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An Investigation of the Structural and Relational Characteristics of Social Networks on Knowledge Exchange and Performance

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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. Research has demonstrated that relationships are critical to knowledge exchange, yet we know little about the specific characteristics of relationships that affect access to different types of knowledge. Additionally, while prior research has focused on relationships based on face-to-face communication, with advances in information and communications technologies, individuals can just as easily seek knowledge through computer-mediated communication, changing the nature of the relationships that facilitate knowledge exchange. Therefore, our quest is to better understand how technology influences knowledge exchange, how the attributes of the relationships between individuals influence knowledge exchange, and how having access to different types of knowledge affects individual performance in organizations. Data will be gathered and analyzed in network form, using social network analysis techniques. Structural equation modeling will be used to test the hypothesized path model.

Keywords

Social Network, Structural Ties, Relational Ties, Performance, Centrality, Knowledge Exchange

INTRODUCTION

In knowledge-intensive work, individuals who can make full use of knowledge resources are likely to be more innovative, efficient, and effective in the workplace. In order for organizations to leverage the knowledge of its employees, the organization must understand what influences the exchange of knowledge. Knowledge exchange is the process where individuals mutually exchange their knowledge and jointly create new knowledge. Access to knowledge is not dependent primarily on the attributes of an individual, but is facilitated by how individuals are connected to others.

Research has shown that relationships are important for the exchange of knowledge, therefore knowledge exchange is fundamentally a social process. Given the centrality of social interaction as a vehicle for knowledge exchange, it is important to better understand these processes from a social network perspective. In social network theory, researchers have found that the interactions between individuals create patterns of relationships that produce a network structure. This research suggests that individuals who occupy more central positions than other individuals in social networks are more likely to have access to knowledge resources as well as have the ability to influence or be influenced by others.

Granovetter (1992) noted that relationships are characterized not only by who is connected to whom, but also in the quality of relational content of the tie, making the distinction between the structural and relational ties. Characteristics of structural ties refer to the overall pattern of connections between network members—that is, how you reach others (Burt, 1992). The relational tie characteristics, in contrast, refer to quality of these relationships. We focus on the individual networks created through personal and electronic structural ties and the relational characteristics of the relationship between a knowledge seeker and the source.

In social network literature, research on networks and relationships have focused either on structural characteristics associated with effective knowledge exchange (Borgatti & Cross, 2003) or how relational characteristics affect access to knowledge resources (Levin & Cross, 2004). Few researchers have looked simultaneously at the impact of structural and relational characteristics on knowledge exchange. Our focus is on both the structural and relational characteristics associated with knowledge exchange for the completion of one's work.

The literature has failed to acknowledge that in addition to structural and relational ties, individuals may now effortlessly access and exchange knowledge through numerous electronic communication technologies. It has become more common for people to communicate using various forms of communication media, such as computer-mediated communication (CMC). Research has shown that people engage in interactions, build relationships, share knowledge, and request advice using communication technologies (Wasko & Faraj, 2005). Thus, while prior research has examined knowledge exchange through interpersonal, face to face relationships, we know significantly less about how increasing the amount of information sources and communication channels employees have available affects knowledge exchange, resulting in an improved level of performance for both the individual and the firm.

The objective of this research is to develop and empirically test a model that investigates the relationship between structural and relational ties and knowledge exchange and the impact on job performance. Therefore, the research questions are as follows:

1. How do structural tie characteristics impact knowledge exchange?
2. How do relational tie characteristics impact knowledge exchange?
3. How does access to knowledge impact individual performance?

THEORETICAL FOUNDATION

Social network theories, such as social capital, focus on the value of social relationships inherent in networks. Several scholars have conceptualized a social network as a set of social resources embedded in relationships (e.g., Burt, 1992; Tsai & Ghoshal, 1998). Bourdieu defines social capital as “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition” (1986, p. 405). Bourdieu's definition is important because it distinguishes between two critical elements: (1) the social relationship itself that allows actors to claim access to resources possessed by their associates; and (2) the amount and quality of those resources. For the purposes of this research, the social relationships examined are based on structural (communication channel) and relational tie characteristics (quality of the relationship between seeker and source), and the resource being exchanged is knowledge.

Structural Ties and Knowledge Exchange

Structural ties refer to overall pattern of connections between actors—that is, who you reach and how you reach them (Burt, 1992). Network structure facilitates interactions and communications for the exchange of knowledge. Characteristics of the structural tie include the different types of communication media: face-to-face, email, and discussion forums. In this study we consider each of the structural tie characteristics as a separate network. Individuals who have lots of relationships take on central positions in the structural tie network. Centrality in the structural network indicates that individuals can exert more influence by virtue of being linked with a larger number of people in the network. They are more likely to be connected with other powerful actors in the network, potentially receiving and exchanging knowledge of higher quantity and quality than less central individuals. Thus, centrality in the structural tie network will influence knowledge exchange.

Hypothesis 1: Individual centrality in the structural tie networks will be related to knowledge exchange.

Relational Ties and Knowledge Exchange

The decision to seek knowledge from someone in the face of a new problem or opportunity is likely affected by the quality of one's relationship with the source of the knowledge. Prior research on knowledge seeking indicates that factors such as the seeker's perception of the source as an expert in the area, available, and trustworthy facilitate more effective exchanges of knowledge (Nevo, Benbasat & Wand, 2003). An individual is more likely to seek and exchange knowledge from a source that the individual is aware has the expertise to help in the situation (Borgatti & Cross, 2003). Individuals tend to seek help from network members who they are relationally tied whether they are located in the same organization or not (Nevo et al., 2003). Individuals may seek help from members that they interact with frequently because they have developed a trusting relationship (Cross & Cummings, 2004). For the purpose of this study, we suggest that relational tie characteristics can be characterized along three dimensions: expertise, availability, and trust. We predict that an individual central in the relational tie network is more likely to have access to various types of resources and to exchange knowledge.

Hypothesis 2: Individual centrality in the relational tie networks will be related to knowledge exchange.

Knowledge Exchange and Performance

Knowledge resources refer to the knowledge and knowing capability of individuals (Nahapiet & Ghoshal, 1998). Knowledge is a multifaceted concept with multilayered meanings. Research has established two dimensions of knowledge – “know-what” and “know-how”. “Know-what” or information refers to knowledge that is transmittable in formal, systematic language. On the other hand, “know-how” or advice has a personal quality, which makes it hard to formalize and communicate. While knowledge varies along these two dimensions, knowledge also varies in terms of content—organizational and technical—and both are relevant for understanding individual performance in organizations (Shah, 1998). Organizational knowledge is relevant to organizational assimilation, to adapting to a firm’s culture, and being integrated into its social system. Technical knowledge is required for the completion of one’s work. An individual’s coordination, communication, and performance improve as a result of having greater access to knowledge resources. Tsai and Ghoshal (1998) identified that individuals who are more central in knowledge networks tend to perform better. Centrality in a knowledge network reflects one’s ability to take action on new opportunities by leveraging others’ expertise. Thus we suggest that a central position in the knowledge network can affect performance by increasing the likelihood of obtaining relevant knowledge to solve novel problems.

Hypothesis 3: Individual centrality in the knowledge networks will be related to higher individual performance.

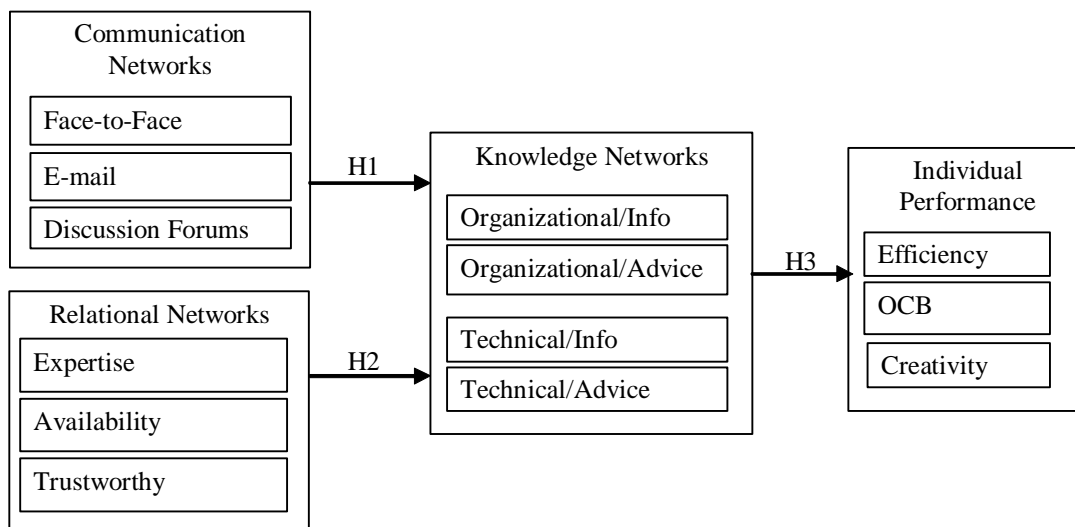


Figure 1. Research Model

METHODOLOGY AND RESEARCH DESIGN

The data for this research will be collected by surveying employees from a single multinational pharmaceutical firm, known as PharmaCo. The choice of PharmaCo was motivated primarily because it is a knowledge-intensive, medium-sized, multinational organization. The population consists of 14,000 R&D scientists. The sample is based on project area which results in approximately 1500 respondents. We use twelve name generators to prompt respondents for their work-related contacts. We ask respondents to name at least five co-workers with whom they regularly seek information or advice for each of the networks.

A web-based survey will be administered to the employees of PharmaCo. Survey-based studies of social networks typically use one of two approaches to collect data about relationships. For studies where the network boundaries are clearly defined and the populations are relatively small, a roster method may be used, where a full list of potential contacts is presented to the respondent to minimize loss due to poor recall. These data will be used to create different social network matrices assessing each variable at the individual level. An individual’s centrality will be measured from these social network matrices, and then used as an attribute variable to formally test the hypotheses.

Individual performance is complex and has been studied from multiple perspectives. In knowledge intensive work, innovation is critical for individual performance. However, knowledge workers must also be able to complete tasks efficiently and on time. Finally, knowledge workers benefit the organization when they engage in organizational citizenship behaviors. Therefore, this study examines all three dimensions as different indicators of individual performance. These will

be measured using a multidimensional approach. First, we have a multi-item survey for self assessment, adapted from Williams and Anderson (1991) and Teigland and Wasko (2003). These items ask to what extent an individual performs on a five-point Likert scale.

Second, to better understand the network relationships of all network members, we ask each person to complete a name generator for each of the performance constructs: efficiency, organizational citizenship, and creativity. For example, we asked each person to "Please name at least five (5) coworkers on project XXXX who perform the most efficiently (complete work in a timely and effective manner)". Each respondent will also be asked to indicate the frequency of communication with each contact. For example, "how often they turned to each person in the past three (3) months" (1, "once a day," to 7, "once every 3 months") (Levin & Cross, 2004).

We examine three types of structural ties: face-to-face, email, and participation in discussion forums using the same name generator technique. For example, for face-to-face we asked each person to "Please name at least five (5) coworkers on project XXXX with whom you regularly seek information/advice through face-to-face communications." Each respondent will also be asked to indicate the frequency of communication with each contact.

We examine three types of relational ties: awareness of the source's level of expertise, perceptions about his/her availability, and the extent to which the seeker trusts the source. For example, for expertise we asked each person to "Please name at least five (5) coworkers on project XXXX that have the greatest expertise in the knowledge domain of this project" (Nevo et al., 2003). Each respondent will also be asked to indicate the frequency of communication with each contact.

We examine four types of knowledge: organizational/information, organizational/advice, technical/information, and technical/advice. For example, for organizational/information we asked each person to "Please name at least five (5) coworkers on project XXXX who are most knowledgeable about organizational information related to the project (such as information regarding specific work responsibilities, procedures and policies)." Each respondent will also be asked to indicate the frequency of communication with each contact.

While the study examines the relationships between relevant network structures and performance, it is important to also include the demographic factors of the network members. We collect each person's age, gender, position in organization, tenure in organization, tenure in position, tenure in industry, education, nationality, and physical location (which office they work in). All of these will be used to construct control variables.

Structural equation modeling will be used to test the hypotheses. SEM techniques are second-generation regression techniques that include measurement error in the estimation of the model, and allow for the testing of complex path models. SEM is characterized by two basic components: (1) the measurement model and (2) the structural model. The measurement model provides for the assessment of the contribution of each scale item as well as how well the scale measures the concept (reliability) into the estimation of the relationship between dependent and independent variables. The structural model is the "path" model, which relates independent to dependent variables.

CONCLUSION

This study contributes to the current literature in several ways. The first contribution is that this study examines the impact of technology on how people access knowledge. The second contribution of this study is that it examines multiple dimensions of structural and relational networks and the differential impact on knowledge exchange. The third contribution is that this study examines multiple dimensions of knowledge: information (know-what), advice (know-how), organizational, and technical. Incorporating knowledge research into a network framework allows one to investigate how attributes of the relationships between people affect what type of knowledge is exchanged. Finally, few social network researchers consider the final link between network position and actual performance. This study examines the actual link between knowledge and multiple dimensions of individual performance: efficiency, organizational citizenship, and creativity measures for individual performance.

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