

There are several activities associated with the different brokerage strategies. Brokers may be involved with the simple transfer (Shannon & Weaver (1949), articulation (Winter, 1987), translation (Latour, 1987), and transformation (Carlile, 2002) of knowledge and information in one or multiple directions, negotiation (Burt, 1992), reconciliation of competing interests (Simmel, 1950), simple introductions, articulation work (Strauss et al., 1985; Gerson & Star, 1986), and the creation of projects or coordinated forms of action intended to introduce new forms into a social context. Each of these activities has varying levels of association with the four basic brokerage strategies. Broker-orchestrated negotiation between two vying parties represents a classic *tertius gaudens* case (brokerage strategy 2) described by Burt. The movement of knowledge and information can be associated with all four brokerage strategies. The generation of innovations and the creation of projects in general are most strongly connected to the second *tertius iungens* strategy.

Independent of preexisting social network structure, the *tertius iungens* strategy identifies the mobilization activity essential to many forms of innovation. A *tertius iungens* strategy, then, is a behavioral orientation that emphasizes creating or facilitating ties among people in one's social network. Individuals that are active in introducing dissimilar others and facilitating action among existing alter-alter ties will be more involved in the combinative activity that leads to innovation.

**Hypothesis 1: The greater an individual's *tertius iungens* orientation, the greater the individual's involvement in innovation.**

**Social Networks**

An earlier social networks literature examined the connection between social networks and innovation quite explicitly. An extensive tradition of social network approaches to innovation and product development (e.g., Allen, 1977; Tushman, 1978; Tushman and Scanlan, 1981) determined that strategically positioned individuals facilitate information dissemination that in turn facilitates innovation. Allen (1977), for example, found that individuals with more informal contacts outside the organizations, or "gatekeepers," were critical for importing novel information and linking the organization with its environment. These gatekeepers effectively serve as the primary link to external sources of information and technology (Katz & Tushman, 1981.) In this stream of research, like the related broker literature discussed above, the activity of these advantageously situated individuals is conceptualized as facilitating information flow from a fixed position in a static social network. This work illuminated the passive role of social networks in channeling innovation but neglected the active role that individuals can play to link different parties and advocate for innovation. Ibarra (1993a) provided a more dynamic interpretation of her related finding that network centrality predicted innovation involvement in an advertising and public relations agency suggesting that centrality presented the potential to mobilize a broader base of support for innovation.

More recent work on social networks and innovation at the individual and firm level follows the lines of a more general debate regarding the merits of two different conceptualizations of social capital (Baker and Obstfeld, 1999; Burt, 2000; Putnam, 2000; Adler and Kwon, 2002). One conceptualization stresses the benefits of "closed," dense, or cohesive networks (e.g., Coleman, 1988) including cooperation, trust, as well as the potential to build knowledge through intensive,

repeated interactions and exchange of ideas (e.g., Ahuja, 2000). The other emphasizes structural holes, unique ties to other individuals or firms that provide superior access to information and greater opportunities to exercise control (Burt, 1992; 1997). According to structural holes theory, networks full of structural holes, by exposing an actor to novel communities, diverse experiences, unique resources, varying preferences, and multiple thought worlds, provide superior opportunities. The information advantage Burt associates with networks with structural holes roughly corresponds with the advantageous position occupied by the gatekeepers in the earlier social networks/innovation literature to the extent that both imply boundary positions. As noted earlier, structural holes also present the broker with a control advantage derived from the leverage they have over the individuals they connect. Consistent with the *tertius gaudens* logic, Burt suggests that separation between structurally equivalent alters provide ego with the maximal opportunity to play alters against one another and thus to benefit.

The opposite position in the social capital debate holds for the advantages of dense networks. This alternative prediction is consistent with a growing body of work recognizing the importance of dense networks for certain types of knowledge work. The advantages for dense social networks, and the more frequent communication and strong ties they usually entail, include trust, norms of cooperation, and the more effective exchange of complex knowledge, all of which are crucial to the coordinated action necessary for sustained innovation efforts. With respect to trust, for example, Uzzi (1997: 43) found in embedded ties "a predilection to assume the best when interpreting another's motives and actions." With respect to norms, Coleman (1988) suggests that network closure provides the basis for sanctioning that can effectively constrain action that serves the collective good. Finally, dense networks tend to be the locus of shared knowledge

(Arrow, 1974; Kogut & Zander, 1992; Nahapiet & Ghoshal, 1998), language, and style that facilitates communication. Recent work on team performance (Reagans and Zuckerman, 2001; Reagans, Zuckerman, and McEvily, 2003) found that dense within-team networks and increased structural holes (i.e., network heterogeneity) outside the team increased team productivity and reduced project duration.

Research results with respect to this dense/sparse network distinction and innovation are limited and mixed. Rodan and Galunic (2004:541) observe, "… as Ibarra (1993a) noted a decade ago, there are remarkably few applications of the social capital perspective to managerial innovation and little has changed since she made that observation." Structural holes, for example, facilitated the technology brokering role that the product design firm IDEO used to develop innovative products (Hargadon and Sutton, 1997; Hargadon, 2002). In a recent study (Rodan and Galunic, 2004), network sparseness was a marginally significant predictor of innovation but the interaction of sparseness and knowledge heterogeneity was significant. On the other hand, recent research has begun to identify the importance of dense networks in innovation and innovation-related tasks such as knowledge transfer. Uzzi (1997) and Hansen (1999) identified fine-grained information transfer of tacit knowledge as a function of stronger, embedded ties that correspond roughly with dense social networks. Such knowledge sharing is likely to concern not only technical knowledge but knowledge regarding the social and political context in which the innovation are conceived and pursued over time.

Exchanging, integrating and creating knowledge can be extraordinarily difficult (Dougherty, 1992; Carlile, 2002) despite the advantages of conducting knowledge processes inside the firm

(Kogut and Zander, 1992), When the primary innovation activity becomes more concerned with the creation and mobilization of support for innovation based on the sustained development of more complex forms of knowledge, rather than the simple transfer of information, dense networks would appear to become particularly important. The communities of practice literature (Brown and Duguid, 1991, 2001; Lave and Wenger, 1991; Wenger, 1998) considers the knowledge sharing and creation benefits of dense, informally constituted networks of shared practice. Brown and Duguid (2001: 202) argue that such dense communities are "sites for a tight, effective loop of insight, problem identification, learning, and knowledge production." In this sense, a dense network is also "premobilized" in that it presents less inherent conflict between those who must agree to support the innovation. Podolny and Baron (1997) found that structural holes in information networks led to promotions, but found the opposite effect if those structural holes occurred in the individual's buy-in network, the network with greatest similarity to that required to garner support for an innovation.

Thus the following relationship between structural holes and innovation is hypothesized:

**Hypothesis 2: The fewer the number of structural holes (i.e., the higher the density) in an individual's social network, the greater the individual's involvement in innovation.**

**Knowledge**

Social network approaches recognize the importance of structural knowledge conduits but often assume the social network serves as a proxy for individual knowledge without exploring the potentially complex relationship between the social network and individual knowledge (Rodan

& Galunic, 2004). Social network theories that stress the advantages of structural holes or gatekeepers, for example, tend to emphasize access to new information and overlook the individual accumulation of technical and social knowledge that make its application to innovation possible. This preexisting individual stock of knowledge makes possible an absorptive capacity, which Cohen and Levinthal (1990: 128) define as "the ability of a firm to recognize the value of new, external information, assimilate it and apply it to commercial ends." They argue that such a capacity is a function of a firm's level of prior related knowledge. While presenting absorptive capacity as a firm-level construct, Cohen and Levinthal ground the construct in research that suggests that individual learning is cumulative and that a depth and diversity of knowledge enables the individual to assimilate and apply knowledge from a broad number of areas. Szulanski (1996) found that lack of absorptive capacity was an important barrier to internal knowledge transfer and Reagans and McEvily (2003) determined that previously shared knowledge provided an absorptive capacity that facilitated knowledge transfer. An accumulated stock of individual knowledge, then, is important to innovation both as a resource to draw upon directly as well as the basis to assimilate new knowledge.

The concept of absorptive capacity stresses the importance of prior related technical knowledge as a basis of successful innovation and R & D. While technical knowledge is essential to any innovation effort complex, technically-oriented organizations place particular demands on its participants for depth and familiarity with newer technologies and practices in their functional area of expertise.

Similarly, a person with a rich stock of social knowledge – knowledge of the organization's culture along with the nature, history, and preferences of different personnel and departments – would be in a better position to introduce innovations. Situated theories of knowledge suggest that knowledge occurs in intertwined technical and social realms (Lave and Wenger, 1991). Extensive social knowledge about the personnel and differing styles of critical departments across the organization resulting from informal ties and potentially shared design experience contribute critically to cross-boundary innovation efforts. Social knowledge is related to the accurate cognition of informal networks that Krackhardt (1990) found was a base of power. Rodan and Galunic (2004) found that knowledge heterogeneity was a significant predictor of both overall managerial performance and innovation performance. Thus, other things being equal, individuals with more in-depth technical and more diverse social knowledge are more likely to be involved in innovation efforts.

**Hypothesis 3a: The greater an individual's technical knowledge in his or her functional area of expertise, the greater the individual's involvement in innovation.**

**Hypothesis 3b: The greater an individual's social knowledge across all relevant functions, the greater the individual's involvement in innovation.**

A summary of the hypothesized relationships is contained in Figure 2.

## METHODS

### Site and Participants

NewCar (a pseudonym) is an engineering division of a major Detroit automotive manufacturer with over 1000 employees, 440 of whom were dedicated to the design of a new vehicle which I will refer to as the G5. The core automotive design work for the G5 was carried out by five engineering units: Powertrain, Electric, Interior, Chassis, and Body, and was coordinated by two other engineering groups responsible for program management and integration of different design contributions. The engineers and designers from NewCar frequently worked with representatives from corporate styling, Marketing, Operations, Manufacturing, and numerous external suppliers to which various parts of the engineering work had been outsourced. A NewCar engineering executive and the G5 Program Manager served as the main sponsors for the study. A survey was conducted approximately three years into the G5's five-year design process – a point at which the G5's design was nearly complete.

The design of an automobile is a roughly a five-year process that begins first by establishing a general styling theme and key design features of the car. From there, engineers and the designers who assist them begin to rough out and refine various parts while coordinating their design with those responsible for adjacent parts in the design through continual discussions and meetings in a variety of cross-functional teams. Engineers and the designers responsible for the digital design of parts in three-dimensional space continually develop designs that are assembled digitally and in successive rounds of actual prototype builds to determine compatibility. It is routine for an engineer to carry responsibility for one or more parts while serving on multiple teams that monitor the emerging vehicle's performance, cost, weight, and schedule. It is well

understood that compromise and coordination are more difficult the further the overall design moves toward production, as the work associated with changing part designs reflecting hundreds of hours of design and testing increases.

The survey for this study was administered in two parts. The first part contained all survey items except the social network-related items. It was distributed over the internal company e-mail system to all 440 professional-level employees (engineers, designers, and managers) working on the G5. Completion of the entire survey entered respondents into a lottery for prizes that served as an incentive. Several weeks before the initial distribution of the survey, the G5 program manager sent an e-mail to the entire division describing the survey and encouraging employees to participate. Two reminders to complete the survey were e-mailed. The survey and reminders indicated that the purpose of the study was "to better understand the social dynamics of the product development process."

A total of 182 respondents returned the survey via company e-mail. In return, each received a pass code to enter a website on the company intranet to complete the social network portion of the survey. This latter portion of the survey was completed by 152 people for a total response rate of 35%. An independent samples T test indicated no difference in education, rank, or years in the company between respondents and nonrespondents to the second part of the survey. Of the respondents, 128 were male, 24 were female.

**Ethnographic study**. Field observations of NewCar innovation efforts were conducted before, during, and after the survey administration in part to augment the quantitative analysis. The first

phase of ethnographic observation was conducted over a 12-month period that concluded several months prior to the survey administration. I maintained active contact with the organization for another year during the preparation and administration of the survey study. Field observation averaged four days a week for the first nine months of a two-year observation period. Site visits were scaled back to approximately four days a month for the latter 15 months. Each day of observation yielded five to 50 pages of handwritten field notes that were usually written up within 24 hours after leaving the field. Field notes were supplemented with 112 taped and transcribed interviews. Meeting minutes, prints of CAD/CAM designs, and informal sketches were routinely collected as part of the data gathering effort.

## Measures

**Dependent variable.** Innovation involvement was measured by respondents' highest level of participation in a change to the G5 product or process. Specifically, Ibarra's scale of five categories of innovation involvement (1989, 1993a) were used and presented to respondents with instructions to:

> Check 1 if you, along or conjunction with others, were the initiator of the innovation---that is, if its introduction and use was in large portion your idea. This is the number to check if the innovation would not have happened without you. (It is expected that '1's will be very rare.); Check 2 if you were not the initiator, but played a major role in the development of the innovation as a whole. This is the number to check if you played an important role in shaping the innovation--- it would not exist in its present form without your contribution.; Check 3 if you were associated with the development of the innovation in a more limited capacity, for example, providing advice to the initiator on specific aspects of the innovation. This is the number to check if you played a minor role in bringing the innovation to the organization; Check 4 if you know about the innovation but had nothing to do with it.; Check 5 if the innovation is not applicable to your work and is one you know nothing about.

Respondents were asked to evaluate their level of involvement in each of the 73 innovations. The list of 73 innovations was derived by (1) interviewing 26 "middle managers" from each of the G5's seven departments to determine the significant changes to product and process in their area since the inception of the G5, a three-year period; (2) conducting informal discussions and examining patent application lists, and (3) subjecting the initial list of 81 innovations developed in steps 1 and 2 to review and approval by the G5 program manager and senior managers in each of the six other NewCar engineering areas. This process established a final list of 73 innovations, all of which were new or a major modification to what previously existed and were implemented. An example of a G5 product innovation is "Double boot on manual shifter to enhance NVH characteristics." An example of a G5 process innovation is "Creation of a prototype parts management group and process."

A respondent's innovation involvement reflected the highest level of involvement reported across all 73 innovations. If an individual reported that he or she was an initiator for one or more of the 73 innovations, then he or she was designated as an initiator. This approach stresses the highest level of involvement rather than counting the number of innovations pursued because innovations varied widely with respect to the amounts of time they involved. The measure thus emphasizes comparable levels of engagement. The coding of the innovation involvement was reversed so that factors that contributed to innovation involvement would display a positive regression coefficient.

Initiator and major role self-reports of innovation involvement were validated using reviews by 49 experts. A listing of all those self-reporting either an initiator or major role for a given

innovation was created. Experts were asked to describe the genesis of the innovation (on tape) after which they were provided the list of names and were asked to assign them one of four levels of involvement: "Initiator," "Major Role," "Minor Role," or "No Involvement or No Knowledge Of Individual's Involvement." Responses were used to review and change, as appropriate, initiator and major role self-report innovation involvement according to predetermined criteria. For example, self-reported innovation involvement was not altered when confirmed by at least one other report of involvement at an equal or higher level.

Of the 84 respondents who self-reported either an initiator or major role as the highest level of innovation involvement, 61 respondents' level was left unchanged, 18 respondents were moved down a level of involvement, three were moved up a level, and two individuals were eliminated from the study due the size of the discrepancy (two levels) between the self-report and expert responses. Seven initiator or major role self-reports were left unchanged due to the unavailability of expert reports.

**Independent Variables**

***Tertius Iungens* Orientation.** A *tertius iungens* orientation scale was created to capture a predisposition to bring people together in collaboration. The scale captures both the introduction of disconnected others and the forging of stronger ties between others who may already have ties with one another. To capture this social activity, I created and tested a six-item *tertius iungens* orientation scale. Examples of items in the final scale include: "I introduce people to each other who might have a common strategic work interest." and "I point out the common ground shared by people who have different perspectives on an issue." A response of 1 corresponded with

"never" and a response of 7 corresponded with "all the time." The scale was administered to a group of 55 professionals from several organizations prior to its use at NewCar. The initial test of the scale had a reliability (Cronbach alpha) of .85. In the final study, the scale had a reliability of .88.

To further test the discriminant validity of the *tertius iungens* construct, a confirmatory factor analysis (CFA) was conducted comparing the structure of the *tertius iungens* scale to individualism collectivism (Wagner, 1995, Triandis et al., 1988; Erez and Earley, 1987) the integrating and compromising styles of handling conflict (Rahim and Manger, 1995), proactive personality (Bateman and Crant, 1993) and the big five personality dimensions (Saucier, 1994). New data was collected from 130 fully employed MBA students in order to conduct the comparison with eight of the scales. Pre-existing data was used for the comparison of the *tertius iungens* scale with the individualism-collectivism scale. In all analyses, the phi matrix showed minimal inter-scale correlation. The highest observed inter-item correlation was 0.52 between the *tertius iungens* and proactive personality scales in effect accounting for only 25% of shared variance.

**Structural Holes.** Consistent with Burt's (1992) original work on structural holes, a single list of people with whom the respondent had ties was derived from an egocentric social network survey instrument. The name-generator questions asked the respondent to identify persons with whom they had different kinds of relations including those with whom they discussed important matters, with whom they communicated to get work done, who were influential in getting new projects approved, with whom they socialized informally, and to whom they turned to for advice.

Tie strength (Granovetter, 1973) between the respondent and each alter was established by the question, "How strong of a connection do you have with X?" with the possible responses "Strong," "Somewhat strong," "Somewhat weak," "Weak," and "I prefer to avoid this person." Ties between alters was established by a similar question "How connected are X and Y?" and similar response options with the addition of the option "Strangers or not acquainted" to indicate when alters had no relationship. A tie between alters was considered to be absent if the respondent provided the "strangers" or "prefer to avoid this person" response.

I used two measures of structural holes, density and Burt's (1992) measure of constraint. The density measure reflects a level of cohesion necessary for coordinated action while the constraint measure is meant to capture the extent of an individual's dependence on the others in his or her network as well as his or her access to novel, non-redundant information (Burt, 1992). The latter measure corresponds directly to Burt's *tertius gaudens* conception of action. Density, or the ratio of existing ties between those in a subject's network out of all possible ties, is often seen as a general proxy for structural holes (e.g., Podolny and Baron, 1997) and is of particular relevance with respect to the innovation-related dependent variable where simple density of ties may reflect the sustained cooperation necessary for innovation efforts to succeed.

Burt's measure of structural holes, constraint, was also used. The constraint measure is meant to identify the social network positions that confer the greatest information and control advantages. Low constraint corresponds with larger numbers of structural holes. Constraint is a function of the existence of direct ties between ego *i* and *j*, and of the extent to which *j* has other ties *q* that are in *i*'s network as well. The formula for constraint is:

$$c_{ij} = \left( p_{ij} + \sum_{q \neq i \neq j}^{Q} p_{iq} p_{qj} \right)^2$$

where $p_{ij}$ is the proportion of the total relational strength that ego devotes to a given alter in proportion to the sum of relational strengths of all other of ego's alter ties, and $\Sigma p_{iq} p_{qj}$ captures the degree of triadic closure between $i$, $j$, and third parties $q$ (Reagans, Zuckerman, & McEvily, 2004.) Both density and constraint were calculated in UCINET (Borgatti, Everett, & Freeman, 2002).

**Knowledge.** The extent of an individual's knowledge was captured with four measures. First, technical knowledge was measured with a scale that emphasized familiarity with the respondent's area of functional expertise. Kaplan (1993) suggested that familiarity and comfort are strongly associated with the experience of tacitly held knowledge. Therefore technical knowledge was determined by the respondent's response to the question, "In general, how comfortable are you addressing the more advanced technical issues associated with the following areas?" for each of ten technical areas (i.e., Body, Chassis, Electric, Interior, Powertrain, Vehicle Development, Program Management, Marketing, Manufacturing, and Purchasing) with the technical knowledge measure referring only to the response to the technical area in which they were based. A value of 1 meant "not comfortable at all" and a 7 meant "very comfortable."

Second, social knowledge was seen as a function of broad access to current and often unofficial information about the activity in various areas surrounding the G5's development. That access serves as a conduit for unfiltered intelligence about individual and departmental issues and

interests, and suggests a deeper appreciation of the social and political dynamics that surround innovation efforts. Social knowledge was measured by the respondent's response to the question, "In general, how easy would it be for you to get candid, 'behind-the-scenes' input regarding G5 issues concerning the following areas?" for each of the ten technical areas indicated above. As with the technical knowledge scale, a value of 1 meant "not comfortable at all" and a 7 meant "very comfortable." These ten responses formed a social knowledge scale with a reliability (Cronbach alpha) of .88.

Third, time in the firm influences technical and social knowledge (Hitt et al., 2001). This takes the form of familiarity with the organization's culture and language, greater insight into other individual and group preferences, and instincts about how to advocate for innovation. In this respect, years in the firm appear to reflect both accumulated technical and social knowledge. Therefore, the number of years employed by NewCar was used as a third measure of accumulated technical and social knowledge.

Formal education served as a fourth measure of an individual's stock of knowledge. Given the importance of engineering to the automotive context in which the survey was administered, education levels were broken into a binary scale – those with a master's degree in an engineering or engineering-related area received a 1 and all others, a 0.[4]

[4] Formal education was an important consideration at NewCar for reasons other than its association with knowledge. First, promotion past a fairly low professional rank without an undergraduate degree was prevented by company policy. Second, the impact of advanced degrees must be considered in light of the enhanced status they might confer on an individual independent of the knowledge obtained. Despite these additional considerations, I chose to leave education in the knowledge category of variables but consider it as distinctly different from the other measures of knowledge proposed here.

**Control Variables**

**Years in firm dummy variable.** Several participants in the survey (18 out of 152, or 12%) indicated a length of time in the firm of less than one year. Because of the greatly reduced potential for these individuals to contribute substantively to a majority of innovations which were typically initiated two or three years before the survey administration, these respondents had the potential to distort the time in the firm measure. To control for this effect, a dummy variable was created where respondents with less than a year in the firm were coded with a one and all other respondents were coded zero.

**Organizational rank.** Consistent with the innovation literature (e.g., Ibarra, 1993a), senior managers are expected to be were very influential in innovation processes due at least in part to the authority associated with their formal position. It is therefore expected that certain innovations occur simply by virtue of the formal authority vested in more senior ranking individuals. For this reason, rank was used as a control. NewCar employees were asked to provide their formal grade level. These levels formed a six point numerical scale. The highest rank on this numerical scale corresponded with an executive engineer who would be in charge of

an entire department such as Chassis as it related to the G5. People who held this rank had considerable tenure and influence in the organization. Levels 4 and 5 represented middle managers jobs. Level 3 positions were both professional and managerial. Levels 1 and 2 corresponded with frontline professional positions. A rank equivalent had to be determined for contract workers who worked full-time for NewCar but were technically employed by an outside firm. Contract workers constituted a substantial part of NewCar's work force. In this study 34% of the respondents were contractors. The G5 program manager indicated that the contractors' rank was widely considered to be equivalent to the second increment of the six-point scale. The measure of rank incorporated all contractors at this level.

**Number of alters.** Because the density measure does not reflect the size of the respondent's network, an additional independent variable, the number of people in the respondent's network, was added to control for impact of network size in the model containing the density variable.

**Data Analysis**

An ordered logit model was used to estimate the probability of involvement in innovation. Ordered logit models are used to estimate the relationship between an ordinal dependent variable and a set of independent variables. An ordinal variable is a variable that is categorical and ordered. The categorical, ordered dependent variable used in this study had five response levels (i.e., initiator, major role, minor role, know about the innovation, or did not know anything about the innovation). A multinomial logit models is appropriate for categorical dependent variables more generally, but such a model does not capture the information inherent in the ordering of the dependent variable. Ordinary regression, on the other hand, has the potential to produce

different and potentially misleading results according to the numerical values assigned to the different ordinal response levels. An ordered logit model makes use of the ordered nature of the response levels without being influenced by the numerical values used for the dependent variable.

In an ordered logit, an underlying probability score is estimated as a linear function of a set of independent variables and a set of cut points. The probability of observing outcome *i* corresponds to the probability that the estimated linear function, plus random error, is within the range of the cut points estimated for the outcome:

$$\Pr(\text{outcome}_j = i) = \Pr(\kappa_{i-1} < \kappa\beta_1 x_{1j} + \kappa\beta_2 x_{2j} \ldots + \beta_\kappa x_{kj} + u_j \leq \kappa_i)$$

where $u_j$ is assumed to be logistically distributed in the ordered logit. In either case, one estimates the coefficients $\beta_1, \beta_2, \ldots, \beta_\kappa$ together with the cut points $\kappa_1, \kappa_2, \ldots, \kappa_{I-1}$, where $I$ is the number of possible outcomes. $\kappa_0$ is taken as $-\infty$ and $\kappa_I$ is taken as $+\infty$.

**RESULTS**

Table 1 presents means, standard deviations, and correlations among the variables included in the regression. Of 152 respondents, 20.5% were coded as an initiator, 24% were coded as "major role," 38% were coded as a "minor role," 16.5% were coded as recognizing at least one innovation, and 1% did not recognize any of the innovations. Regression results are reported in Table 2. Tests of significance shown in the table are one-tailed for directional predictions and two-tailed otherwise.

--- Insert Table 1 and 2 about here ---

Model 1 presents the results using density as the social network measure. Model 2 ran the data substituting constraint for density as a measure of structural holes.

In both models, the *tertius iungens* orientation variable was a significant predictor of innovation involvement, confirming Hypothesis 1.

This orientation was demonstrated by the NewCar program manager, a senior G5 manager, revealed how he strategically orchestrated and altered social networks during my observations. The program manager indicated:

> [My boss] came back from that course at IBM [all excited] about these network ideas … gatekeepers and what-not. I said, 'Ed, I create these networks.' That's half the battle. Half the battle is creating the networks. I've created the networks between functional specialists and my staff. I created the drivetrain and chassis [connection]. … Getting Pat engaged in the process. [The network] is different now.

The program manager routinely forged ties between his program management staff and the engineering clientele that his department served and with whom he, as a former line manager, had strong ties. About this activity, the program manager commented:

> I created relationships with my direct reports and functional areas. Frank [*a frontline program management professional*] with George Brown [*a manager in a functional area – a program management client*], *Sally* [*a program management frontline professional*] and Ted Welch [*a manager in a different functional area*]. I create links between my reports and … managers [from other … areas] to [work together.] I work on both sides of that. Get my people comfortable with that and get managers comfortable. When a ball comes off the court, [the line managers are] comfortable going to the program management person…

Through these introductions the program manager forged and legitimized ties between his frontline staff and higher ranking middle managers they were tasked with serving. In the

process, the program manager forfeited a certain measure of *tertius gaudens* control but buttressed the social capital, reputation, and effectiveness of his staff and overall unit.

The program manager's *tertius iungens* orientation was also salient over a four-month period I observed him successfully advocate for the creation of an entirely new unit charged with the coordination between part suppliers, engineers, and prototype builds – a substantial innovation to NewCar's design process. His efforts involved an initial phase of coordination between three already tied senior executives – two within the division and one outside – whose support he needed for the new unit to go forward, followed by the introduction and enlistment of a manager and five frontline employees to staff an entrepreneurial team that would develop and execute the new coordinative process. The program manager subsequently introduced that new team's manager and team members to critical stakeholders in the same manner he did with his other program management staff.

Another six-month set of field observations concerned the efforts of a grassroots, informal network of seven individuals advocating for a major corporate-wide reengineering of the prototyping process – an effort entirely outside of top management's agenda and consequently one that was hidden in its initial phases. Of particular note here were the repeated microsocial activities of *tertius iungens* joining necessary to make this effort progress at multiple levels.[5] The group initiated scores of *tertius iungens* introductions that can be grouped into three major *tertius iungens* cycles targeting successively broader or higher ranking audiences. The first

[5] Simmel indicates (1950: 148) the triad as a type spans "the conversation among three people that lasts only an hour, to the permanent family of three."

cycle involved a design engineer, Brian, who mobilized a network of individuals interested in pursuing innovations in engineering and operating processes. A second cycle involved the convening of a much larger three-day gathering to consider how the prototype process might be reengineered in order to create a broad base of legitimacy. The third and final cycle involved the core team's convening of a senior tier of executives to which they would present their recommendations. Each of these cycles was built around a multitude of *tertius iungens* joinings.

Hypothesis 2 predicted that density or the absence of structural holes would predict involvement in innovation. As shown in Model 1, density is significantly related to innovation involvement, supporting Hypothesis 2. In model 2, constraint is marginally significant, also supporting Hypothesis 2.

My ethnographic data also illustrated why dense social networks were important in a variety of G5 innovation efforts. In the program manager's efforts to create a new prototype build team and process, he first coordinated the support of previously related executive engineers who had to work together on other product design issues. In the second stage he brought together a manager and several frontline staff, many of whom had pre-established ties.

In the second innovation effort described above, although the core group looking to radically alter the corporation's prototyping procurement process spanned six divisions and ranged in rank from front-line professional to senior manager, five of its core member were previously acquainted and had collaborated sporadically over several years and in some cases decades. Brian had re-mobilized the pre-existing, cross-departmental network of engineers who had

periodically worked and socialized together, but whose day-to-day contact was unpredictable. Reflecting on the process before the senior executive presentation, Carl, a member of the core group indicated:

> … you have the same people. Brian, myself, Hill, Nelson, Rogers... I mean, we were all the team that started it. We've been talking about it to each other and in different changing networks for five, six years now. So basically, we all finally got together, formed this little team. That spurred the [business reengineering effort.] We had the [business reengineering meeting] so everybody bought into what the team wanted and now the team's gotten back together to come up with a real process.

Preexisting ties also surrounded the next two stages of mobilization. The 35 attendees to the three-day reengineering meeting in many cases had already known one another to varying degrees due to their preexisting association with the prototyping process but had gathered together specifically for the initiative the core team spearheaded. The senior executives convened for the core team's high-level pitch also knew one another but were selectively convened to establish the joint approval that would allow the core team to go forward with a more detailed proposal.

Three of the four measures associated with knowledge (Hypothesis 3) were significant predictors of innovation involvement in the direction hypothesized. Hypothesis 3b was confirmed with social knowledge serving as a highly significant predictor of innovation involvement. In addition, as expected, years in the firm was a significant predictor of innovation involvement and, based on the dummy variable, those with more than one year in the firm had a marginally significant greater probability of being involved with innovation. Also as expected, the higher the education level, the greater was the involvement in innovation. Technical knowledge and innovation involvement were not significantly related.

Ethnographic data showed that the importance of social knowledge was how that diverse, behind-the-scenes information aided efforts to marshal support for various initiatives. Participants in these innovation efforts routinely went through repeated discussions concerning the key stakeholders that needed to be linked to an ongoing effort or attracted to a new one. In the following exchange the program manager (PM) discusses with another manager (Ken) the creation of a meeting to gain support around a key technology initiative:

> PM: Parker wants everyone to put their [cards] on the table, drink some Courvoisier, roll some doobies. Jackson wants to be more directive. You don't want 1 ½ hours of meat, you want ½ hour of meat and lots of discussion. …. I won't let Jackson sandbag us. Morgan will be looking at the ceiling. Sanders will be asleep. Hughes will be [playing with] his moustache ... You and Jackson and Parker will be engaged. We need Jack there. We need to do some skeet shooting. Put up the slide… 'Pull! Bam! Bam! Bam!' *<The PM mimes the shooting of a rifle.>* Talk for 15 minutes and "Pull!" *<The PM again mimes the shooting of a rifle.>*
>
> Ken: The big five. *<Ken thinks five key senior managers need to be invited to the meeting.>*
>
> PM: Sure.
>
> Ken: Steve Sanders.
>
> PM: Sure. My boss.
>
> Ken: Why?
>
> PM: He owns the process

The core team described pursuing the reengineering of the corporate wide prototype build process continually marshaled social intelligence about how to proceed, what stakeholders to appeal to, and who to invite to various of their meetings. The people invited to the reengineering meeting for example, were carefully selected attendees that were judged to be receptive to the

initiative and so would provide a broad base of support and legitimacy. In a critical meeting the team took considerable time to determine who should be invited:

Max: We need engineers, we have none yet.

Brian: I can get you all kind of engineers.

Terry: Forward thinking people like [us.]

Brian: Forward thinking body guys in Division 1 or Division 2.

Rogers: We need more engineering types from corporate.

Brian: I walked into Hill [*a senior manager in the core team*] and asked about guys "like us" at corporate and he just shook his head. We can try to get Victor Collins. I can give you Division 1 or Division 2. Division 1, Howard Esterbrook, a smart, smart guy. Division 2, Stanley Gould…

Someone: You have got to have Eatmon there. You either have to channel him or kill him. No one knows the system like Eatmon but it comes with his dark side. …

Brian: You know who would jump on this in a moment? Curtis Wald.

Finally, organizational rank was significant suggesting that the authority associated with higher organizational rank alone was responsible for innovation involvement and is therefore an important control. Network size in Model 1 was not significant.

## DISCUSSION AND CONCLUSION

The findings provide strong evidence that a *tertius iungens* orientation, social knowledge, and social network density are independent predictors of innovation involvement within the firm. With the *tertius iungens* and social knowledge measures, structural accounts of innovative action

are incorporated and expanded on to specify the social action associated with those who initiate and implement combinative innovation. My field observations suggest more concretely how *tertius iungens* activity and social knowledge interweave in dense networks as innovation efforts unfold.

In his work on the triad, Simmel (1950: 154) points out two roles for the *tertius*: "While in the cases discussed [the third] behaved as a means to the ends of the group <*tertius iungens*>, he may also, inversely make the interaction that takes place between the parties and between himself and them, a means for his own purposes <*tertius gaudens*>." Structural holes theory develops the particulars of *tertius gaudens* dynamics in a conception of social organization built around competition and stressing a set of dependent variables that are outcomes of those competitions (e.g., promotions and profit). The language of structural holes theory is a language of competition, control, relative advantage, and manipulation. Burt (1992: 33) indicates, for example, the *tertius* may choose to move "accurate, ambiguous, or distorted information" between contacts. While the *tertius* certainly entertains the option of distorting information, according to Simmel (1950: 147), the non-partisan may also organize information to justify reconciliation "not only in the obvious elimination of misunderstandings or in appeals to good will" but by showing "each part the claims and arguments of the other [and] thus lose the tone of subjective passion which usually provokes the same tone on the part of the adversary." While recognizing the important insights that structural holes theory has provided, it is important to recognize alternative social network mechanisms corresponding with critical corporate processes such as innovation that revolve around more explicitly coordinative action. The *tertius gaudens*

and *tertius iungens* orientation, taken together, offer a broader rendering of social network mechanisms and a fuller account of organizational processes and outcomes.

A fundamental premise of structural holes theory is the advantage ego gains from disconnected alters, an advantage that ego forgoes when he or she introduces those alters, the essential element in the *tertius iungens* orientation. Put differently, networks with structural holes confer a control that the *tertius* sacrifices when he or she connects people through casual introduction or as a part of a more thoughtfully orchestrated project. It would be incorrect, however, to suggest that the tertius iungens is itself a self-sacrificing or disinterested strategy because it too creates advantages but of a more indirect type. The *tertius iungens* introduction, while forfeiting control of a *gaudens* approach, is generative in indirect ways. In Figure 3-T1, A has a structural hole between B and C. The introduction of B and C closes the hole (Figure 3-T2) but has a second order generativity of creating structural holes for B and C (Figure 3-T3) that may indirectly benefit A. Such an introduction (Figure 3-T2) may initiate other virtuous cycles. B, having benefited from the introduction to C, may also take the reciprocal step of introducing A to new node D (Figure 3-T4). When ego's alters provide such reciprocal introductions of ego to new people they extend the reach of ego's network thereby generating new structural holes. Additionally, while newly tied B and C are no longer in a position to be leveraged against one another, they are also now in a position to conspire to support ego as well. The *tertius iungens* logic suggests a different form of action reminiscent of the cooperative strategies found in game theory. The introduction of alters constitutes a loss of control and a certain vulnerability to the subsequent collusion of alters along with the potential for longer term generativity and coordination.

Introductions of alters close holes in A's original network but such closure may actually constitute the reaping of network potential that may otherwise go unrealized. The action of the *tertius iungens* is not that of cultivating the preexisting competition of structurally equivalent alters but facilitating, locating, and even forging coordinated action between disparate network members. The commensurability to be accomplished may be ready at hand, in the sense of coordinating predetermined constellations of actors with a shared necessity for collaborating. Alternatively, the actors to be joined, the interests to be shared, the terms of exchange, or even the currency of the pay-off may not be readily apparent. The activity of the *tertius iungens* is most challenging where the nature and prospects for projects are uncertain and relevant actors to engage are not apparent. In these cases identifying actors and the appeals that will resonate with multiple audiences is the subject of considerable skill quite discrete from the structure of the social network itself.

The marginal statistical significance of the social network measure of constraint and the greater significance of the density measure suggests that the choice of a dependent variable bears on the relevance of the social network measure. Where the density measure reflects a level of cohesion necessary for coordinated action, the constraint measure is meant to capture the extent of an individual's dependence on others in his or her network as well as his or her access to novel, non-redundant information (Burt, 1992). Burt (1992: 54) indicates, "Contact *j* constrains your entrepreneurial opportunities to the extent that: (a) you've made a large investment of time and energy to reach *j*, and (b) j is surrounded by few structural holes with which you could negotiate to get a favorable return on investment." Correspondingly, Burt's constraint measure consists of

two components, one concerning the proportion of the total relational strength that ego devotes to a given alter in proportion to the sum of relational strengths of all other of ego's alter ties, and a second component that is a function of triadic closure (Reagans, Zuckerman, & McEvily, 2004). Despite the strong correlation between constraint and density (.473, $p < .01$, two-tailed test), the constraint measure's failure to correlate with innovation involvement and its limited capacity to predict innovation involvement in comparison to density suggests that its blended emphasis on relative dependence and closure does not correspond with the conditions under which innovation occurred at NewCar.[6]

The importance of dense networks to innovation involvement needs further refinement. In this study it may reflect the types of incremental innovations characteristic of the large-scale automotive design process. None of the innovations in this study qualify as radical innovations and many constituted solutions to well-structured problems. The radical ideas that precede radical innovations may result from the novel information available in sparse (non-dense) networks. NewCar's dense networks may mitigate the potential for radical innovation, but facilitate the daunting task of integration and implementation associated with any automotive design process (Gabbay and Zuckerman, 1998). Networks rich in structural holes and the novel information they generate may be more valuable and predictive of innovation in entrepreneurial environments with more rapid design cycles, faster ramp-up, and greater social change. The dense networks found at NewCar may be as strongly predictive of the absence of radical innovation as they are of incremental innovation.

[6] The constraint measure does have a moderate correlation with social knowledge the most significant independent variable in the study. The constraint measure, however, fails to predict innovation with or without the social knowledge measure in the ordered logit.

The significance of two direct effects, density and the *tertius iungens* orientation, taken together, depict a form of innovative action emphasizing coordination among preexisting ties that is quite distinct from the control and leverage upon which the constraint measure is based. If innovation involves the marshalling of support around new ideas, the incremental, shared nature of NewCar innovation suggests more marshalling than newness is necessary for innovation efforts to proceed. The fact that neither social network measure correlates significantly with the *tertius iungens* orientation suggests that social network structure may create a context for selective coordination but does not explicitly determine it. The decoupling of social networks from mechanisms of agency and brokerage suggests a variety of approaches to innovation advocacy.

The strong significance of the social knowledge measure suggests that diverse, "behind the scene" information is important because it provides a basis for enlistment, translation, and coordination. The social knowledge finding also indicates the importance of considering knowledge independently of social networks rather than structural holes as a proxy for knowledge access (Rodan & Galunic, 2004). Consistent with Burt's argument that information benefits accrue to social networks high in structural holes, the constraint measure was negatively correlated with social knowledge (-.182, $p < .05$, two-tailed test). Despite this correlation, social knowledge, independent of the social network, and in the highly technical engineering context of the study, was the strongest predictor of innovation involvement.

The knowledge finding suggests the importance of further specifying the mechanisms by which social and technical knowledge are brought to bear on efforts to innovate. My field observations

reveal that it was not only the possession of knowledge but the ability to articulate, or make social and technical knowledge more explicit and usable, that determined the success of innovation efforts. My field observations suggest that innovators made use of a toolkit of articulation behaviors (e.g., metaphors, analogies, stories, informal sketches, humor, and perspective taking) through which they articulated knowledge in a number of domains (product, process, relational, political, and organizational culture.) Further, a preliminary survey study of respondent's propensity to use analogy and metaphor suggests that such articulation behaviors may be at the root of *tertius iungens* success. Future work needs to develop this articulation process and its connection to knowledge creation (Nonaka and Takeuchi, 1995) and social action.

The *tertius iungens* orientation and social knowledge constitute a set of agency-related factors that complement social structure (e.g., social networks) as predictors of social action. The innovations in this study display a moderate degree of the "maneuverability, inventiveness, and reflective choice" that Emirbayer and Mische (1998: 964) associate with agency and underscore the collective action that underpins successful innovation efforts within the firm. By using both social networks and the social processes that surround them, this study presents a model of action that addresses the need to integrate structure and agency (Emirbayer and Goodwin, 1994; Emirbayer and Mische, 1998).

The *tertius iungens* may be a foundation for what Fligstein (2001:106) calls social skill, or the ability to induce cooperation in others, which he asserts is critical to the "emergence, stability, and transformation of many kinds of local orders." The idea of prosecuting *tertius iungens*

strategies as an element of social skill is supported by the following observation of the G5 program manager:

> How many move networks proactively? Tony Nelson, Jim Williams, Charlie Collins. You're not so naïve as to think that everyone knows about this stuff? Most people spend their entire lives coming to understand functional [responsibilities]. They operate within that and a couple of other relationships. … getting the job done faster. Few recognizing there's some ways to get things done.

Different contexts may dictate the need for dense or sparse networks for innovation but require *tertius iungens* skill as a constant. While examining social action in a more micro context than Fligstein's institutional perspective, this study shares the same microsocial level of analysis from which change or stability emerges. The connection between strategic orientations and social skill, as well as their link to more macro processes such as institutional entrepreneurship (DiMaggio, 1988), remains to be investigated. Further, greater attention to different strategic orientations and network content may provide a better understanding of the micromechanisms of network formation on multiple levels of analysis.

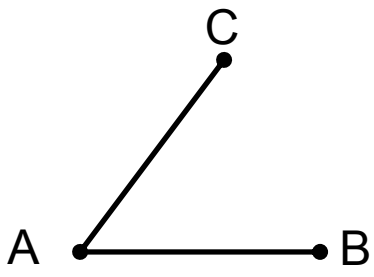
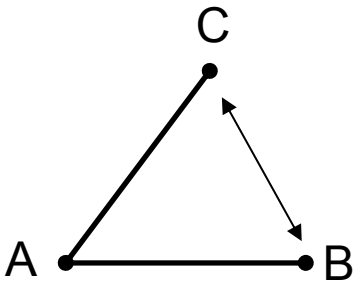
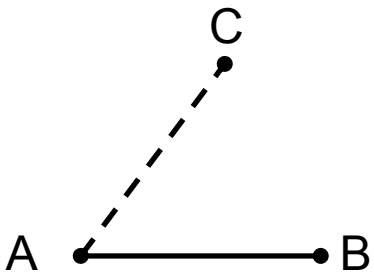
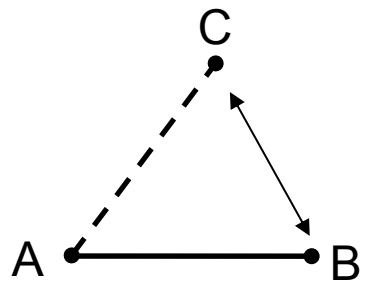
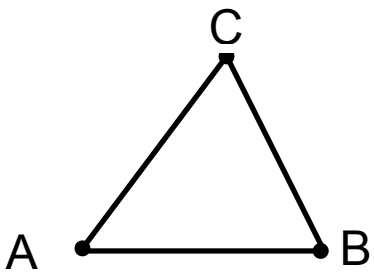
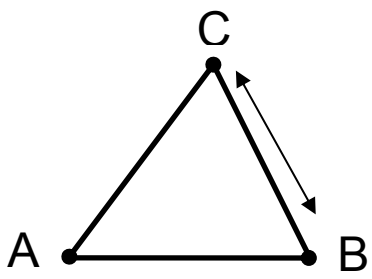
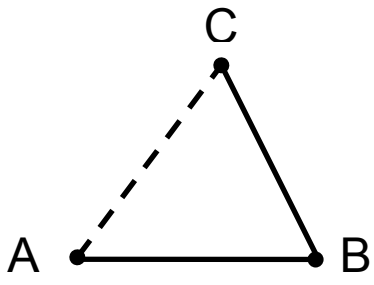
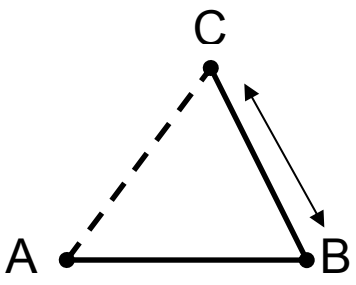
This study has certain limitations necessitating further research. The dependent variable, innovation involvement, only identifies successfully implemented innovations, and thus leaves unanswered whether the dependent variable captures involvement in innovation only or a more generic level of involvement common to a variety of innovation and non-innovation activities. The measure also does not capture the differential impact of innovations or the potential for individuals to be involved in more than one innovation. The study also has limited longitudinal data in the form of ethnographic observations only; the individual level and survey data are only at one point in time. It is assumed, for example, that individual social network and social knowledge preceded innovation involvement and the ethnographic data supports this

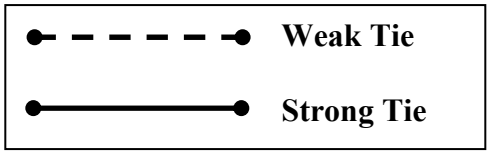
assumption, but there is no way to rule out that these independent variables may have been altered as a consequence of prior innovation-related activity. Third, ego network data gathering presents an opportunity to use a statistical sampling measure across a broad population and systemically capture network ties outside of a given organizational community but it brings with it certain problems. Alter-alter network ties are based on respondents' impressions regarding the relationships between third parties and subject to systematic bias (Krackhardt & Kilduff, 1999). Other social network data collection approaches provide more accurate information. Additionally, the ego network approach here combined all networks into one when other approaches might have allowed for the comparison between different constituent types of networks (e.g., buy-in versus informational networks.) Finally, this study focuses on innovation involvement and in so doing does not capture the effects of the independent variables on other activities associated with job or team performance (Welbourne, Johnson, and Erez, 1998) and therefore does not provide a fuller picture of the role of innovation in the context of these other activities.

This study contributes to social network theory by identifying the *tertius iungens* mechanism as a fundamental pattern of action that accounts for innovation involvement independent of network density. The study also suggests strong link between social network density and innovation in at least some within-firm contexts. As Law and Callon (1988: 284) suggest, "Engineers are not just people who sit in drawing offices and design machines, they are also, willy nilly, social activists…" The *tertius iungens* orientation suggests one form this social activism might take. The model of innovation involvement proffered – social networks, the *tertius iungens*

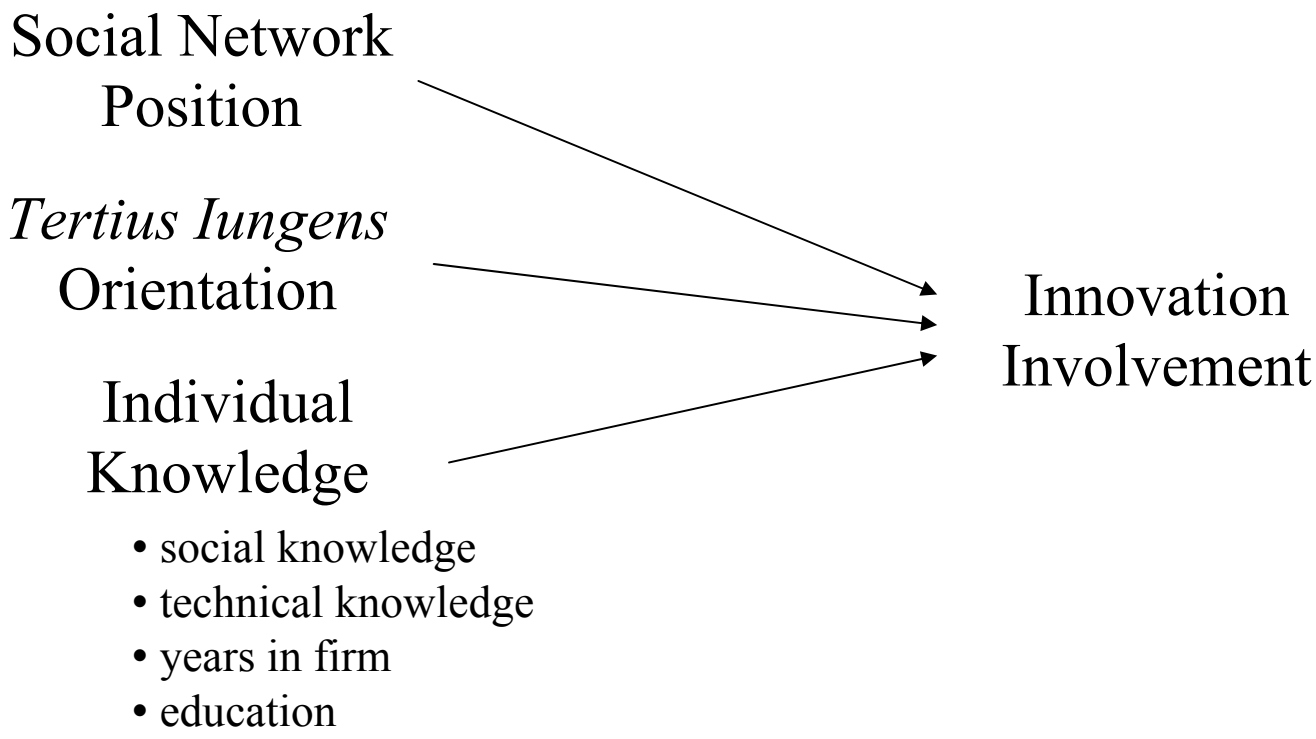
orientation, and the use of social knowledge – is suggestive of the mechanics that lead to organizational and institutional change as well.

# Figure 1: Different *Tertius Iungens* Opportunity Structures

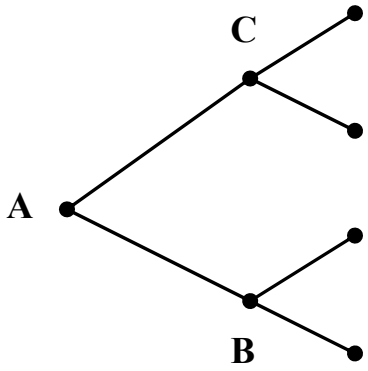
| | Before | Locus of TI Activity |
|---|---|---|
| **TI Opportunity A:** Open Strong-Tie Triad |   |   |
| **TI Opportunity B:** Open Weak-Tie Triad |   |   |
| **TI Opportunity C:** Closed Strong-Tie Triad |   |   |
| **TI Opportunity D:** Closed Weak-Tie Triad |   |   |



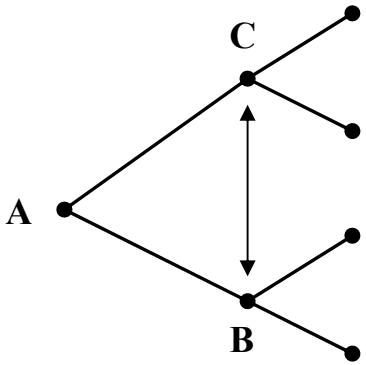
# Figure 2: Innovation Involvement Model



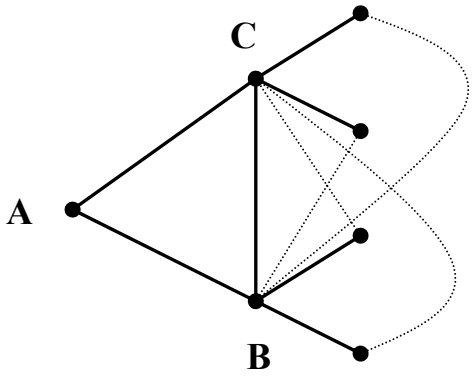
# Figure 3: Tertius Iungens Activity Creates Structural Holes



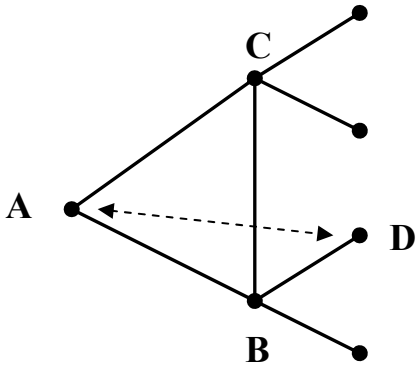

Network at




T2: Network after




T3: New structural holes created




T4: 2nd Reciprocal TI introduction

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**Table 1**

Means, Standard Deviations, and Correlations among Variables

| Variable | Mean | S.D. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Innovation involvement | 3.45 | 1.04 | ---- | | | | | | | | |
| 2. Density | .54 | .20 | .211 | ---- | | | | | | | |
| 3. Constraint | .32 | .10 | .059 | .473 | ---- | | | | | | |
| 4. Number Alters | 13.23 | 3.74 | .023 | -.178 | -.822 | ---- | | | | | |
| 5. *Tertius iungens* Orientation | 4.73 | .93 | .340 | -.029 | -.035 | .032 | ---- | | | | |
| 6. Social Knowledge | 4.36 | 1.27 | .350 | -.131 | -.182 | .197 | .341 | ---- | | | |
| 7. Technical Knowledge | 6.14 | 1.35 | .221 | .119 | -.009 | .075 | .206 | .160 | ---- | | |
| 8. Years in firm | 7.10 | 7.55 | .418 | .191 | .075 | -.014 | .196 | .123 | .145 | ---- | |
| 9. Education | .24 | .43 | .137 | -.061 | -.067 | -.007 | .007 | .019 | .090 | .025 | ---- |
| 10. Organizational Rank | 2.15 | .87 | .360 | .180 | .057 | -.007 | .175 | .025 | .039 | .488 | .117 |

**Table 2**
**Ordered Logit Coefficients Predicting Innovation Involvement**

| | **Model 1** (with Density) (n=152) | **Model 2** (with Constraint) (n=152) |
|---|---|---|
| Social network | | |
| Density | 2.079** (.853) | ---- |
| Number alters | -0.014 (.043) | ---- |
| Constraint | ---- | 2.546† (1.619) |
| *Tertius iungens* orientation | 0.362* (0.184) | 0.356* (0.184) |
| Knowledge | | |
| Social knowledge | 0.551*** (0.142) | 0.521*** (0.140) |
| Technical knowledge | 0.072 (0.122) | 0.092 (0.120) |
| Years in firm | 0.062** (0.026) | 0.065** (0.026) |
| Years in firm (Dummy variable) | 0.904* (0.533) | 0.916* (0.532) |
| Education | 0.756* (0.374) | 0.718* (0.374) |
| Organizational rank | 0.440* (0.215) | 0.502** (0.213) |
| Chi-square | 73.312*** (df=9) | 69.239*** (df=8) |
| Nagelkerke $R^2$ | .408 | .390 |

* p < .05  ** p < .01  *** p < .001  † .10