

Developing and Deploying Effective Customer Solutions:

The Role of Networks Within and Between Buying and Selling Teams

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ABSTRACT

We examine how the nature and pattern of interactions within and between buying and selling teams affect the development and deployment of effective customer solutions. We formulate and test several novel hypotheses, combining insights from the literature on selling and buying teams, the emerging view on customer solutions, and social network theory. The results of our conjoint study using 281 purchasing professionals indicate that developing and deploying effective customer solutions is associated with a pattern of matching ties between firms where only counterparts with similar domains of expertise are connected to each other. However, having more-than-matching ties is beneficial when interaction within the selling team is infrequent. In short, the structure of the ties between buying and selling teams not only has a direct effect on solution effectiveness but also can compensate for the adverse effects of infrequent interaction. Additional moderator analysis indicates that both knowledge transfer and governance support considerations affect the importance of the nature and pattern of interactions in developing and deploying solutions. The results are consistent across several robustness checks.

Keywords: Business-to-business marketing, social networks, industrial buying behavior, customer solutions

INTRODUCTION

Business-to-business marketing increasingly involves developing and delivering customer solutions. This requires capturing customer requirements, customizing and integrating components, deploying the offering, and providing after-sales support to ensure that the offering delivers on the customer's business needs (Tuli, Kohli, and Bharadwaj 2007). These relational processes require a large number of people to interact with each other. On the customer side, this typically involves a decision making unit consisting of members of several departments (e.g., Johnston and Bonoma 1981; McQuiston 1989). Similarly on the supplier side, there is a problem solving unit or account team consisting of members of multiple functional departments (e.g., Cespedes, Doyle, and Freedman 1989; Hutt, Johnston, and Ronchetto 1985).

Marketers and purchasing managers recognize that managing these relational processes and structuring their team interactions is of critical importance, but get limited guidance on how to do so from current research (Homburg, Workman, and Jensen 2002; Palmatier 2008; Wuyts et al. 2004). Some suppliers, for instance, try to have the composition of their account teams mirror that of the clients' teams, such that level of decision-making authority, expertise, and background on the buying side are matched on the selling side (e.g., Capon 2001; Cunningham and Homse 1986; Palmatier 2008). However, it is not clear whether this arrangement is ideal given that the effectiveness of such matching arrangements has not been documented, and possible contingencies have been ignored.

In this study, we draw on social network theory to better understand how the nature and pattern of interactions within and between buying and selling teams affect the effectiveness of complex customer solutions. While the marketing literature abounds with conjectures that social network structure affects account team effectiveness (e.g., Hutt and Walker 2006; Jones et al.

2005; Moon and Gupta 1997; Üstüner and Godes 2006), the empirical evidence to date is quite sparse and mostly anecdotal (for exceptions see Dekker 2001; Palmatier 2008). Using a conjoint study of purchasing professionals in which the nature and pattern of ties within and between teams are manipulated based on network-theoretical considerations, we provide empirical evidence on this important issue. The distinctive feature and contribution of our study is that it explicitly assesses the impact of the structure of the ties between buying and selling teams, a key issue in marketing practice scarcely studied to date.

We introduce the notion of matching ties—which we define as a pattern of buyer and supplier firm interactions involving only ties between counterparts with similar domains of expertise in the two firms. We find that matching ties are associated with effective customer solutions, especially when the frequency of interaction within the selling team is high. This is consistent with hypotheses newly derived from social network theory and is of clear practical importance.

Our findings also suggest that stronger ties, both within and between teams, are associated with the development and delivery of effective customer solutions. This consistent with both theory (Granovetter 1982) and prior empirical research investigating the benefits of strong vs. weak ties in situations requiring complex knowledge transfer (Darr 2006; Hansen 1999; Wuyts et al. 2004). Of particular note, however, is our finding that network structure, in the form of more-than-matching ties between a buying and a selling team, can be used to compensate—be it only in part—for the drawback of weak ties within the selling team.

In addition, we find that both knowledge transfer considerations and inter-firm atmosphere considerations such as trust and conflict tend to impact the effectiveness of particular network patterns. Notably, knowledge transfer issues dominate at the deployment stage whereas

inter-firm atmosphere or governance issues tend to matter more at the development stage. These moderator results provide additional process insights and corroborate in a single empirical setting that strong ties have benefits for both knowledge transfer and governance (Van den Bulte and Wuyts 2007).

In short, our study puts forward new theoretical predictions and reports novel findings on how social networks within and between buying and selling teams influence the development and delivery of effective customer solutions. By doing so, it advances the literatures on social network issues in business marketing (e.g., Palmatier 2008; Wuyts et al. 2004) and on customer solutions (Galbraith 2002; Tuli, Kohli, and Bharadwaj 2007). It also brings a new perspective on the developing literature on team selling (Homburg, Workman, and Jensen 2002; Jones et al. 2005), and answers the call to investigate how specific sales processes and structures can affect the quality of inter-firm relationships and the outcomes they generate (Palmatier 2008). Our findings are of interest not only to academics but also to marketing and sales managers in business-to-business settings and to purchasing managers in charge of sourcing complex solutions.

We proceed as follows. First, we briefly discuss the key concepts in our theoretical framework, after which we present our hypotheses. Next, we describe the research design and methods. We then present our results, including several robustness checks and additional moderator analyses providing further insights into the processes at work. We conclude with discussing implications for theory, research, and practice.

FRAMEWORK AND KEY CONCEPTS

We seek to better understand how the nature and pattern of interactions within and between selling and buying teams affect how well complex customer solutions meet customer needs. Given the complex nature of the task, we expect frequent interaction within both the buying and selling teams as well as between the two teams to lead to more effective solutions. Of greater interest is that we also develop and test conjectures about the importance of the structure of the social ties. To this end, we introduce the concept of matching ties. A network with matching ties is a network where counterparts with similar domains of expertise in the two firms are connected to each other. Our key proposition is that matching ties between experts with similar areas of expertise are both more effective and efficient than non-matching ties for transferring knowledge and therefore tend to lead to more effective solutions, but that purchasing managers can use non-matching ties to improve the solution when interactions within the selling team or between the selling team and the buying team are infrequent. In other words, we develop and test the idea that network structure is used to compensate for the limitations associated with weak ties, a fundamental theme in social network theory and organization theory (e.g., Coleman 1990; Gargiulo 1993; Reagans and McEvily 2003) which has been all but ignored in marketing so far (Van den Bulte and Wuyts 2007). In developing these ideas, we take into account both knowledge transfer considerations and inter-firm relational considerations such as trust and conflict.

Solution Effectiveness

Our dependent variable, solution effectiveness, is the extent to which a solution meets a customer's requirements (Tuli, Kohli, and Bharadwaj 2007). Consistent with suggestions by Szulanski (2000) and Wuyts et al. (2004), we distinguish between two stages of the solution

process: development and deployment. Developing effective solutions typically requires that buying and selling firms work together to first define customer requirements and then design an integrated solution to meet customer requirements. Effectively deploying the designed solution typically involves installation and systems integration as well as employee training to maximize the customer's utilization of the solution. Being effective at both phases of the solution process is necessary to deliver value from the customer's point of view (Tuli, Kohli, and Bharadwaj 2007; Üstüner 2005).

Tie Intensity as Interaction Frequency

A central tenet of social network theory is that both the structure and the strength of ties affect the behavior and outcomes of network members. Network researchers distinguish between two key dimensions of tie strength: tie intensity, which corresponds in most applications to frequency of interaction, and tie valence, which corresponds to the amount of benevolence or cooperation (Frenzen and Nakamoto 1993; Marsden and Campbell 1984; Van den Bulte and Wuyts 2007; Wellman and Wortley 1990; Wuyts et al. 2004).

Our investigation focuses on tie intensity (i.e., interaction frequency) only. This keeps the factors manipulated in the research design to a manageable number, while at the same time keeping our study consistent with prior research documenting the importance of tie intensity in both social network theory and sales management (Cespedes, Doyle, and Freedman 1989; Spekman and Johnston 1986; Üstüner 2005; Uzzi and Lancaster 2003).

We carefully take this focus on intensity rather than valence into account when developing our theoretical arguments. Specifically, we account for the possibility that valence and governance concerns may lead business customers to want to keep track of the project's progress. As Wuyts et al. (2004) note, both tie intensity and network structure can be used for

such tracking. So, we take into account that intense ties can provide coordination benefits over and above knowledge transfer benefits. Focusing on tie intensity safeguards the main substantive insights, given prior work documenting the highly similar effects of tie intensity and tie valence on preferences for governance structures (Wuyts et al. 2004). Another safeguard is that we experimentally manipulate rather than measure tie intensity, so that its effects are free of omitted variable bias.

Matching Ties

A central notion in team selling and account management is the need to have a team with a constellation of various kinds of expertise and knowledge that have to be combined to develop and deploy a customer solution (e.g., Capon 2001; Cunningham and Homse 1986; Jones et al. 2005). At the same time, some member of the selling team (e.g., a key account manager) has to ensure the coordination within the team and between the team and the customer. Similar structural arrangements exist in the buying team. An important idea in the literature on buyer-seller interaction is that having experts from one side of the buyer-seller dyad interact intensely with their counterparts on the other side of the dyad leads to better knowledge sharing and facilitates keeping track of the current status of the project (Cunningham and Homse 1986; Håkansson and Östberg 1975; Håkansson et al. 1979; Hutt, Johnston, and Ronchetto 1985). These knowledge transfer, coordination, and monitoring benefits, in turn, should result in better customer solutions.

To investigate this notion in network terms, we introduce the concept of matching ties. A network with matching ties is a network where counterparts with similar domain of expertise in the two firms are connected to each other. For example, a tie between an information technology (IT) specialist from the selling team and the IT manager from the buying team would be a

matching tie. So would a tie between the account manager from the selling team and the purchasing manager from the buying team, since both have rather similar context-specific knowledge of coordinating the process on their side of the buyer-seller dyad (e.g., Leenders and Blenkhorn 1988). Note, a network with matching ties is not totally homophilous. Rather, it is a network where members from different organizations but similar expertise are connected. As such, matching ties require heterogeneity in one actor attribute (firm membership) but homogeneity in another (domain expertise), and so relate to cross-cutting social circles (Blau 1977; Simmel 1955) rather than pure homophily. Also, people connected through matching ties are similar in their domain expertise but not in motivation (organizational and personal objectives).

We introduce the concept of matching ties to capture a key feature of team selling and customer solution marketing. While its introduction is motivated by a substantive marketing phenomenon, the concept is also of theoretical interest, as it relates to knowledge transfer and coordination ability within network structures. In the next section where we develop specific hypotheses, we argue that ties are not costless and, therefore, limiting the between-team network to matching ties is likely to be efficient. Yet in situations where other means to coordinate and mobilize the network are absent, going beyond matching ties may be beneficial to the development and deployment of customer solutions.

HYPOTHESES

Before turning to hypotheses about the importance of network structure, and matching ties in particular, we present a set of baseline hypotheses about the benefits of frequent interaction both within and between buying and selling teams.

Tie Intensity

Customers perceive knowledge transfer and coordination among selling team members of solution provider firms as problematic (Tuli, Kohli, and Bharadwaj 2007). Frequent communication among team members can help address this problem. Not only does it increase the number of opportunities for knowledge transfer and coordination (Darr 2006; Hansen 1999; Maltz and Kohli 1996; Reagans and McEvily 2003), but it also increases the odds that these opportunities are used effectively by fostering a better understanding of the different “thought worlds” of team members from different functional areas and backgrounds (Dougherty 1992).

More effective knowledge transfer and coordination, in turn, should make the solution more valuable to the customer. This is suggested not only by research on innovation (e.g., Troy, Hirunyawipada, and Paswan 2008), but also by some studies on team selling. Üstüner (2005, p. 121), for instance, reports that “salespeople who communicated with their engineer-contacts more frequently were more effective in solution creation” and (Cespedes, Doyle, and Freedman 1989, p. 45) similarly report that “salespeople repeatedly cited more communication as the one thing that could most improve teamwork on shared accounts.” Hence:

H_{1a}: There is a positive relationship between tie intensity within the selling team and solution effectiveness.

Suppliers face a significant challenge in defining customer requirements, as customers themselves have difficulty with fully articulating the breadth of their business needs that evolve over time (Dhar, Menon, and Maach 2004). Suppliers can try to tackle this challenge by building

and mobilizing extensive communication lines with the buyer organization. Frequent interaction with customers has been found to enhance exploration of novel alternatives (Uzzi and Lancaster 2003), enable innovation (Tsai and Ghoshal 1998) and increase understanding of formal and informal roles of network members (Spekman and Johnston 1986). This latter point is particularly pertinent given that effective solutions involve understanding the personnel capabilities and the political and operational landscapes of each firm (Tuli, Kohli, and Bharadwaj 2007). Hence, we posit:

H_{1b}: There is a positive relationship between tie intensity between buying and selling teams and solution effectiveness.

Because developing and deploying an effective customer solution requires mobilizing and combining knowledge on both sides of the buyer-seller dyad, we expect frequent communication within the selling team and between the selling and buying teams to mutually reinforce each other's effect. Specifically, intense between-team ties should foster discussions within the selling team that are much more informed by customer preferences and procedures. Similarly, members of the selling team should be able to have more informed and productive interactions with the customer if they are keenly aware of their own colleagues' thinking and progress. Furthermore, customers may also use sequences of strong ties to indirectly monitor and influence supplier employees they do not directly interact with (Wuyts et al. 2004). For instance, the IT manager in the customer company may leverage his own strong tie to an IT expert in the supplier company who himself interacts frequently with other team members. In this way, the IT manager may indirectly keep track of the progress of the entire account team and intervene, either indirectly or directly, when he believes it may be necessary for the project's success.

H_{1c}: The positive relationship between intense ties within the selling team and solution effectiveness is stronger when the between-team ties are intense.

Matching Ties between Buying and Selling Teams

Team leaders on both sides of the buyer-selling dyad are expected to coordinate the efforts, especially in situations requiring complex problem framing and extensive problem solving. While matching ties are essential to the notion of team selling, the need for coordination may compel the two team leaders, say the account manager and the purchasing manager, to go beyond matching ties and interact with people other than their own colleagues or their direct counterpart in the other firm. The benefits of adding such non-matching ties are not quite clear, however.

On the one hand, both network theory and empirical evidence suggest that having team leaders connected to many people in both the buying and selling firms provides greater opportunities for integration and monitoring (cf. Van den Bulte and Wuyts 2007). By acting as a bridge between parties in different companies with different areas of expertise, a team leader might discover and exploit opportunities to share and integrate information with experts. Improving the quality of the solution by bringing parties together, in essence, is the reverse of the *tertius gaudens* benefit of brokers spanning a structural hole, emphasized by Burt (1992). Instead of exploiting such unrecognized opportunities for his own gain, the team leader acts as a “linking third” or *tertius iungens* and brings to the two parties together to the benefit of the project (Fleming, Mingo, and Chen 2007; Obstfeld 2005). By interacting directly with members of the other firm’s team, rather than relying solely on his counterpart leader as a conduit of information, a team leader may also be better able to keep track of the other team’s work (e.g., Darr 2006). This benefit of direct contact with multiple parties includes the standard network closure mechanism (Coleman 1990) ensuring that one team leader is not at the mercy of the other team

leader's diligence and honesty when it comes to having a clear picture of how the project is progressing.

On the other hand of those knowledge integration and coordination benefits stands the fact that maintaining a large portfolio of contacts is demanding (Rowley, Behrens, and Krackhardt 2000). Interacting frequently with many people not only within their company but also in the other company's team may be overly burdensome. Instead, a team leader may find it more efficient to monitor indirectly through sequences of strong ties, as mentioned above, or to monitor directly through weak rather than strong ties (Wuyts et al. 2004). Similarly when it comes to mobilizing experts in the other company, it may be more efficient to work indirectly through one's own experts, especially if they have a strong tie with their counterparts, in effect applying the two-step leverage mechanism studied by Gargiulo (1993).

There is a second reason why going beyond matching ties might not help and may even hurt solution effectiveness. When knowledge complexity is high, having a non-expert team leader interact with experts may result not in effective knowledge transfer but in confusion and misinterpretation. When a team leader is not able to understand what experts on the other team are doing or saying, indirect monitoring through one's own team's experts may be the only option. Having a team leader interact frequently with experts on the other team may also negatively affect the quality of the customer solution if the leader's direct involvement with the other company's experts reduces the latter's ability or willingness to have focused discussions with matching experts at the leader's company.

Taken together, the various arguments imply that non-matching cross-firm ties are not the team leaders' first choice and are turned to only when necessary, e.g., for trouble-shooting. Hence, as an overall main effect we expect:

H₂: A pattern of between-firm interaction limited to matching ties is associated with high solution effectiveness.

However, the arguments we just presented also imply that team leaders may use non-matching ties to protect customer solutions against ineffective knowledge transfer within and between teams or against opportunistic brokerage by other members of the buying or selling teams. Such transfer and governance problems are more likely to occur when the communication within the selling team or between the two teams is infrequent. Hence, non-matching ties, though associated with less effective solutions in general, may actually aid rather than harm solution effectiveness in situations of low tie intensity.

H_{3a}: A pattern of between-firm interaction limited to matching ties is associated with high solution effectiveness especially when the within-selling team interaction frequency is high rather than low.

H_{3b}: A pattern of between-firm interaction limited to matching ties is associated with high solution effectiveness especially when the between-team interaction frequency is high rather than low.

METHOD

Research Design

We use a ratings-based conjoint experiment with purchasing professionals to test our hypotheses. Such a design has several benefits, as noted by Wathne, Biong, and Heide (2001) and Wuyts et al. (2004). It enables one to draw conclusions on causal effects; it can provide multiple measurements per respondent, which increases statistical power and enables one to control for unobserved heterogeneity; it is less subject to *post hoc* rationalizations than a retrospective study asking respondents to evaluate their actual relationships and customer solutions; and high internal validity need not come at the detriment of contextual realism.

The two dependent variables in our study are the effectiveness of the customer solution development and that of the customer solution deployment. We manipulate three independent variables (attributes), each at two levels: (1) tie intensity within the selling team (frequent vs. infrequent communication), (2) tie intensity between the selling and buying teams (frequent vs. infrequent communication) and (3) matching ties (matching ties vs. more-than-matching ties). These manipulations result in a 2^3 (network profiles) x 2 (phases) full factorial design in which no main effects, two-way interactions or three-way interactions are aliased (confounded) with any other main effects, two-way interactions or three-way interactions (Box and Draper 1987) .

We first had participants rate 8 profiles for solution development, and then 8 profiles for solution deployment, with the order of specific profiles within each series of 8 randomized to avoid order artifacts. Pretests indicated that eliciting a response to these 8 profiles each presented twice was not overly time-consuming or burdensome to the study participants. Since particular combinations of the relevant network attributes are difficult to convey succinctly in words, we conveyed the information in both textual and pictorial format. Figure 1 shows the network pictures used and Table 1 presents the instructions given to participants on how to interpret the network pictures. Table 2 presents the wording used for rating the effectiveness of the solution and for describing in words the situation depicted in each of the eight graphs (scenarios) in Figure 1. The picture-based design was crafted to eliminate confounds from demographic traits of network members such as age, gender, or race.

[Figure 1, and Tables 1 and 2 about here]

Scenario

The scenario is that of a purchasing manager working with his/her own team members as well as selling team members in the acquisition of a complex IT solution. Participants were

instructed to see themselves in the role of purchasing manager for their firm who is involved in purchasing an integrated computer network solution consisting of hardware (e.g., server, workstations, routers, switches, access points) and software (e.g., network operating system, network security software, application software). The cover story further noted that “This purchasing task requires that you include your functional and technical specialists in the solution process. It also requires that your buying team works with members of the selling team to develop and implement an effective systems solution on time.” This scenario is similar to that used by Wuyts et al. (2004) and is consistent with exemplars of complex customer solutions described by Tuli, Kohli, and Bharadwaj (2007).

We make three assumptions about the network (see Figure 1). First, we assume that all within-team members are at least weakly tied to one another. It is likely that team members from the same team will communicate with each other at least infrequently during the project rather than remain total strangers. Second, we assume that all tie strengths *within* each team are the same and that all tie strengths *between* the buying and the selling team are the same. This avoids an inordinate number of combinations of weak and strong ties within and between the teams making the experiment intractable. Third, we explicitly assume high interaction frequency (tie intensity) within the buying team, again to prevent the experiment from becoming too time-consuming and cumbersome for the respondents.

Pretesting

The instrument underwent two rounds of pre-testing. It was first reviewed by six PhD candidates across management disciplines, eighteen MBA students, and three professors. Their extensive feedback led to a revised version which was pretested among six individuals with significant purchasing experience with complex IT solutions, who also provided valuable feedback. The two

pretests led to significant changes in the opening scenario, the text-based description of network attributes, the picture-based illustration of network attributes, and the wording of the ratings question. Pretest participants indicated that the pictures were very helpful to understanding the scenarios.

Data Collection

Approximately 4,580 members of seven different chapters of the National Association of Purchasing Managers were contacted on our behalf by their local chapter head. The request to participate was sent by email which included a link to a website featuring the conjoint task. This email included an endorsement of the head of the local chapter as well as a pledge to donate \$25 to one of three charities of the respondent's choice for his or her participation in the study (Habitat for Humanity, Save the Children, American Cancer Society). A reminder email was sent approximately one week after the initial email. We received 281 completed surveys, for a 6% response rate. Chapter heads indicated that only about 20% of emails they send to their members are actually received and opened, largely due to corporate firewalls installed by the addressees' employers. Assuming this 20% delivery rate, the number of members effectively contacted was 916 and the effective response rate 31%. We use statistical robustness checks to document that our conjoint parameter estimates and substantive conclusions are robust to variations in response time, indicating the absence of non-response bias.

We measured how familiar the study participants were with purchasing integrated systems solutions (Table 3). Following Kumar, Stern, and Anderson (1993), we asked participants to report, on a scale from 1 (strongly disagree) to 10 (strongly agree), the extent to which they were familiar, knowledgeable, and had been involved with purchasing integrated systems solutions (IT or other), and combined the three items into a single scale ($\alpha = .95$). The

mean was 5.64, a rather high value given the category-specific nature of the question. In addition, we asked participants to report their years of work experience (in general, not only in purchasing). The average was almost 22 years. So, study participants have typically over two decades of work experience, and are fairly familiar with purchasing integrated systems solutions. We use statistical robustness checks to document that our conjoint parameter estimates and substantive conclusions are robust to variations in experience and familiarity.

[Table 3 about here]

Additional Covariates

Our theoretical arguments and specific hypotheses are based on assumptions about how tie intensity and network structure facilitate the transfer of knowledge. Hence, if our theoretical arguments are correct, the effects we predict should be more pronounced to the extent that customers recognize the need for knowledge transfer. To conduct such a “process validation,” we measured to what extent study participants agreed that large amounts of complex information need to be shared among members of buying and selling teams. We did so using a 10-point, two-item scale, for each stage separately (Table 3). On average, participants strongly agreed with the need for knowledge transfer, both during the development stage (7.63) and the deployment stage (7.11).

Our hypotheses are also based on assumptions about how tie intensity and network structure may facilitate keeping track of the status and smooth flow of the project. Hence, if our theoretical arguments are correct, the predicted effects should be more pronounced to the extent that customers recognize that intensive ties may improve the work atmosphere both within and between teams. To gain insight into this process, we measured to what extent study participants agreed that frequent communication is important in order to increase commitment, empathy,

cohesiveness, and trust and to reduce conflict and the shirking of responsibilities—all factors that might affect the need a buyer feels to keep close tabs on the project’s progress. We did so by requesting the respondent to check off any of six binary items (Table 3).¹ On average, participants agreed with this governance-supporting role of frequent communication, checking off an average of three items in both the development and the deployment stage. Note, our measure applies to ties in general, both within and across teams (Table 3). Table 4 reports the descriptive statistics for the measured covariates.

[Table 4 about here]

In our statistical analyses, we also include a third-order interaction term to check whether the presence of more-than-matching ties affects how frequent communication both within and between teams enhances solution effectiveness. This prevents the conclusions on the hypothesized second-order interactions to be biased by omitting a non-hypothesized higher-order interaction from the model.

Statistical Model

We use a mixed-effects linear model allowing for random effects in both the intercept and slopes. To ensure that the parameter estimates obtained from a model fit on both development and deployment stages simultaneously are average values but also correspond exactly to the parameter estimates obtained from fitting a model to each stage separately, we specify the model such that the parameters of the explanatory variables pertain to the average whereas the random effects pertain to each stage separately. To ensure this, and to also ensure that the model likelihoods of the separate models add up to that of the joint model, we specify the model as follows.

¹ Note, the governance supporting role of tie intensity is not the same as relationship atmosphere (Håkansson 1982) or quality, but pertains to the extent to which tie intensity is critical in fostering such an atmosphere.

Let subscript i denote a respondent, s denote a project stage ($s: 1,2$), and j denote a rating task or profile within a stage ($j: 1, \dots, 8$). Also, let x_k denote the k -th regressor describing a network structure with x_1 being the intercept ($k: 1, \dots, K$, where $K = 2^3 = 8$), and let $D1_s$ and $D2_s$ indicate whether the rating is for stage 1 ($D1_s = 1, D2_s = 0$) or stage 2 ($D1_s = 0, D2_s = 1$). The model structure we use to explain preference scores y_{sij} is:

$$(1) \quad y_{sij} = \sum_k \beta_k x_{kij} + \sum_k \gamma_k (D2_s - D1_s)x_{kij} + \sum_s \sum_k (U_{1ki} * D1_s + U_{2ki} * D2_s)x_{kij} + \varepsilon_{sij},$$

where

$$\varepsilon_{sij} \text{ i.i.d. } N(0, \sigma_s^2),$$

$$U_{ski} \text{ i.i.d. } N(0, \tau_{sk}^2).$$

In this model, the β coefficients correspond to averages across stages, the γ coefficients correspond to contrasts between stages, and the U_{ski} terms are individual-specific random effects. Note, $(D2_s - D1_s)$ is -1 for development and +1 for deployment, and so acts as an effects-coded variable.

Having only eight observations per respondent per stage, we impose a variance components structure where the random effects are independent from each other. In a subsequent analysis we check that our substantive conclusions are robust to a more flexible random effects specification. As Wuyts et al. (2004) note, random effects not only capture heterogeneity in preferences and the resulting dependence in errors, but also allow for conditional heteroscedasticity and control for possible differences in how respondents interpret the conjoint attribute levels. We estimated the models using both standard maximum likelihood and residual maximum likelihood. Both methods produced extremely similar results and identical substantive conclusions. We report only standard maximum likelihood results. Since we use (-1,+1) effects coding for the three manipulated factors as well as development vs. deployment, all effects can be interpreted as average effects even in the presence of significant higher-order interactions.

RESULTS

Hypothesis Tests

Table 5 presents the results from the main analysis based on 281 respondents rating 4495 profiles (one respondent rated only 7 of the 8 development profiles). As indicated by the pseudo- R^2 , computed as the square of the Pearson correlation between actual and predicted ratings, the model fits quite well. We first focus on the average effects across the two stages. The presence of intense interaction, both within the selling team and the between the selling and buying teams, is associated with more effective customer solutions. Also, these two effects mutually reinforce each other, as indicated by the positive interaction effect. So, Hypotheses 1a through 1c on tie intensity are supported. The presence of more-than-matching ties is associated with less rather than more effective customer solutions, as predicted by Hypothesis 2. Going beyond matching ties is particularly harmful when the members of the selling team are already interacting intensely among themselves, as predicted by Hypothesis 3a. Whether there is frequent interaction between the selling and buying teams, however, does not moderate the effect of more-than-matching ties. So, Hypothesis 3b is not supported.

With two minor exceptions, the effects are quite robust across the development and the deployment stages. The first exception is that intense interaction within the selling team is slightly less important in the deployment stage. The moderating effect is quite small compared to the main effect (-.052 vs. 0.520). The other exception is that the third-order interaction between intense communication within the selling team, intense interaction between the two teams, and the presence of more-than-matching ties is slightly more detrimental in the deployment stage than the development stage.

Table 6 shows the results of the model estimated separately by stage, and also reports the random effect variances (which are identical to those in the main model reported in Table 5). Note that the average coefficients in Table 5 are indeed the average of those in Table 6, that the latter differ across stages by twice the contrast reported in Table 5 (they do so because of the (-1,+1) coding in Table 5 rather than a (0,1) or (-1/2,+1/2) coding), and that the two likelihood values for each stage in Table 6 add up to the likelihood value for the model across stages in Table 5. The model fits slightly better in the second stage than in the first stage, but the fit is quite good in both. The results in Table 6 show that the hypothesis test results from the main analysis across stages also apply within each stage separately, except that the main effect of more-than-matching ties loses significance in the development stage while remaining directionally correct. The latter is due to a loss of statistical power rather than genuinely different effect sizes across stages (the contrast in Table 5 is not significant).

[Tables 5 and 6 about here]

Robustness Checks

We performed several checks to ascertain that our results are robust. First, we extended the model by having all 16 coefficients in Table 5 vary as a function of familiarity with integrated systems solutions (mean-centered). Adding these 16 interaction terms improved the -2LL or deviance by only 12.3 ($p > 0.10$) and did not have any effect on the pseudo- R^2 . More importantly, none of the β coefficients of substantive and theoretical interest were moderated. Next, we performed a similar robustness check for years of work experience (mean-centered). Adding those 16 interaction terms to the model estimated for the 279 participants who reported their years of work experience improved the -2LL by 21.6 ($p > 0.10$) and increased the pseudo-

R^2 by only a minute amount (from 88.8% to 88.9%).² The moderating effect was concentrated on the intercept: more experienced respondents tended to give significantly higher ratings in general. Again, none of the β coefficients of interest were moderated. We also re-estimated the main model in Table 5 by using respondent familiarity and experience as regression weights rather than as moderators. Weighting by familiarity somewhat increased the pseudo- R^2 from 89.0% to 91.2%, while weighting by work experience increased it from 88.8% only to 89.2%. More importantly, the values of the β coefficients of substantive and theoretical interest were hardly affected, and all hypotheses tests from the original analysis without weighting were corroborated.

Next, we tested for the possibility of non-response bias in our hypotheses tests by allowing all 16 coefficients in Table 5 to vary as a function of response time (mean-centered). Adding the 16 interaction terms improved the -2LL or deviance by only 11.8 ($p > 0.10$) and did not have any effect on the pseudo- R^2 . More importantly, none of the β coefficients of substantive and theoretical interest were moderated. As an additional check for non-response bias, we regressed each of the measured covariates in Table 6 on response time. None varied significantly with response time ($p > .10$).

Finally, we also tested an alternative error correlation structure. Specifically, we allowed the error term ε_{sij} and the random effects pertaining to the same regressor to be correlated across the development and deployments stages (including the intercept but excluding the third-order interaction as the latter covariance was not identified). This relaxation in error structure led to a marked improvement in model deviance (Δ -2LL = 591.7, $p < .001$) but a slightly lower pseudo- R^2 (88.4% instead of 89.0%), and produced identical β coefficient estimates as those reported in

² Since two participants did not report their years of experience, we re-estimated the main model on the remaining 279 respondents in order to make proper likelihood ratio tests and pseudo- R^2 comparisons.

Table 5. The standard errors of the β coefficients somewhat increased while those of the γ coefficients somewhat decreased. The only notable consequence was that the contrast effects in the intercept, the between-team tie intensity, and the third-order interaction became significant at 1%. The significance levels of the β coefficients of substantive and theoretical interest, just like their sizes, did not change from those reported in Table 5.

Additional Insights from Measured Covariates

Need for knowledge transfer. To gain a better understanding of the processes at work, we conduct two moderator analyses using measured covariates. First, we take the measures of need for knowledge transfer during each stage, and mean-center them to create two Need for Knowledge Transfer (NKT) variables (one for each stage). We then assess the extent to which the stage-specific effects in Table 6 are moderated by these stage-specific NKT variables. The results are shown in Table 7. Note, since each NKT variable is mean-centered, the effects of the variables of theoretical interest they interact with can still be interpreted as average effects.

In the development stage, NKT increases the value of frequent interaction within the selling team, of frequent interaction between the two teams, and of their joint presence. Importantly for our theoretical arguments, NKT boosts the value of more-than-matching ties. Hence, having teams engage in such ties increases solution effectiveness more when knowledge transfer is more important. While adding the 8 interaction terms improves the model significantly ($\Delta-2LL = 26.7, p < .001$), the moderation effects are not very large and, collectively, do not improve the BIC ($\Delta BIC = -18.4 < 0$).

When we turn to the deployment stage, we see that NKT has a decidedly larger role. Adding the 8 interaction terms not only improves the model likelihood to a larger extent ($\Delta-2LL = 53.9, p < .001$), but it also improves the model fit in terms of the more stringent Bayesian

information criterion ($\Delta\text{BIC} = 8.8$). There is an interesting contrast between the two stages. In the *deployment* stage, NKT has its largest effect on the value of ties *between* the two teams (tie intensity between the selling and buying team, more-than-matching tie structure, and their interaction terms), but in the *development* stage NKT has its largest and most significant effect on the value of interaction *within* the selling team. This pattern adds credence to our theoretical arguments, since deployment requires relatively more contact with customers employees (and also takes place mostly at the customer's site), whereas development relies comparatively more on engineering expertise internal to the supplier organization.

Governance support. We now turn to the importance of tie intensity for fostering a supportive atmosphere between the two companies. To this end, we take the measures of the governance supporting role of tie intensity during each stage, and mean-center them to create two Governance Support (GS) variables. For each stage, we then assess to what extent the stage-specific effects in Table 6 are moderated by these stage-specific GS variables. The results are shown in Table 8. As with the NKT variables, the effects of the variables of theoretical interest that interact with GS can still be interpreted as average effects.

In the development stage, GS increases the value of intense ties *within* the selling team but has even larger effect on the value of intense ties *between* the two teams (tie intensity between the selling and buying team, more-than-matching tie structure, and their interaction terms). GS also boosts the value of more-than-matching ties. Hence, having such ties increases solution effectiveness more when intense communication is important to support a positive relational environment between the two companies. Adding the 8 interaction terms improves the model fit significantly both in terms of deviance and BIC ($\Delta-2\text{LL} = 49.2$, $p < .001$; $\Delta\text{BIC} = 4.1$).

When we turn to the deployment stage, we see that GS is relevant here as well, though to a lesser extent. Adding the 8 interaction terms improves the model likelihood to a sizable extent ($\Delta-2LL = 30.6$, $p < .001$), but not the more stringent BIC ($\Delta BIC = -14.5$). During deployment, GS has its most significant effect on how intense communication between the two teams moderates (i) the value of communication within the selling team and (ii) the value of more-than-matching ties.

The pattern of results in Tables 7 and 8 indicate that intense ties are important not only for facilitating knowledge transfer during deployment (Table 7) but also for fostering a supportive atmosphere between the two companies during both development and deployment (Table 8).

[Tables 7 and 8 about here]

DISCUSSION

Conclusions

The effectiveness of customer solutions is affected not only by the nature of dyadic ties but also by the pattern of those ties within and between buying and selling teams. Buyers of complex customer solutions value strong ties, operationalized as frequent interaction, both within the selling team and between the selling and buying team. The presence of strong ties within the selling team enhances the value of such ties with the buying team. These results are consistent with both the knowledge transfer and coordination benefits of strong ties. The presence of more-than-matching ties, i.e., situations where ties are not limited to pairs of counterparts with similar domain of expertise in different firms, is associated with less rather than more effective customer solutions. However, this effect is moderated by the strength of ties within the selling team. More-than-matching ties are *not* associated with lower effectiveness when the ties within the selling

team are weak (infrequent interaction). This finding suggests that more-than-matching ties are used by buyers as recourse when the ties within the selling team are weak. When those ties are strong, maintaining more-than-matching ties is simply an additional burden providing no coordination benefits and, on net balance, hurting rather than enhancing the effectiveness of the customer solution.

The results are remarkably consistent across the development and deployment stages, something which Wuyts et al. (2004) noted may, but need not, happen. The strength of ties within the selling team is somewhat less valuable during deployment, but the difference is too small to appear substantively meaningful.

The effects of the manipulated factors vary with the importance of the need for knowledge transfer and with the importance of strong ties to support a positive atmosphere among all parties involved. Specifically, the atmosphere or governance supporting role of tie strength amplifies how much strong ties and more-than-matching ties between the two companies help improve the effectiveness of the customer solution. Also, this amplification effect is more pronounced at the development than the deployment stage. These results suggest that strong ties have an important role in fostering a positive atmosphere conducive to cooperatively designing effective solutions. Equally noteworthy is the result that the importance of the need for knowledge transfer amplifies (1) how much strong ties within the selling team help improve the solution effectiveness during development and (2) how much strong ties and more-than-matching ties between the buyer and seller help improve the solution effectiveness during deployment. These results indicate that strong ties indeed facilitate the transfer of complex knowledge transfer, and that knowledge transfers within the selling team are especially

value-enhancing during development whereas transfers between the two companies are especially value-enhancing during deployment.

Theoretical Implications

Our study introduces the concept of matching ties, which allows us to apply a network-theoretical perspective to an issue of key substantive interest in the areas of team selling, industrial marketing, and relationship marketing (e.g., Håkansson 1982; Jones et al. 2005; Palmatier 2008). Our findings indicate that buyers prefer *not* to use more-than-matching ties, unless the interactions within the selling team are found to be lacking. As a result, our study documents how the pattern of ties between two teams can be used to handle a problem within one of the two teams. In doing so, our work supports prior research suggesting that richer insights in business marketing and channel management can be gained by going beyond mere dyadic considerations (Wuyts et. al 2004). Our research also complements and extends the idea that network structure and tie strength can act as substitutes of each other (Rowley, Behrens, and Krackhardt 2000).

Our study may be the first one to document the phenomenon of over-embeddedness (where adding ties is actually detrimental) in a situation of key interest to marketers, and to do so not in a setting already known to favor weak ties and low clustering (such as information search and diffusion epidemics) but in a setting known to typically favor high clustering and strong ties, such as the transfer of complex knowledge in problem solving projects (Hansen 1999; Van den Bulte and Wuyts 2007).

The results of our moderator analyses are of particular theoretical interest, as they corroborate in one single empirical setting the claim that strong ties have benefits for both knowledge transfer and governance (Van den Bulte and Wuyts 2007). The results also suggest

that the atmosphere or governance supporting role of tie strength may matter more in the development than in the deployment stage. This result can be explained by noting that since solutions typically involve multiple functions of the supplier firm, the interdependencies could lead to turf battles and resource disputes in the process of designing the solution. Such disputes are especially likely when people and departments within the supplier firm can use ambiguity about customer requirements as political cover. Consequently, governance oriented activities are necessary to ensure that the supplier's personnel cooperates in the development of an integrated and customized solution. On the other hand, during the deployment phase, there is much less ambiguity about customer requirements, and expectations and performance metrics are more clearly defined. Consequently, while governance oriented activities are still important, they are less important than in the development stage. These results suggest that strong ties complement the structural and process approaches identified in prior theoretical research on customer solution effectiveness (Tuli, Kohli, and Bharadwaj 2007).

The need for knowledge transfer is another important contingency factor. When it is high, stronger ties *within* the selling team are especially value-enhancing during development whereas stronger ties *between* the two companies are especially value-enhancing during deployment. This suggests that the relative importance of relational processes may vary across the stages of development and deployment, even though the effects of the various manipulated factors were quite robust across the two stages. This, in turn, implies that more insights may come from detailed investigations of such processes across multiple stages (e.g., Szulanski 2000; Tuli, Kohli, and Bharadwaj 2007).

Our study corroborates prior theoretical claims and empirical evidence on the importance of tie intensity in the provision of complex co-created customer solutions (Tuli, Kohli, and

Bharadwaj 2007; Uzzi and Lancaster 2003; Wuyts et al. 2004). We find that the joint presence of strong ties both within the selling team and between the buying and selling team has a super-additive impact on the effectiveness of the customer solution, suggesting that sequences of dyads permeating organizational boundaries matter. This shows the need to interrelate the buying and selling team research traditions which have developed largely in isolation of each other.

Managerial Implications

Arguably the most important implication for practice is that, from a purchasing manager's perspective, building *more* personal ties between vendor and buyer teams need *not* increase the effectiveness of the customer solution. At best, more-than-matching ties can be used to help neutralize the detrimental impact of weak interactions within the vendor team. This result contrasts with prescriptions of building tight interconnections with customers, but are consistent with more nuanced recommendations based on contingency arguments (e.g., DeBruicker and Summe 1985; Matthyssens and Van den Bulte 1994) and recent research on customer participation (Fang 2008). Structuring teams and engagement policies such that they emphasize matching ties need not only avoid unnecessary interaction but, our results suggest, may actually also be more effective.

Another important implication, less surprising but important to have validated empirically, is that managers need to be aware that strong ties are important to customers not only in the early in the process when trust is achieved but also later when the solution is being deployed and knowledge transfer remains difficult. This is consistent with prior research documenting challenges in knowledge transfer (Szulanski 2000) but is rarely emphasized in the relationship marketing literature. More generally, marketers of complex customer solutions may

benefit from applying insights on the role of networks in knowledge management to the tasks of managing account teams and their interactions with customers.

Limitations and Future Directions

Our work has some limitations suggesting fruitful avenues for research. First, it might be interesting to assess to what extent the best between-team network structure consists of strong matching ties facilitating knowledge transfer between experts combined with weak non-matching ties facilitating progress tracking and problem detection. With the benefit of hindsight from our results, this may be a way for buyers to efficiently combine the benefits of strong ties and more-than-matching ties. Second, it would be of interest to carry out a study similar to ours from the seller's rather than the buyer's perspective. Such a study might be especially informative as solution effectiveness may mean very different things to buyers and sellers (Tuli, Kohli, and Bharadwaj 2007). Finally, whether the account manager and purchasing manager engaged in more-than-matching ties or not, they were constrained to behave symmetrically in our profiles. It is possible that, based on personal power considerations, purchasing managers may prefer to be able to get in touch directly with many members of the selling team while the account manager is not able to deal directly with buyer employees besides the purchasing managers. Given our research objectives, we controlled for such power considerations by using a symmetric design, but future research could explicitly focus on preferences for network structures where one team leader is more central than the other.

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TABLE 1.
INSTRUCTIONS TO PARTICIPANTS
ON HOW TO INTERPRET THE NETWORK GRAPHS

Selling team members:

Person 1 is the key salesperson assigned to your firm. S/he has a general base of knowledge, but often relies on his/her experts

Person 2 is an industry expert (i.e., s/he is an expert in the industry you are in)

Person 3 is a technical specialist (i.e., s/he knows everything there is to know about IT configurations)

Buying team members:

Person A is the purchasing manager for your firm. **YOU** are the purchasing manager.

Person B is your industry expert (e.g., s/he is an expert in the industry you are in)

Person C is your technical specialist (i.e., s/he knows everything there is to know about IT configurations)

The lines connecting the people in the diagram reflect who interacts with whom. Whether the line is full or broken reflects how often they interact.

———A solid line between any two people means that they communicate with each other frequently. By frequently, we mean at least several times per week.

- - - - A dashed line between any two people means that they communicate with each other very infrequently. By infrequently, we mean only a few times per month.

TABLE 2.
DEPENDENT VARIABLE AND
TEXT-BASED CONJOINT ATTRIBUTE LEVELS

Dependent Variable: Solution Effectiveness

To what extent will this pattern of interaction within and between teams result in the timely (design/development) (deployment) of an effective solution that meets your firm's expectations?

Very unlikely Very likely

1 2 3 4 5 6 7 8 9 10

Manipulated Attributes and Their Levels

1. Tie intensity within the selling team (INTWI)	+1: Within the selling team, members communicate with each other several times per week -1: Within the selling team, members communicate with each other only a few times per month
2. Tie intensity between the buying and selling teams (INTBE)	+1: Members of your buying team communicate several times per week with those members of the selling team that they are connected to -1: Members of your buying team communicate only a few times per month with those members of the selling team that they are connected to
3. Matching and more-than-matching ties between the buying and selling teams (MTMT)	+1: There are 7 linkages between members of your team and members of the selling team -1: There are 3 linkages between members of your team and members of the selling team

Note: The words in parentheses in the instructions for rating solution effectiveness pertain to the different stages of the process.

TABLE 3.
MEASURED COVARIATES

Familiarity with integrated systems solutions ($N = 281$; Mean = 5.64; SD = 2.60)
(1 = strongly disagree to 10 = strongly agree; 3 items; Cronbach $\alpha = 0.95$)

I am familiar with purchasing integrated systems solutions (IT or other).

I am knowledgeable about purchasing integrated systems solutions (IT or other).

I have been involved in purchasing integrated systems solutions (IT or other).

Work experience in years ($N = 279$; Mean = 21.7; SD = 10.6)

Knowledge transfer during development ($N = 281$; Mean = 7.63; SD = 2.17)
(1=strongly disagree to 10=strongly agree; 2 items; Cronbach $\alpha = 0.78$)

Knowledge transfer during deployment ($N = 281$; Mean = 7.11; SD = 2.03)
(1=strongly disagree to 10=strongly agree; 2 items; Cronbach $\alpha = 0.75$)

During the design/development [deployment] of an integrated and customized computer network solution...

large amounts of information need to be shared among members of buying and selling teams.

complex information needs to be shared among members of buying and selling teams.

Governance supporting role of tie intensity during development (Average of 6 binary items)
($N = 281$; Mean = 0.53; SD = 0.26)

Governance supporting role of tie intensity during deployment (Average of 6 binary items)
($N = 281$; Mean = 0.49; SD = 0.30)

During the design/development [deployment] phase, frequent communication is very important in order to...

increase commitment

increase empathy

increase cohesiveness

increase trust

reduce conflict

reduce shirking of responsibilities

TABLE 4.
DESCRIPTIVE STATISTICS OF MEASURED COVARIATES

	Mean	SD	Correlations					
			1	2	3	4	5	
1. Familiarity with integrated systems solutions	5.64	2.60						
2. Work experience in years	21.67	10.63	.19					
3. Knowledge transfer during development	7.63	2.17	.05	.17				
4. Knowledge transfer during deployment	7.11	2.03	.17	.14	.34			
5. Governance role of tie intensity during development	0.53	0.26	.03	-.01	.15	.15		
6. Governance role of tie intensity during deployment	0.49	0.30	.04	.03	.15	.22	.64	

Note: Work experience is measured for 279 participants; all other variables are measured for all 281 participants. All correlations of .14 or higher are significant at 5%.

TABLE 5.
MAIN RESULTS

Effect	Hypothesis	Coeff	Standard error
<i>Average effects (β)</i>			
Intercept		5.412***	0.046
INTWI	H _{1a}	0.520***	0.025
INTBE	H _{1b}	0.935***	0.038
INTBE*INTWI	H _{1c}	0.167***	0.021
MTMT	H ₂	-0.096**	0.035
INTWI*MTMT	H _{3a}	-0.115***	0.021
INTBE*MTMT	H _{3b}	-0.036 ^{ns}	0.023
INTBE*INTWI*MTMT		0.013 ^{ns}	0.017
<i>Stage contrast effects (γ)</i>			
(D _{2s} - D _{1s})*Intercept		0.075 ^{ns}	0.046
(D _{2s} - D _{1s})*INTWI		-0.052*	0.025
(D _{2s} - D _{1s})*INTBE		0.025 ^{ns}	0.038
(D _{2s} - D _{1s})*INTBE*INTWI		0.022 ^{ns}	0.021
(D _{2s} - D _{1s})*MTMT		-0.005 ^{ns}	0.035
(D _{2s} - D _{1s})*INTWI*MTMT		-0.018 ^{ns}	0.021
(D _{2s} - D _{1s})*INTBE*MTMT		0.024 ^{ns}	0.023
(D _{2s} - D _{1s})*INTBE*INTW*MTMT		-0.039*	0.017
-2 LL = 17980.7			
BIC = 18161.1			
Pseudo-R ² = 0.890			

^{ns} $p > .05$.

* $p \leq .05$.

** $p \leq .01$.

*** $p \leq .001$.

TABLE 6.
STAGE-SPECIFIC RESULTS

		Development stage			Deployment stage		
		Coeff.	St. Err.	Var(U)	Coeff.	St. Err.	Var(U)
Intercept		5.337***	0.068	1.105	5.487***	0.063	0.979
INTWI	H _{1a}	0.572***	0.036	0.162	0.468***	0.034	0.180
INTBE	H _{1b}	0.910***	0.054	0.613	0.960***	0.054	0.677
INTBE*INTWI	H _{1c}	0.145***	0.031	0.072	0.189***	0.027	0.0586
MTMT	H ₂	-0.091 ^{ns}	0.051	0.528	-0.100*	0.049	0.532
INTWI*MTMT	H _{3a}	-0.096**	0.031	0.073	-0.133***	0.027	0.066
INTBE*MTMT	H _{3b}	-0.060 ^{ns}	0.033	0.111	-0.013 ^{ns}	0.031	0.132
INTBE*INTWI*MTMT		0.052 ^{ns}	0.027	0 ^a	-0.026 ^{ns}	0.022	0 ^a
-2 LL		9198.3			8782.4		
BIC		9288.5			8872.6		
Pseudo-R ²		0.871			0.912		

^a While the fixed effect of the third-order interaction is identified within each stage, the random effect is not.

^{ns} $p > .05$.

* $p \leq .05$.

** $p \leq .01$.

*** $p \leq .001$.

TABLE 7.
PROCESS VALIDATION: NEED FOR KNOWLEDGE TRANSFER (NKT)

		Development stage			Deployment stage		
		Coeff.	St. Err.	Var(U)	Coeff.	St. Err.	Var(U)
Intercept		5.337***	0.068	1.104	5.487***	0.062	0.955
INTWI	H _{1a}	0.571***	0.035	0.147	0.468***	0.034	0.180
INTBE	H _{1b}	0.910***	0.053	0.600	0.960***	0.053	0.637
INTBE*INTWI	H _{1c}	0.145***	0.031	0.067	0.189***	0.026	0.051
MTMT	H ₂	-0.091 ^{ns}	0.051	0.518	-0.100*	0.048	0.506
INTWI*MTMT	H _{3a}	-0.096**	0.031	0.073	-0.133***	0.027	0.062
INTBE*MTMT	H _{3b}	-0.060 ^{ns}	0.033	0.111	-0.013 ^{ns}	0.031	0.125
INTBE*INTWI*MTMT		0.052 ^{ns}	0.027	0 ^a	-0.026 ^{ns}	0.022	0 ^a
NKT*Intercept		-0.012 ^{ns}	0.032		0.076*	0.031	
NKT*INTWI		0.058***	0.016		0.001 ^{ns}	0.017	
NKT*INTBE		0.051*	0.025		0.098***	0.026	
NKT*INTBE*INTWI		0.033*	0.014		0.042***	0.013	
NKT*MTMT		0.046*	0.023		0.079***	0.024	
NKT*INTWI*MTMT		-0.011 ^{ns}	0.014		0.030*	0.013	
NKT*INTBE*MTMT		0.003 ^{ns}	0.015		0.040***	0.015	
NKT*INTBE*INTWI*MTMT		-0.004 ^{ns}	0.012		0.004 ^{ns}	0.011	
-2 LL		9171.6			8728.5		
BIC		9306.9			8863.8		
Pseudo-R ²		0.868			0.909		

^a While the fixed effect of the third-order interaction is identified within each stage, the random effect is not.

^{ns} $p > .05$.

* $p \leq .05$.

** $p \leq .01$.

*** $p \leq .001$.

TABLE 8.
PROCESS VALIDATION: GOVERNANCE SUPPORT (GS)

		Development stage			Deployment stage		
		Coeff.	St. Err.	Var(U)	Coeff.	St. Err.	Var(U)
Intercept		5.337***	0.068	1.100	5.487***	0.063	0.972
INTWI	H _{1a}	0.571***	0.036	0.158	0.468***	0.033	0.175
INTBE	H _{1b}	0.910***	0.053	0.580	0.960***	0.054	0.669
INTBE*INTWI	H _{1c}	0.145***	0.030	0.058	0.189***	0.026	0.053
MTMT	H ₂	-0.091 ^{ns}	0.050	0.511	-0.100*	0.049	0.529
INTWI*MTMT	H _{3a}	-0.096**	0.031	0.074	-0.133***	0.027	0.066
INTBE*MTMT	H _{3b}	-0.060 ^{ns}	0.033	0.104	-0.013 ^{ns}	0.031	0.122
INTBE*INTWI*MTMT		0.052 ^{ns}	0.027	0 ^a	-0.026 ^{ns}	0.022	0 ^a
GS*Intercept		-0.305 ^{ns}	0.258		-0.272 ^{ns}	0.212	
GS*INTWI		0.271*	0.136		0.253*	0.113	
GS*INTBE		0.702***	0.200		0.299 ^{ns}	0.181	
GS*INTBE*INTWI		0.466***	0.115		0.263**	0.088	
GS*MTMT		0.507**	0.191		0.172 ^{ns}	0.165	
GS*INTWI*MTMT		0.031 ^{ns}	0.119		0.030 ^{ns}	0.091	
GS*INTBE*MTMT		0.342**	0.125		0.335**	0.103	
GS*INTBE*INTWI*MTMT		0.130 ^{ns}	0.102		0.071 ^{ns}	0.075	
-2 LL		9149.1			8751.8		
BIC		9284.4			8887.1		
Pseudo-R ²		0.868			0.911		

^a While the fixed effect of the third-order interaction is identified within each stage, the random effect is not.

^{ns} $p > .05$.

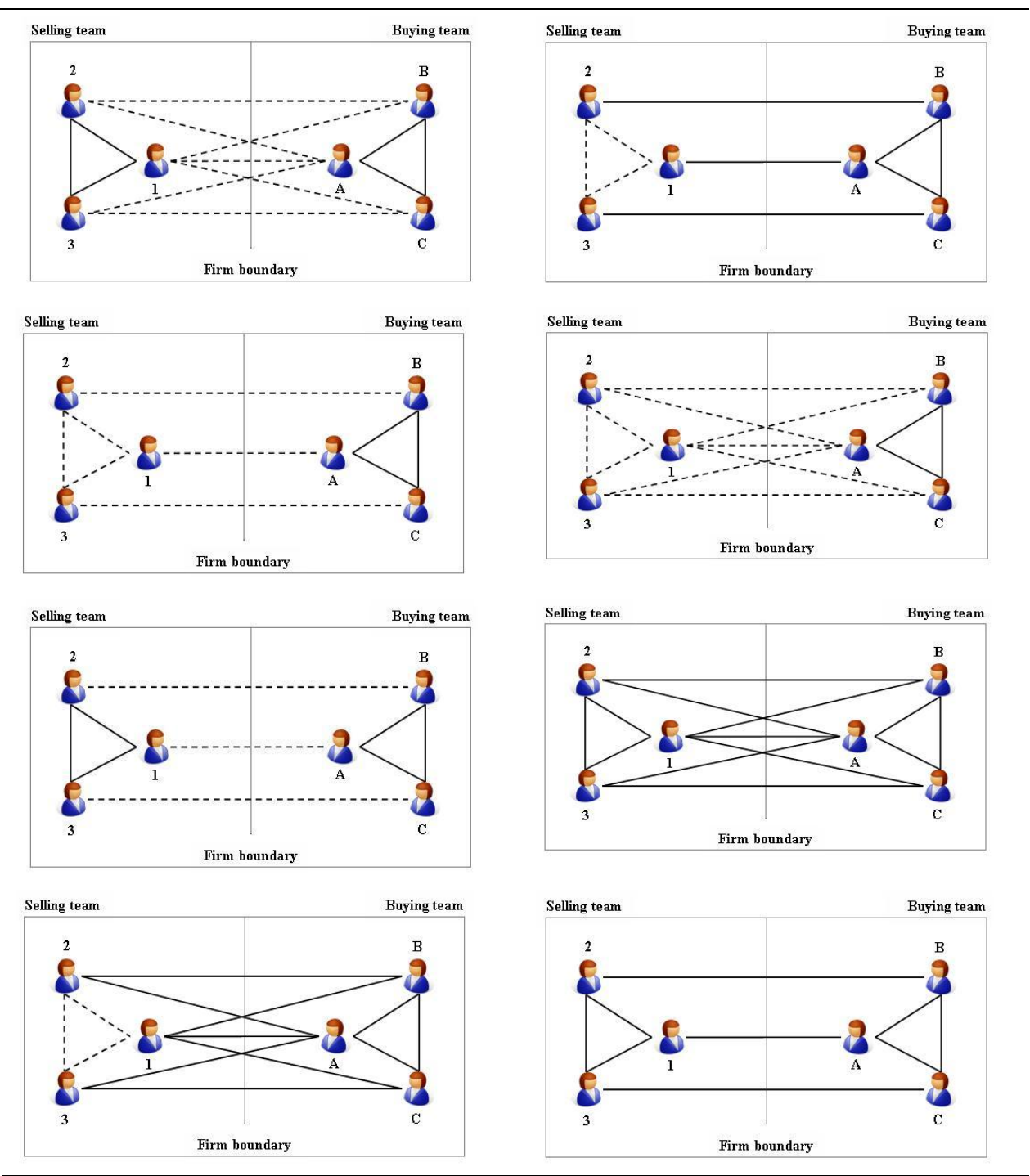
* $p \leq .05$.

** $p \leq .01$.

*** $p \leq .001$.

FIGURE 1.

GRAPHICAL DEPICTION OF NETWORK STRUCTURE IN CONJOINT SCENARIOS



Notes: Dotted lines indicate infrequent interactions whereas solid lines indicate frequent interaction. Network members 1 and A are the account manager and purchasing manager, respectively. Table 1 reports the verbal instructions given to study participants.