Structure and Agency in Networked, Distributed Work: The Role of Work Engagement

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Abstract

In this paper, we examine the social structure of workplace relationships (both actual and desired ties) in networked distributed work. We focus on the role of human agency in forming networks needed to succeed in this environment. In particular, we address how employee work engagement enables individuals to occupy the network positions that they need in order to succeed in networked and virtual settings. We analyze a distributed team within a large multinational firm involved in software development and delivery activities and find that highly engaged employees have personal networks that are anchored locally (i.e., strong ties with colleagues who are collocated and more transitive triples) and connect globally (i.e., strong ties with distant colleagues and more liaison brokerage ties across geographic locations). We also find a general tendency for all respondents to desire new ties that reach across global locations to improve performance at work. However, only the highly engaged employees achieve these ties highlighting the role of motivation and agency associated with engagement.

Keywords: social networks, work engagement, networked work, network agency
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Introduction

Work is increasingly "net work" (Anklam, 2011). This means that work is increasingly done in a self-organized way that relies a great deal on individual initiative and implemented in a collaborated/negotiated fashion rather than through managerial fiat -- what Wellman (2002) calls networked individualism. Increasingly, networked individualism occurs hand-in-hand with geographic separation and virtuality. To successfully navigate this world of networked individualism and geographic distribution, individuals have to form and maintain relationships with those they need to learn from and coordinate with. Particularly in settings where work is organized around projects, individuals are constantly working with new constellations of partners. Because each project typically involves intensive interaction -- often without the benefit of face-to-face communication -- it is helpful if many of the project members have pre-existing ties (Cross & Borgatti, 2004).

A generic model of action argues that action (including successful action, or performance) is a joint function of capability and motivation. In the field of networked work, quite a bit of research has been done on the antecedents of success, but almost all of it falls under the capability side of the ledger (Blackburn, Furst & Rosen, 2003; Hinds & Mortensen, 2005; Wellman, Dimitrova, Hayat & Guang, 2014). This parallels the situation in many fields where there is a theoretical tension between structure and agency. In network analysis, for example, it is often noted that the majority of research has been more focused on structure than agency (Borgatti, Mehra, Brass & Labianca, 2009; Borgatti & Halgin, 2011; Borgatti, Brass & Halgin, 2013).

In contrast, this paper focuses on the agency side of the equation. In particular, we examine the role of employee work engagement in enabling individuals to occupy the network positions that they need in order to succeed in networked and distributed settings.

To test our ideas, we analyze a globally distributed team of individuals responsible for managing global software applications for a large client organization. These individuals are located across five countries and must coordinate with each other for timely completion of their work tasks. There are few formally assigned working relationships: individuals have to overcome various challenges to connect with the appropriate people, within and across geographies, in order to ensure that work is completed in an effective and efficient manner. We note that this setting is representative of the new work environment, and engagement is a crucial ingredient needed to form and maintain relationships required to succeed in the workplace.

Networked and Distributed Work

According to Rainie and Wellman (2012), the "triple revolution" (i.e., changes in social networks, internet, and mobile platforms) has drastically changed core aspects of daily life including how work is accomplished in organizations. In what is termed the networked work environment, people now frequently "work together while apart" (Dimitrova & Wellman, 2013). Knowledge-intensive work is frequently distributed across geographic locations (Cummings, 2004; Hinds & Kielser, 2002), and individuals are members of multiple dispersed project teams enabled by digital technologies and connected through loose networks rather than formal hierarchies. To do their work, these individuals must regularly coordinate and exchange information with people located in numerous different locations (Wellman et al., 2014). In the process, they must overcome physical distance, time zone differences, and cultural differences

with fellow colleagues (Jarvenpaa & Leidner, 1999; Maznevski & Chudoba, 2000; O'Leary & Cummings, 2007).

This new environment places less emphasis on task structure (Wageman & Gordon, 2005; Wageman, Gardner & Mortensen, 2012) and more emphasis on proactive search and coordination behavior on the part of individuals. For instance, Wageman and colleagues (2005, 2012), posit that workers now exercise more autonomy in designing task structures that facilitate the exchange of resources and coordination with others. Rather than receiving a task as given or being assigned a process, individuals decide among themselves how subtasks are allocated and performed. Thus, work dependencies are shaped by the network of social relationships and the positions that individuals come to occupy in the network will influence their ability to efficiently locate expertise, exchange information and coordinate efforts with others -- in short, to do their jobs.

Rainie and Wellman (2012) address the importance of talent, energy, altruism, social acuity, and savviness needed to develop and manage large diverse networks in the network operating system. Similarly Wellman and colleagues (Wellman, Dimitrova, Hayat & Guang, 2014) discuss the importance of search skills that enable one to invest in networks of distributed others for information and resources rather than rely only on members of a collocated and bounded group with clearly defined roles and responsibilities. Other scholars working in the closely-related area of distributed work, report the importance of proactivity, interpersonal communication skills, cultural sensitivity, and willingness to adopt new technologies as needed to communicate and coordinate across distances (Blackburn, Furst & Rosen, 2003). Similarly Hinds and Mortensen (2005) discuss the value of acting as an "informal liaison" who encourages spontaneous communication amongst individuals located within and across locations. In summary, the work

environment has changed and individuals must adapt and develop the new social skills necessary to navigate the networked workplace.

Work Engagement

Work engagement has been defined as an enduring, positive, fulfilling work-related state of mind characterized by vigor, dedication, and absorption (Schaufeli, Bakker & Salanova, 2006; Schaufeli, Salanova, Gonzalez-Roma & Bakker, 2002). Engaged employees have a sense of energetic and affective connection with their work activities (Schaufeli et al., 2002) and exhibit greater task and contextual performance (Christian, Garza & Slaughter, 2011; Rich, Lepine & Crawford, 2010).

As highlighted by Christian and colleagues (2011), engaged employees are those who experience a high level of connectivity with their work tasks and as a result strive toward task-related goals that are intertwined with their in-role definitions and scripts, leading to high levels of task performance. Engaged employees often perceive a sense of autonomy, task variety, task significance, job complexity, and social support in the workplace. They are characterized by high levels of energy and identification with their work (Schaufeli et al., 2009). Engaged employees are more likely to exhibit organizational citizenship behaviors (Rich et al., 2010) that create a social context that is conducive to teamwork, helping, voice, and other important discretionary behaviors that can lead to organizational effectiveness (Podsakoff, Whiting, Podsakoff, & Blume, 2009). Work engagement thus has become crucial in meeting the challenges of networked work where workers must proactively reach out and gain commitment of others for timely completion of jobs. In summary, existing studies find that work engagement leads to higher performance. In

this study, we postulate that highly engaged workers achieve higher performance through managing their network ties effectively.

The Role of Engagement in Networked and Distributed Work

Weak ties are known to be a source of novel information (Granovetter, 1973) and therefore associated with creativity and innovation (Perry-Smith, 2006). However, strong ties are also important. Hansen (1999) argues that whereas weak ties are beneficial for search, strong ties are needed to effectively transfer complex knowledge. Krackhardt (1992) argues that strong ties constitute a sense of trust that can reduce resistance and provide comfort in the face of uncertainty, such as organizational change. Other work links strong ties with trust (Uzzi, 1997; Reagans & McEvily, 2003), as well as the formation of common identities (Coleman, 1988). Ideally, then, an individual would like to have a portfolio of both strong and weak ties.

One of the advantages of collocation is that the face-to-face communications it enables can result in strong, trusting relationships. In addition, these face-to-face communications provide strongly-tied individuals opportunities to transfer complex, possibly tacit, knowledge. They also afford opportunities to share sensitive information, which individuals will share only with those they trust and only in settings that offer few possibilities of being overheard.

However, strong ties, even when local, require effort to develop and maintain (Reagans & McEvily, 2003). Unmotivated individuals may serendipitously fall into some strong ties, but in general we would expect more motivated individuals to have more of them. We formalize this expectation as a hypothesis.[1]

[1] It should be noted that the hypotheses contain the phrase "in distributed work settings" as a scope condition. It is not intended as a moderating variable.

Hypothesis 1. In distributed work settings, work engagement will be positively associated with the number of strong ties to collocated others.

One of the advantages of collocation is that it facilitates coordination by mutual adjustment, which Thompson (1967) argues is needed to manage dyadic interdependence. Thompson further argues that, under norms of rationality, organizations will locate units that need coordination by mutual adjustment in the lowest, tightest hierarchical units. We argue that the same is true of location: units are collocated when they involve multiple dyadic interdependencies and require mutual adjustment to coordinate among them. Hence, at the location level, we should see high transitivity, which is to say a high number of closed or transitive triads (see Figure 1). At the individual level, therefore, we expect people to have many closed triads in the ego networks[2] of their local alters, at least if individuals are trying to maximize the benefits of collocation. Of course, few employees can be expected to fully maximize their networks. However, if anyone is going to do it, we would expect it to be the most engaged workers. Hence,

Hypothesis 2. In distributed work settings, work engagement will be positively associated with the number of transitive triples in individual ego-networks.

Insert Figure 1 about here

In networked work settings that are geographically distributed, ties to individuals in different locations are essential: interaction with distant others is how work gets done. But, as discussed by Borgatti and Cross (2003), interactions with a given other are more effective if there is a pre-existing positive relationship with that person, and this takes time and effort to build. Geographic distance restricts the frequency of certain kinds of interaction modes. Asynchronous, computer-

[2] By "ego network" we mean the set of persons ("alters") that have ties with a focal individual ("ego"), along with the ties between ego and alters and the ties among the alters.

mediated communications such as email are easy, but real-time face-to-face communications are costly and require planning to arrange. This makes tie maintenance more difficult and requires greater motivation to carry out. Consequently, it is the more engaged workers that we expect to have more standing strong ties with non-local others.

Hypothesis 3. In distributed work settings, work engagement will be positively associated with having strong coordination ties to non-local coworkers.

In distributed systems with more than just pooled interdependence between locations, having no ties at all between any pair of locations is untenable. Work must be coordinated between locations, and information and work products must flow between them. However, it is also not necessary -- and indeed counter-productive -- to have every person be connected to every person in every other location. More efficient is to have a moderate level of connection between locations, along with a few individuals that are positioned to serve as connectors or brokers between pairs of non-collocated persons who do not have direct ties with each other.

Gould and Fernandez (1989) present a typology of brokerage positions that arise when nodes are identified by a categorical attribute such as location or team. Of special interest in networked distributed systems are the liaison, gatekeeper, and representative roles, in which the broker serves to connect otherwise unconnected locations. Of these, the most difficult to occupy is the liaison role, in which a member of group B brokers the relationship between members of group A and group C (see Figure 2). As a result, we expect only the most motivated and engaged individuals to play that role. In the formalization below, we refer to occupying a liaison position between locations as *global brokerage*.

Hypothesis 4. In distributed work settings, work engagement will be positively associated with global brokerage.

Insert Figure 2 about here

Methods

To test our hypotheses, we studied work relationships among employees at a global high technology firm. At the time of the study, the firm employed over 130,000 people with offices in North America, Asia Pacific, and Europe. We focused on a globally distributed account team of 62 individuals involved in designing and maintaining global software applications of a large client organization. The team was responsible for ensuring that major software applications of the client were functional at all times; in order to provide timely support, employees were grouped into eight teams located near client operations in different geographic regions. During the survey design phase, we interviewed senior managers and randomly selected employees to better understand the nature of their work and the importance of coordination ties. It appeared that although employees at each location had a distinct area of work responsibility, they needed to coordinate across locations. One employee explained, "*We are responsible for different things that are inter-related. For instance, I need to ensure that the system delivers business intelligence at the level of granularity and coverage every moment as client expects. But the level of granularity and coverage vary for client members in different regions. Therefore, I need to know the architecture and functionalities of other applications [at other locations] and use that knowledge to do my job well*." Another, speaking on the importance of cross-location connections, said, "*Different [location-based] teams are accountable for different parts of the*

work. But they are closely linked with each other. In our work there is only so much one can do alone or with members of own [location-based] team."

Further, one of the most important criteria of success at work on this account team was the time required to complete the tasks. In discussing the importance of efficient communication and coordination across geographic regions, another team member said, "*We need to learn about changes in technology and client expectations fast. They need to be communicated across the team. It is not about English or other languages, it is about doing what it takes to move fast*."

While this group did have formal reporting relationships, there were no other formally assigned work relationships, and individuals met their work needs by quickly tapping into their network of other local and distant associates on the account. For example, individuals worked with the onsite client to understand their expectations, as well as coordinated with account colleagues across sites to effectively design and implement changes to the global software system. This is representative of common networked work configurations in that work was coordinated among the 62 individuals located in different parts of the world (Brazil, Canada, Germany, United States and India).

To capture these relationships, we administered a social network survey in which each respondent was given a full roster of all account team members and asked about several types of ties they might have with each coworker. In this sample, the majority of essential relationships were confined to others working on the same account. We therefore restricted our analysis to within account team relationships. We also administered a survey capturing work engagement and demographic variables. The survey response rate for both the network survey and the work engagement survey was 92 percent (57 of 62 account members). Following data collection and

analysis, we conducted limited interviews with selected employees to help us gain a deeper understanding of our statistical findings.

Dyadic Network Data

Two types of ties are referenced in our hypotheses. The first is work coordination. We collected this by asking respondents *with whom they directly coordinated in order to get their work done*. This yielded a binary person-by-person matrix in which $x_{ij} = 1$ if person *i* indicated that they directly coordinated with person *j*. The second is work interaction. We asked respondents "*how frequently you engage in important work-related discussions*" with each person in the group. This yielded a valued person-by-person matrix in which x_{ij} took on values between 1 and 5, representing frequency categories. To obtain a network of *strong ties*, we dichotomized the frequency matrix at 3 and above, obtaining a new matrix in which $x_{ij} = 1$ indicated weekly interaction or better. Consistent with other definitions of strong ties (Krackhardt, 1992) we also symmetrized the matrix via the minimum method, meaning that in the final strong-tie matrix, a strong tie existed between two individuals only if each listed the other as someone they interacted with on a weekly basis or more.

Dependent Variables

Strong local ties. The measure of strong local ties was constructed by counting the number of strong ties (as defined above) that the respondent had with persons in their same location.

Local transitivity. Local transitivity refers to the number of closed strong-tie triads that a respondent was involved in, counting only alters that were collocated with the respondent.

Strong ties with non-collocated colleagues. This measure is the complement of strong local ties: it is the number of strong ties that a respondent had with non-collocated others.

Global brokerage. Global brokerage refers in this paper to the number of times that a person occupied the liaison role (as defined by Gould and Fernandez, 1989) in the work coordination network. We used the Gould and Fernandez (1989) brokerage routine in UCINET (Borgatti, Everett & Freeman, 1992) to count the number of times each individual occupied the middle position in the open triad shown in Figure 2, where each person worked in a different geographic location.

Independent Variables

Work engagement. To determine each individual's level of *work engagement,* we used the 9-item Utrecht Work Engagement Scale (Schaufeli, Bakker & Salanova, 2006), which includes three subscales of vigor (e.g., *At my work, I feel bursting with energy*), dedication (e.g., *I am enthusiastic about my job*), and absorption (e.g., *I am immersed in my work*). The response scale ranges from 0 ("never") to 6 ("always"). For the analysis, we used a composite score of all subscales. The Cronbach's alpha (a = 0.90) for our scale indicates high reliability and is in line with existing research that finds that the UWES-9 has comparable psychometric properties across respondents from multiple countries (Schaufeli et al., 2006; Balducci, Fraccaroli & Schaufeli, 2010).

Controls

We controlled for a variety of factors known to be associated with network ties and/or work engagement. These included number of months spent working on the account team (account experience), the number of outgoing and incoming coordination ties, and formal position in the

organization hierarchy (captured by the number of direct and indirect reports). Although our sample was only 12% female, we also controlled for gender. Given that our hypotheses involve counts of ties within and between locations, a key control variable was the number of people at the respondent's location.

Analytical Models

The dependent variables in each of our hypotheses were counts with issues of over-dispersion, so in each case we used a negative binomial regression model. We used UCINET 6.480 (Borgatti et al., 2002) to calculate all network statistics and Stata 11.0 to estimate the negative binomial regression models.

Results

Table 1 presents the means, standard deviations and zero-order correlations of our study variables. Our sample consisted of 57 respondents with an average tenure of 26.97 months in the account team (SD = 10.92). Results from a density by location analysis (available upon request) indicated, that the majority of work coordination ties and weekly discussion ties occurred within locations. A one-way ANOVA test showed no significant difference in work engagement across locations (results, $F = 1.34$, $p > 0.27$).

Insert Table 1 about here

Hypothesis 1 predicted a positive association between work engagement and strong ties with collocated colleagues. Controlling for account work experience and position in the organizational hierarchy, we found support for this hypothesis (Table 2, $\beta = 0.02$, $p < 0.01$). Similarly, Hypothesis 2 predicted a positive relationship between work engagement and the number of

transitive triples with collocated colleagues. This was also supported (Table 3, $\beta = 0.04$, $p < 0.05$). The results lend credence to the notion that, in distributed work settings, it is the highly engaged individuals that will do what it takes to develop strong, cohesive local ties.

Insert Tables 2 and 3 about here

Hypothesis 3 predicted that highly engaged individuals, more so than others, would have strong ties with non-local colleagues. The results of our negative binomial regression are presented in Table 4, and indicate a positive association between engagement and the number of strong ties with distributed colleagues ($\beta = 0.02$, $p < 0.01$). Hypothesis 4 predicted that highly engaged individuals would occupy more global brokerage positions, serving as a liaison between geographic locations. Table 5 presents results that support this relationship ($\beta = 0.03$, $p < 0.01$). Taken together, these findings suggest that it is the highly engaged workers that coordinate between geographically dispersed colleagues.

Insert Tables 4 and 5 about here

Discussion

Our results show that more engaged workers are more likely to successfully engage in the networking behaviors that many have seen as fundamental for networked, distributed work settings (Quan-Haase & Wellman, 2004). We have cast this in terms of a motivation-capability framework, arguing that certain kinds of network behaviors are costly in time and energy and require high levels of motivation to execute. Our findings seem to suggest that workers in networked settings need more than the usual motivation to carry out the needed networking actions. We suggest that engagement is a factor that is associated with extra motivation.

Of course, we recognize that there are many mechanisms by which work engagement could yield the network outcomes we have studied here. One possibility is that highly engaged individuals are also more knowledgeable about what needs to be done in a networked, distributed setting. For example, if engaged workers are talking more, listening better, and spending more time thinking about the organization and its needs, they might be more likely than disengaged employees to see the need for global brokerage. Our follow-up interviews do not support this, as an appreciation of the importance of networking behaviors seemed to be widespread. A representative comment in our interviews was "*if you aren't quick to [connect with others] the game slows down…there is so much happening around and if you sit in your cubicle all the time, you would hardly know anything and no one will help you out when you have an issue*."

We also examined the alternative possibility quantitatively by analyzing another kind of tie that was collected in our network survey. We had asked respondents to consider ways that their performance at work might be enhanced through new workplace connections. Respondents selected individuals from the full organizational roster with whom they wanted to form a new relationship so as to improve their performance at work. If highly engaged individuals were simply more aware of the importance of having ties to distant others we would expect them to name more alters in distant locations as desired future contacts than would less engaged workers. Results from a dyad-level logistic regression quadratic assignment procedure analysis of desired ties indicate that this is not the case. Controlling for individual attributes (account experience, gender) and structural parameters (current network ties, transitivity, preferential attachment, structural equivalence) we found that the targets of desired ties tended to be in other locations, but the level of engagement of the sender had no effect (see Table 6 for results). In other words, it appears that everyone recognized the importance of creating global ties, but only highly

engaged workers were actually able to achieve it, as shown in Tables 2 and 5. This supports our contention that the mechanism relating engagement to network position is motivation rather than, say, understanding of organizational needs.

Our study also addresses the antecedents of network position. Although we recognize that there has been a fair amount of work on network antecedents, such as the research on homophily (*cf.* McPherson, Smith-Lovin & Cook, 2001), the more common approach to network research has been to focus on outcomes of network position (*cf.* Borgatti & Halgin, 2011). In this study, we contribute to the developing line of network research investigating the impact of individual factors, such as performance feedback (Parker, Halgin & Borgatti, 2013), and traits, such as self-monitoring (Sasovova, Mehra, Borgatti & Schippers, 2010), on network outcomes. We argue that engagement is one of the factors needed for the creation and maintenance of valuable relationships in networked work.

Insert Table 6 about here

From a practical perspective, our findings underscore the importance of investing in employee work engagement in networked organizations. In more bureaucratic settings with close supervision and clearly defined routine tasks, and appropriate incentives, it is possible to guide a weakly-engaged individual to do the tasks the organization needs doing. In networked, distributed settings there is little supervision and tasks are constantly changing, hence engaged individuals are especially needed. It has been found that organizational leaders can create work environments that foster worker engagement (Rich et al., 2010). However, work engagement is also often regarded as a stable trait. If so, this puts a premium on excellent organizational recruiting.

We recognize a number of limitations in our study. We studied relationships among members of a single distributed group involved in networked work. Qualitative evidence from interviews suggests that these individuals rarely consulted non-account members within the organization for work-related issues. However, they did need to work with their external client to implement software changes and we did not collect data on these relationships. Individuals in different types of networked work likely need to rely on contacts across organizations and industries for work performance (*cf.* Cummings & Haas, 2012). Future work can more thoroughly investigate networked work in diverse settings with multiple teams to see how individuals form and manage external connections.

Future research can also follow changes in network structure and composition over time. For instance, while not theorized, we found a negative relationship between account experience and number of global brokerage positions (Table 5, $\beta = -0.03$, $p < 0.01$). It's possible that individuals with less tenure were more motivated to search across locations because they lacked knowledge of who knows what and therefore needed to conduct more extensive network search. A longitudinal study could test whether brokerage positions in networked work decay as an individual gains more experience working on the account. Also, while engagement is typically treated as a stable trait, it is possible that network relationships also influence future levels of engagement. Thus, a longitudinal study could address the coevolution of engagement, networks, and performance in networked distributed work.

A weak but nevertheless present assumption in our work is that individuals in networked settings know what kinds of network behaviors and positions are needed (or at the very least that the degree of knowledge about such things is more or less uniform). This is plausible for simple things like the need to have ties to people in other locations. Indeed, our data show a tendency

for all individuals to choose non-collocated others over collocated when asked who they need to form new relationships with in order to improve their own performance. However, it is not clear whether higher-order network concepts such as bridging between pairs of others who are not collocated are present in our respondent's minds. As noted by Mehra et al. (Mehra, Borgatti, Soltis, Floyd, Ofem, Halgin & Kidwell, 2014), an important area for future research is the direct collection of individuals' perceptions of higher-order network properties, such as bridging, path-length, and homophily. Finally, data were collected through surveys, which introduced an element of subjectivity to the responses.

Conclusion

A large body of network research has identified beneficial network structures that contribute to high performance at work, and more recently networked work. In the networked world, individuals must form and maintain relationships with those with whom they need to coordinate and learn from. A challenge has been to determine the role of the individual in creating and managing such structures. Our study contributes to this discussion of agency by highlighting the importance of work engagement in creating the required ties needed to make networked work environments function.

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Table 1
Descriptive statistics and correlations of study variables

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1	UWES-9	38.36	10.75											
2	Global brokerage	12.11	17.07	0.14										
3	Strong ties with non-collocated	4.13	3.61	0.18	0.52***									
4	Strong ties with collocated	4.97	3.66	0.27*	0.28*	0.41***								
5	Closed triads with collocated	8.86	10.03	0.29*	0.28*	0.43***	0.93***							
6	Network size	14.47	7.59	-0.09	0.14	0.20	0.64***	0.52***						
7	Coordination outgoing ties	14.05	12.72	0.09	0.77***	0.35**	0.36**	0.34***	0.30*					
8	Coordination incoming ties	14.05	8.53	-0.13	0.33**	0.55***	0.53***	0.46***	0.73***	0.24				
9	Direct reports	0.95	2.19	0.14	0.09	0.24*	0.21	0.19	0.15	0.01	0.36**			
10	Account experience (months)	26.97	10.92	-0.05	0.09	0.16	-0.05	0.04	-0.05	0.03	0.19	0.39**		
11	Female	9 = f	--	0.01	-0.05	0.10	0.001	-0.03	-0.06	-0.06	0.01	-0.18	-0.38**	
12	Number of colleagues in same location	19.49	7.56	-0.24	-0.04	-0.05	0.35**	0.24	0.85***	0.12	0.43***	-0.02	-0.16	0.001

Table 2
Negative binomial regression model predicting the number of strong ties with collocated colleagues

	β	SE
Work engagement	0.02**	0.01
Coordination outgoing ties	0.01[t]	0.01
Coordination incoming ties	0.03**	0.01
Number of colleagues in same location	0.02	0.01
Account experience	-0.01	0.01
Hierarchy (number of reports)	0.03	0.03
Female	-0.03	0.12
Log likelihood = -137.67		
N = 57		

[*] $p < 0.05$; [**] $p < 0.01$; [***] $p < 0.001$.

Note: Entries represent unstandardized parameter estimates and standard errors. The intercept was included in the regression model but is not reported here.

Table 3
Negative binomial regression model predicting the number of closed triads with collocated colleagues

	β	SE
Work engagement	0.04*	0.01
Coordination outgoing ties	0.02[t]	0.01
Coordination incoming ties	0.01	0.01
Number of colleagues in same location	-0.09*	0.04
Account experience	-0.001	0.01
Hierarchy (number of reports)	0.01	0.06
Female	0.06	0.41
Number of work discussion ties with collocated colleagues	0.17**	0.05
Log likelihood = -172.62 N = 57		

[*] $p < 0.05$; [**] $p < 0.01$; [***] $p < 0.001$.

Note: Entries represent unstandardized parameter estimates and standard errors. The intercept was included in the regression model but is not reported here.

Table 4
Negative binomial regression model predicting the number of strong ties with non-collocated colleagues

	β	SE
Work engagement	0.02**	0.01
Coordination outgoing ties	0.02**	0.001
Coordination incoming ties	0.08**	0.01
Number of colleagues in same location	-0.04**	0.01
Account experience	-0.01	0.01
Hierarchy (number of reports)	-0.01	0.03
Female	0.16	0.21
Log likelihood = -117.71		
N = 57		

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Note: Entries represent unstandardized parameter estimates and standard errors. The intercept was included in the regression model but is not reported here.

Table 5
Negative binomial regression predicting the number of global brokerage positions in the task dependence network

	β	SE
Work engagement	0.03**	0.01
Coordination outgoing ties	0.09***	0.01
Coordination incoming ties	0.09***	0.02
Number of colleagues in same location	-0.05**	0.02
Account experience	-0.03**	0.01
Hierarchy (number of reports)	0.01	0.05
Female	-0.97***	0.35
Log likelihood = -165.47		
N = 57		

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Note: Entries represent unstandardized parameter estimates and standard errors. The intercept was included in the regression model but is not reported here.

Table 6
Logistic regression quadratic assignment procedure regression model predicting the characteristics of desired new ties

	β
To geographically collocated alters	-2.31*
Engagement of sender	1.19
Engagement of receiver	0.83*
Absolute difference in engagement	0.92*
Gender of sender	1.21
Absolute difference in account experience	0.04
Current work discussion network	0.32
Structural equivalence in work discussion network (profile similarity)	-0.04
Task dependence network	-2.48
Preferential attachment	-0.07*
Transitive closure	9.38***

$R^2 = 0.23$
N = 3598
Permutations = 10000

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.
Note: Entries represent unstandardized parameter estimates. The intercept was included in the logistic regression model but is not reported here.

Figure 1
Transitive Triad

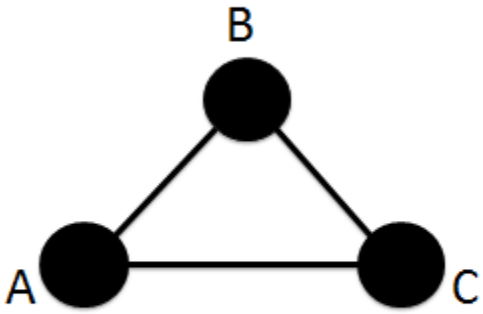

Figure 2
Liaison brokerage position, in which B brokers between actors A and C (color denotes geographic location)