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Tie Diversity, Network Position, Electronic Resources and Knowledge Exchange

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ABSTRACT

A key question for managers in knowledge-intensive firms is how to encourage knowledge flows and new knowledge creation between individuals. We take a social networks perspective to answer this question by examining the extent to which an individual's network diversity and network position influence performance. However, with advances in information and communications technologies, individuals can just as easily access knowledge through documents or electronic communities. Knowledge workers no longer have to rely on their personal social network connections for knowledge resources. Therefore, in our quest to better understand how social networks affect individual performance, we examine the extent to which an individual accesses electronic knowledge resources and whether this influences individual performance above and beyond personal social network factors. Data will be analyzed in network form, and we propose to use QAP (quadratic assignment procedure) hierarchical regression analysis to test the hypotheses.

Keywords

Social Network, Diversity, Performance, Centrality, Electronic Networks

INTRODUCTION

In knowledge intensive work, where do people turn to when they need help and advice? Prior research suggests that knowledge sharing is positively associated with strong ties, co-location, demographic similarity, status similarity, and a history of prior relationship. This suggests that access to knowledge is not dependent primarily on the attributes of an individual, but is facilitated by how individuals are connected to others through social networks. There is an ongoing debate in the social network field as to the link between network attributes and performance-related outcomes. One stream of research focuses on the feature of ties or relationships in these networks. For instance, ties to those higher in an organization might be more valuable because higher level associates should have access to more resources, such as experience and influence. Further, contacts to higher-status associates legitimize both individuals and their ideas, establishing access to unique or non-redundant knowledge that is an important factor in an individual’s performance. The other stream of research focuses on the actual structure of the network, suggesting that networks that span across social boundaries lead to higher performance outcomes. For instance, Burt (1992) argues the value derived from bridging "structural holes" or gaps between nodes in a social network. Such boundary spanning generates "information benefits," because information tends to be relatively "redundant" within a given group. As a result, actors who develop ties with disconnected groups gain access to a broader array of ideas and opportunities than those who are restricted to a single one (Granovetter, 1983).

Thus, the debate is whether the diversity of an individual’s network connections or the individual’s position in the network is more important for enhancing individual performance. However, both streams of research focus primarily on the networks created through inter-personal relationships, largely ignoring the growing use of electronic media for accessing and exchanging knowledge. Information and communications technologies create electronic social networks that may be largely independent from the resources of personal networks. With these technologies, individuals are faced with a multitude of electronic knowledge resources that they may access for help in solving work tasks, e.g., documents and document repositories, online and offline publications, mailing lists, electronic communities, discussion boards, etc. Many
organizations are in the process of implementing sophisticated intranets to promote knowledge sharing between organizational individuals. Thus, increasing the amount of information sources and communication channels employees have available should increase the likelihood of knowledge sharing and new knowledge creation, resulting in an improved level of performance for both the individual and the firm. But does access to more information translate into higher levels of individual performance in knowledge-intensive firms, or does it simply lead to information overload? Do individuals benefit from using electronic knowledge resources above and beyond the influence of their personal social network contacts?

The objective of this research is to examine these questions and investigate the differential influence of an individual’s network diversity, network position and technology use on performance. As such, we intend to investigate three research questions:

1. Does diversity matter for individual performance?
2. Does network position matter above and beyond diversity?
3. Does access to electronic knowledge resources influence performance above and beyond personal network ties?

**Theoretical Foundation**

Within social network theory, individuals and their actions are viewed as interdependent rather than independent, autonomous occurrences. Individuals are embedded in networks of relationships that both enable and constrain behavior. Therefore, in social network research the focus is on the pair-wise relationships between individuals that aggregate to form networks whose structural characteristics both are the result of dynamic interaction processes and have an effect on individual and group outcomes. One stream of social network research focuses on the personal network of one focal individual, referred to as ego-centered networks. For instance, an ego-centered network may be examined to determine how an individual’s set of relations or position in a network influences his or her access to resources. At the individual level, social network analysis examines how dyadic relations, referred to as ties, relate to outcomes. These ties vary in content, direction, and relational strength, all of which influence the dynamics of the network (Garton, Haythornthwaite, & Wellman, 1999). The content of ties refers to the resource exchanged, such as information, money, advice, or kinship. The direction of ties indicates the giver of the resource and the receiver, although ties in some networks are undirected, such as kinship. The relational strength of ties pertains to the quality of the tie. For instance, the relational strength of ties indicates the amount of energy, emotional intensity, intimacy, commitment and trust connecting the individuals. We focus on the individual networks created by the exchange of knowledge, both personally and electronically, and differences in individual performance.

**Diversity of Network Members**

The potential knowledge resources available through a social network are likely to be greater the more diverse the network. For example, Nahapiet and Ghoshal (1998) found that resources will be more abundant and valuable when contacts are varied and connected to unique others. Network diversity refers to both perceptual and actual differences among network members, such as gender, ethnicity, age, physical abilities, cognitive styles, religion, nationality, socio-economic background, affectional orientation, education, learning styles, marital status, and work experience. In terms of performance, heterogeneous networks derive benefit from more creative problem solving as members have different sets of resources, such as contacts, skills, information, and experiences (Reagans & Zuckerman, 2001). For example, Reagans and Zuckerman (2001: 502) write that teams with a more diverse composition achieve higher performance, “Because greater demographic diversity entails relationships among people with different sets of contacts, skills, information, and experiences, heterogeneous teams enjoy an enhanced capacity for creative problem solving.” Thus, we predict that having access to a wide variety of resources through a diverse network will be important for individual performance. Based on prior research, we assess network diversity by examining gender, age, nationality, education, work experience, tenure in the organization, and physical location. This leads to our first hypothesis:

**Hypothesis 1:** The more that an individual exchanges knowledge with diverse others, the higher his or her level of performance.

**Network Position**

In addition to network diversity, prior social network research suggests that network position is associated with performance outcomes for individuals within an organization (Burt, 1992). As several scholars have argued, network position is an important aspect of "social structure" that can enhance an individual’s ability to increase performance (Reagans & Zuckerman, 2001). Centrality, or the extent to which a given individual has relationships with others in a network, is the structural property most often associated with instrumental outcomes such as power, influence in decision making, cognition,
and innovation. More recent research provides evidence of a direct positive relationship to individual performance in both personal (Sparrowe, Liden, Wayne, & Kraimer, 2001) and electronic networks (Ahuja, Galletta, & Carley, 2003). In these studies, researchers generally found that it is the access to unique or non-redundant knowledge that is an important factor in an individual’s performance, similar to the research findings on network diversity. However, there is little research that examines the influence of network position above and beyond network diversity. To address this gap, we hypothesize the following:

Hypothesis 2: The more central an individual is located in the knowledge network, the higher his or her level of performance above and beyond the influence of personal network diversity.

Electronic Knowledge Resources

In addition to the knowledge available through personal social networks, information and communication technologies facilitate access to electronic knowledge resources regardless of personal acquaintance or prior familiarity with other individuals. The extent to which an individual uses electronic knowledge resources to perform work tasks should affect the degree to which an individual accesses non-redundant knowledge. In today’s organizations, individuals are faced with a multitude of potential electronic knowledge resources when solving work tasks. For example, many organizations are in the process of implementing electronic communities that extend across organizational boundaries to promote knowledge sharing between individuals (Davenport & Prusak, 1998). Thus, an individual can use the knowledge available in electronic communities as well as access numerous online publications and databases to supplement the knowledge available in their personal networks. To date, social network researchers have paid scant attention to the relationship between an individual’s electronic knowledge resource usage and individual performance. We expect that accessing electronic knowledge resources in addition to the knowledge available through personal social networks would lead to a greater diversity of knowledge, and enhance individual performance. Thus, we have the following hypothesis:

Hypothesis 3: The more that an individual accesses electronic knowledge resources, the higher his or her level of performance above and beyond the influence of personal network diversity and position.

METHODOLOGY AND RESEARCH DESIGN

The data for this research was collected by surveying all employees in a single firm, Icon. The investigation of only one organization (or subset of an organization) is common in network studies due to the high response rate requirements needed to assess individual social networks. The choice of Icon was motivated primarily on the basis that it was a knowledge intensive medium-sized multinational organization that encompasses a wide variety of functional competences, such as system architecture, programming, management consulting, art direction, human computer interface. At the time of this study, Icon had 28 locations across Asia, the US, and Europe. One additional reason for choosing Icon is that its employees in all functional areas are extremely adept at using electronic knowledge resources, such as bulletin boards, chatrooms, and email, and use these to a high degree in their everyday work. A web-based questionnaire was administered through the company’s intranet to all employees of Icon. Individuals who were currently on leave of absence, working only part-time, or were independent consultants working for the company were eliminated from the respondent pool since their networks would not be comparable to those employees who were actively working full-time for the organization. The resulting number of total potential respondents was 1698. We received 1439 completed surveys for a response rate of 84.7%, a level considered to be high enough to perform sociometric network analyses.

As part of the survey, we collected demographic and organizational data to determine network diversity. To determine network centrality, respondents indicated: 1) “In general, which persons inside Icon do you contact for help or advice when you are not sure what to do with your work, i.e., for help or advice related to your tasks and not your administrative activities?” and 2) “In general, who contacts you in the same way?” To assess electronic knowledge resource usage, the respondents were asked questions about their use of internal and external electronic knowledge resources that were then broken down into codified/static resources such as documents and interactive resources such as electronic communities.

These data will be used to create different social network matrices assessing each variable at the dyadic level. For instance, the network diversity in terms of age will be assessed by subtracting actor j’s age from actor i’s, such that Xij = difference in actors’ ages. All of the network diversity variables, i.e. age, gender, education, experience, tenure, hierarchy, location, and functional divisions, will be measured in this way.

Centrality will be measured by creating social network matrices identifying individuals’ advice networks. We will compute both in-degree and out-degree centrality for each individual.
Electronic knowledge resource usage will also be assessed by creating social network matrices, looking at the difference in the frequency of usage across actors $i$ and $j$.

Individual performance was self-rated from multi-item scales as part of the survey. This data will be entered into a social network matrix, similar to diversity and electronic knowledge resource usage, assessing the difference score across actors $i$ and $j$.

To date, the survey has been administered and we are in the process of creating the social network matrices of the different measures.

QAP (quadratic assignment procedure) regression analyses will be used to test the hypotheses using UCINET (Borgatti, Everett, & Freeman, 1999). QAP is the most frequently used technique for handling network correlations because it has been found superior to other techniques (such as OLS or GLS) for testing regression hypotheses based on network data where observations are correlated and stored in matrix form. We will use hierarchical regressions to investigate the impact of network position and electronic knowledge resource usage above and beyond network diversity on individual performance.

CONCLUSION

So, is it who you know, where you are, or where you look that explains differences in individual performance? This is the question that we aim to investigate through this research. This research contributes to the current state of the field in three ways. First, we empirically test a long-standing debate in social network theory as to what matters more: network diversity or network position for individual performance. Should we find that network diversity matters this would indicate that managers could use interventions that connect diverse sets of people, such as creating cross-functional teams along those resources that were significant. Second, we examine the largely ignored implications of electronic knowledge resources on the importance of personal social networks for individual performance. If electronic resources matter, managers could emphasize the creation of electronic networks over social networks to generate knowledge flows. Finally, we propose to test the hypotheses using social network matrix data and QAP, introducing a novel and relevant method to the study of information systems.

REFERENCES