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Knowledge Acquisition and Transfer Among Engineers: Effects of Network Structure

Tonya Boone* and Ram Ganeshan

Mason School of Business, College of William and Mary, Williamsburg, VA, USA

This paper examines the association between the structure of formal intra-firm networks and productivity. We focus on two network structure components—department centralization and centrality, within a four department engineering organization. Centrality indicates the number of connections between one department and others within the organization, while centralization captures how much of those connections are concentrated among the workers within the department. Both of these represent specific managerial decisions in a formal network structure. We use learning curve theory to measure accumulated organizational knowledge, its depreciation and intra-firm transfers. We hypothesize that the departments are more productive, experience less depreciation and realize more knowledge transfer if they have more intra-firm connections among more workers. The findings suggest a significant yet moderate association between the formal network structure and productivity. Copyright © 2008 John Wiley & Sons, Ltd.

INTRODUCTION

The importance of knowledge management to organizational performance is well documented (Conner and Prahalad, 1996; Hansen *et al.*, 1999; Zack, 1999). According to knowledge-based theory of organizations, the better an organization manages the knowledge that resides individually and collectively among their employees (its 'knowledge stock'), the better its performance. Three general capabilities comprise organizational knowledge management: the acquisition of outside knowledge by the organization; processes for retaining and storing the existing knowledge stock; and the internal dissemination of organizational knowledge (Adler and Clark, 1991; Darr *et al.*, 1995). This paper focuses on the internal dissemination of organizational knowledge, commonly known as knowledge transfer.

Intra-firm knowledge transfer has received increasing attention in the organizational learning and knowledge management literatures (Darr *et al.*, 1995; Reagans and McEvily, 2003; Uzzi and Lancaster, 2003). Intra-firm knowledge transfer is a challenging process because the most important organizational knowledge—especially in professional services such as engineering—resides in people. Thus, organizations must capture the knowledge residing in individuals and transfer it to other relevant users. The transfer process is frequently 'sticky' and incomplete, with relevant knowledge misdirected or surrounded by spurious information (Zander and Kogut, 1995; Szulanski, 1996; Ruggles, 1998). Knowledge transfer capabilities also play a significant role in an organization's knowledge acquisition process. In effect, external knowledge is absorbed by the

*Correspondence to: Mason School of Business, College of William and Mary, PO Box 8795, Williamsburg, VA 23187, USA.
E-mail: Tonya.Boone@business.wm.edu

organization through a variety of processes (Cohen and Levinthal, 1990). This knowledge is then disseminated through the larger organization. Knowledge transfer is an ongoing process which must be repeated continuously if an organization is to successfully manage its knowledge stock.

In this paper, we examine how formal intra-firm networks affect knowledge acquisition and within firm knowledge flows. Building on previous work which addresses the association between network structure and intra-organizational knowledge transfer (Midgley *et al.*, 1992; Reagans and McEvily, 2003; Uzzi and Lancaster, 2003), we focus our attention on two social networks dimensions: department centrality and department centralization. Department centrality indicates a department's connectedness to other departments within the organization. Highly connected departments have more interactions and on-going relationships, i.e., ties, with other departments within the overall organization. Hence they may be more important—or central, to the overall firm network.

Department centralization measures how inter-departmental connections are dispersed throughout the department. It indicates the degree to which one or a small number of individual accounts for most of a department's ties. A variety of intra-departmental structures may support its centrality. Department centralization indicates how the individuals within the department support its centrality or connectedness. For example, a department with high centrality (lots of connections to other departments) may have high centralization (connections are concentrated among a few individuals).

We propose that the department centrality and centralization have significant implications for the way that knowledge transfers into and out of departments.

We conduct this investigation using methods from the literature on organizational learning. Organizational learning focuses primarily on the mechanisms for improving performance through production experience. Accordingly, production experience measures an organization's knowledge stock, which can then be used to predict performance, typically measured as organizational productivity. A consistent finding, in both literatures, is that knowledge management and organizational learning capabilities vary among and within organizations. A more capable organization will be able to exploit its existing knowledge and experience to be more productive than a less capable organization.

Our investigation is pursued using empirical data from several departments of a professional service organization. In earlier work, we identified significant differences in learning rates, knowledge depreciation and knowledge transfer among the departments (Boone, 2002). With this paper, we aim to uncover factors that may explain some of the observed knowledge process asymmetries within this organization. The results contribute to a growing theory on the association between organizational network structures and the organizational knowledge management processes. Decision makers can use the insights of this growing body of research to better manage how their employees acquire, retain and transfer knowledge; mitigating the risk of a 'knowledge shortfall' or an organizational performance failure.

The paper is organized as follows. The next section discusses the research literature that supports the hypotheses examined in the study. The following section describes the methods. Following that are the findings and a discussion of the results. We conclude with a discussion of the implications and future work.

BACKGROUND AND HYPOTHESES

Knowledge Transfer, Type of Knowledge and Network Structure

Nonaka (1994) characterizes two types of knowledge, explicit and tacit, which have critical implications for the ease of knowledge flows. Explicit knowledge—that which can be captured in words, rules, or norms, is more easily organized and communicated via a variety of means (Polanyi, 1967; Nelson and Winter, 1982; Winter, 1987; Nonaka, 1994). Thus, explicit knowledge is more easily codified for capture and storage. Successful management of explicit knowledge is a basic requirement of organizational knowledge management. It relies, however, more heavily on technology in the form of databases, company routines and processes (Leonard-Barton, 1995). Thus, the role of an organization's social network will be primarily to diffuse information about the contents of databases, facility of routines and implications of processes and norms. In other words,

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explicit knowledge transfer can occur without direct interaction between individuals in the network. For example, one worker may add his or her knowledge to a organizational database which is then retrieved by another worker without any direct contact between the workers. Transfer of explicit knowledge is necessary, but insufficient for successful knowledge transfer. Complete knowledge transfer requires dissemination of explicit and tacit knowledge.

Tacit knowledge is more tightly linked to individuals and their personal experiences (Cohen and Levinthal, 1990; Song *et al.*, 2003). It is difficult to articulate in words or represent in rules or norms, and as a result can be more difficult to capture, store and share. Transfer of tacit knowledge is optimally supported by interactions between individuals (Argote and Ingram, 2000). Consequently, we expect that the structure of the intra-firm social network will be critical to the transfer of tacit knowledge. Firms use a variety of mechanisms to enhance interactions between workers, and thus enable tacit knowledge transfer. These may include apprenticeships, internships, and periodic or rotating appointments to different departments, locations and shifts. These mechanisms provide workers with hands-on experience, but also alter the informal social network of the firm. When a worker rotates into a new department, he or she interacts with and forms some ties with workers in the new department. Some of these ties persist as the worker rotates back to his or her own department. This increases the number of inter-departmental ties, and consequently improves the resiliency of the organization's overall social network (Burt, 1992).

Nonaka (1994) proposes a recursive knowledge management processes supported by a strong interplay between explicit and tacit knowledge. Tacit knowledge is created or acquired, then transferred through shared work experiences. Workers then attempt to create explicit knowledge from their experiences for others in the organization. Other workers then internalize this knowledge and combine with their own knowledge to create additional tacit knowledge, and the pattern repeats. The social network structure of the firm is critical to this model. Knowledge, whether explicit or tacit, initially occurs at the individual. The organization then assimilates that knowledge through interactions between workers. The workers create organizational routines, rules, norms, relationships, etc., which are in turn disseminated to individuals throughout the organization. Individuals then adopt and adapt organizational knowledge creating new knowledge in the process which is then captured by the organization. All of these processes rely on the interconnections within the firm. Previous literature (Reagans and McEvily, 2003) suggests that the more interactions that exist between departments or workers, the better and faster will be the diffusion of knowledge.

Knowledge Transfer and Departmental Communities

Community of practice has been used to conceptualize the relationships among individuals inside and outside of firms who have common interests, skills and experiences, and who interact regularly (Lave and Wenger, 1991). This perspective argues that the character of the relationship among network entities, i.e., individuals, accounts for the quality of the network structure. Communities of practice may cross organizational borders, but generally support organizational structures. They may or may not comprise all individuals within a given department. Community of practice is arguably a helpful rubric for understanding some of the factors that impede and facilitate knowledge flows. Individuals with similar professional experiences and training will communicate more easily than workers with different experiences and backgrounds (Goldhar and Jelinek, 1985; Leonard-Barton, 1995). Workers with similar professions, backgrounds and training tend to share the same skills, jargon and knowledge base, all of which make communication easier (March *et al.*, 1996). This allows for easier sharing of explicit and tacit knowledge. Reagans and McEvily (2003) found that knowledge transfers more readily between individuals when they belong to more cohesive networks. In other words, knowledge transfer was eased when there are more ties between individuals.

From a network theoretic point of view, structures, training, experiences and backgrounds potentially indicate the quality of network connections. Departments or individuals with similar markers would experience easier or enhanced communication. This enhanced communication would in turn be indicative of stronger ties between the departments or individuals which would tend to increase knowledge transfer among

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workers. Knowledge transfers more frequently and easily among organizations that share similar knowledge bases, organizational structures and policies (Lane and Lubatkin, 1998).

Formal and informal boundaries, e.g., formal organizational structures, informal alliances and communities or distance (Brown and Paul, 1996), between individuals and organizational units would impede the flow of explicit and tacit knowledge. Network boundaries channel knowledge flows inefficiently and make it more difficult to assimilate and disseminate network knowledge. Consequently, networks with fewer internal boundaries will experience more frequent, rapid and richer knowledge transfers, comprised of both tacit and explicit knowledge (van Dierdonck *et al.*, 1991; Rothwell, 1994). Conversely, organizations with lots of structural boundaries must thus work harder to capture knowledge from disparate entities and make it available to the entire organization (Burt, 1992). The work of Reagans and McEvily (2003) suggests that increasing the interactions between individuals on different sides of organizational boundaries may compensate for the negative boundary effects.

Finally, the individual workers play a critical role in the knowledge transfer process. Individuals must be willing to share what they know, and to seek out, and adopt organizational knowledge (Nonaka, 1994). A worker's willingness to participate in organizational knowledge management processes is one aspect of the individual's connectedness to the social network (Levin and Cross, 2004). An individual's centrality, i.e., the degree to which he or she is connected to others in a network (Wasserman and Faust, 1994)—has been associated with individual performance (Sparrowe *et al.*, 2001), promotions (Burt, 1992), power and influence (Brass, 1984; Friedkin, 1993). Individual and department centrality determines information access, as well as information quality. The more connected individuals will be privy to more knowledge, information which they can use to improve performance.

Hypotheses

Departmental centrality influences the volume and quality of knowledge acquired by an organization's individuals who will in turn determine the volume and quality of knowledge assimilated by the organization. In the context of this study, departments with more workers with relatively higher centrality will benefit from their workers connections by itself realizing higher centrality. We propose that higher departmental centrality will yield department level performance benefits.

We expect that departmental centrality increases productivity improvements indirectly through knowledge transfer. Relatively higher centrality means more interactions through which the workers can access and accumulate production-based knowledge. Centrality would then magnify the effect of imported knowledge on department productivity. So with more connections we expect that the department will transfer in more knowledge. That knowledge will then be assimilated and used to improve the department's performance. The result is an increase in productivity improvements. Formally stated:

H1: Department centrality is positively associated with productivity improvements.

Departments may realize relatively high overall centrality by concentrating the external connections among a few workers. Departmental centralization describes the extent to which departmental interactions are concentrated among a few individuals (Wasserman and Faust, 1994). Little work has examined the relationship between department centralization and performance. Sparrowe *et al.* (2001) found that high centralization did not contribute positively to department performance.

We expect departmental centralization to act on departmental productivity in two countervailing ways—by reducing knowledge depreciation and limiting inter-departmental transfer. The first will increase productivity improvements while the second will slow it down them. We hypothesize that, inter-departmental knowledge transfer will have a stronger effect than the knowledge depreciation, i.e., that the reduction in knowledge depreciation will not be able to overcome the negative effects on inter-departmental knowledge transfer. The ultimate consequence is expected to be a decrease in productivity improvements.

A significant portion of knowledge depreciation is due to the friction of transferring knowledge among people, across time and among production processes. In effect the transaction cost of accumulating, assimilating, storing and disseminating organizational knowledge is a loss of some of the knowledge. Most individuals in highly centralized

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departments will have fewer and less frequent inter-departmental interactions. Most interactions will be concentrated among a few individuals with relatively high centrality. This would act to reduce knowledge erosion due to transferring transactions.

On the other hand, relatively higher centralization would mean fewer people to act as conduits for channeling and processing external information. Knowledge spill conveys significant performance benefits. For example, Lieberman (1984) found that transferred knowledge accounted for a greater proportion of cost improvements than in-house experience. High centralization is also a fairly risky approach for department management. It conveys considerable power to the well-connected individuals who can access more resources, and impose more influence on departmental decisions (Brass, 1984; Friedkin, 1993). Ultimately, we expect that reducing the number of workers with significant outside interactions would actually undermine experience-based productivity improvements. The consequence would be reduced productivity improvements. Stated formally:

H2: Department centralization is negatively associated with productivity improvements.

In sum, we propose a model in which department centrality and centralization are associated with productivity improvements. Department centrality acts indirectly through transferred knowledge to increase productivity improvements. Department centralization acts indirectly through knowledge depreciation to increase productivity improvements, and through transferred knowledge to decrease productivity improvements. The hypothesized net effect of department centralization is to undermine productivity improvements.

METHODOLOGY

Data were collected from a multi-disciplinary professional service organization, comprised of four departments: architects, electrical, mechanical and civil engineers. The organization operates in a project process environment, creating drawings, technical specifications and cost estimates to meet customer requirements. Some of the projects require input from more than one department. In such cases, a multi-disciplinary project team collaborates on the project. The departments are relatively homogenous in terms of skills and work-related backgrounds.

Performance is measured via the production progress function. In general, the function relates improvements in productivity to accumulated production experience (Wright, 1936). In our case, production experience is used to measure the accumulated knowledge stock. Several researchers have used production experience as a proxy for organizational knowledge (Darr *et al.*, 1995; Epple *et al.*, 1996). The progress function theorizes that as an organization gains experience—or in our case organizational knowledge, it is able to complete projects more quickly. In other words, organizational knowledge is reflected in improving productivity. This makes the progress function an appealing measure as it provides a broad indication of organizational knowledge stock, reflecting both tacit and explicit knowledge levels.

The progress function is most often applied to manufacturing operations, but has proven robust enough for application in some services as well (e.g., Dutton and Thomas, 1984; Argote and Epple, 1990; Reis, 1991). Nevertheless, the high labor intensity, product variability and small production volumes of this professional service operation, to some extent limit the productivity improvements captured by the progress function.

We collected data on 12 years worth of engineering and architectural projects. The data indicated the employee and department working on each project. We assessed connections by counting the number of collaborations between every pair of individuals in the organization. Although this allows us to assign values to every relationship, we used a binary matrix which indicated whether or not two workers had collaborated on a job for the analysis.

We computed degree centrality scores for each individual. Degree centrality sums the number of projects that the focal individual has formally collaborated on with every other worker (Wasserman and Faust, 1994). A worker with a higher centrality value will have formally collaborated on projects with more people than a worker with a lower centrality value. Department centrality was computed in a similar fashion—by summing the number of projects that workers in the focal department have formally collaborated on with workers in the other departments.

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Department centralization indicates the variability in individual centrality within the department. It was determined by dividing the sum of the differences between the largest departmental centrality score and all other centrality values in the department by the theoretical maximum possible sum of differences in individual centrality (Freeman, 1979). This value equals zero when all workers are equally connected, and approaches one as one worker deviates significantly from the others (Wasserman and Faust, 1994). Centrality and centralization were calculated using the UCINET social network analysis package (Borgatti *et al.*, 2002).

To determine whether the two network structural variables, department centrality and centralization, are associated with knowledge retention and transfer, department productivity improvements were calculated using the production progress function (see Boone, 2002). First, the number of projects completed by each department for every month over the data set horizon was tallied. Department productivity is predicted by labor hours and the current knowledge stock. Let q_{it} represent the number of projects completed by a department i in time t, where every time period t equals one month. Direct labor hours expended by the department during time t is represented by l_{it}. The inclusion of labor hours allows us to control for the effect of fluctuating work levels, and to a lesser degree the varying amounts of work expended on different projects. Then k_{it} represents the current stock of knowledge possessed by said department at time t—subject to depreciation. Past researchers have found significant knowledge depreciation, especially in service operations (e.g., Darr *et al.*, 1995). Thus, our model weights accumulated knowledge to indicate that not all production-based knowledge is carried forward over time. The base centralization model without interaction terms is

$$\ln q_{it} = \alpha \ln l_{it} + \beta \ln k_{i,t-1} + \gamma \sum_{j=1, j\neq i}^{4} \ln k_{j,t-1} + \delta c_i + \varepsilon_{it},$$

where c_i is the centralization of department i. For this study, there were four departments, and the 12 years of data were divided into months.

$$k_{i0} = 0,$$
$$k_{it} = \lambda_i k_{i,t-1} + q_{it},$$
$$0 \leqslant \lambda \leqslant 1.$$

We assume that department knowledge stock is zero at time $t = 0$. The λ parameter represents the proportion of knowledge from previous periods carried forward to the current period, i.e., knowledge depreciation. For example, if $\lambda = 1$, then all knowledge from accumulated production is carried forward with no depreciation. Although we expect significant knowledge depreciation (see Boone, 2002), we still expect a significant association between the knowledge stock and productivity.

c_i = department centralization.
$\alpha, \beta, \gamma, \delta$ = estimates of labor hours, depreciated knowledge, transfer and centralization, respectively.
ε_{it} = estimation errors.

Past researchers have found external knowledge transferred into an organization to be associated with productivity improvements (e.g., Szulanski, 1996). Our model's knowledge transfer term estimates the association between each department's productivity and the accumulated knowledge in other departments. In fact, as indicated in the earlier discussion transferred knowledge is a critical factor in the hypothesized association between productivity improvements and network structure.

The base model for testing the association between centrality and productivity improvements is

$$\ln q_{it} = \alpha \ln l_{it} + \beta \ln k_{i,t-1} + \gamma \sum_{j=1, j\neq i}^{4} \ln k_{j,t-1} + \delta y_{it} + \varepsilon_{it},$$

where y_{it} is the centrality calculated for department i at time t, and the other terms are as specified earlier.

RESULTS

The entire organizational network consists of 112 workers in four departments. There were 10 isolates, workers with no collaborative projects and thus no connections to the larger network. There were six pendants, workers with only one

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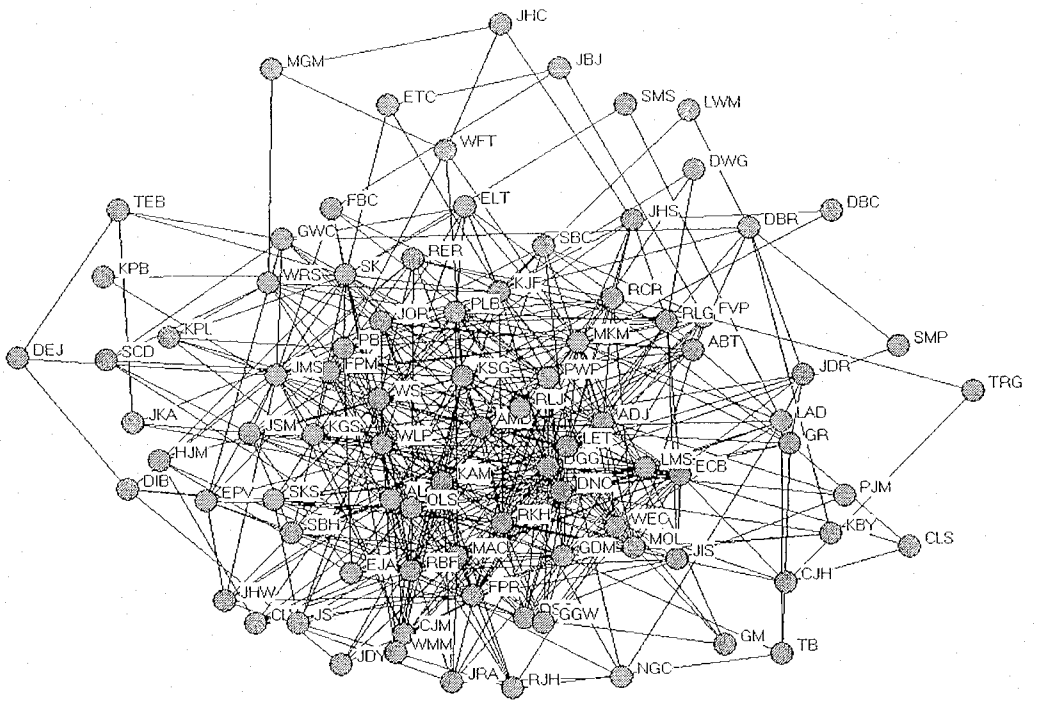

Figure 1. The social network of all employees (sans pendants and isolates).

connection to the rest of the network. Figure 1 depicts the network without these workers. The mean degree centrality is 13.59, which means that the average worker had a little over 13 collaborative projects with other departments. The most connected worker had 32 direct connections to the overall network, or 32 collaborative projects during the time frame studied.

Table 1 presents the results (the least-square estimates and the corresponding p values) testing the relationship between department centrality and performance. There is moderate support for the first hypothesis. The first model indicates that there is a significant and positive association between department centrality and productivity at the 0.001 level of significance. The parameter estimate is 0.011, substantially smaller than the parameter estimates for labor hours, depreciated knowledge stock and transferred knowledge. However, when the centrality–knowledge transfer interaction term is included in the model the centrality term becomes insignificant. The parameter estimate for the interaction term is significant at 0.001, and at 0.007 the magnitude is smaller than that of the direct term.

Table 2 presents the results of the regression analysis testing the relationship between department centralization and performance. There is no significant relationship between centralization and productivity, either directly or indirectly. The parameter estimates are negligible and insignificant for the full and reduced models. The second hypothesis is not supported.

Table 1. Results of Association Between Centrality and Department Productivity

	I	II	III
Labor hours	0.440***	0.444***	0.544*
Depreciated knowledge stock	0.430***	0.402***	0.416*
Transferred knowledge	0.163*	0.071	
Department centrality	0.011***	0.020	
Transferred knowledge × centrality		0.007***	0.001**
Depreciated knowledge × centrality			−0.009
SSE	67.59	66.72	66.07
R^2	0.73	0.74	0.74

***$p < 0.001$ (all models), **$p < 0.01$, *$p < 0.1$.

DISCUSSION

The results support the hypothesized relationship between department centrality and productivity

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Table 2. Results of Association Between Centralization and Department Productivity

	I	II
Labor hours	0.464*	0.529*
Depreciated knowledge stock	0.548*	0.466*
Transferred knowledge	0.031**	
Department centralization	0.004	0.005
Transferred knowledge × centralization	0.002	
Depreciated knowledge × centralization	0.000	
SSE	68.76	66.54
R^2	0.74	0.74

***$p<0.001$ (all models), **$p<0.01$, *$p<0.1$.

improvements. Departments with higher centrality had higher productivity than departments with lower centrality. These results may suggest that the goal of management should be to support the number of inter-departmental interactions.

Although centrality has some direct effect on productivity, it appears to work primarily by enhancing inter-departmental knowledge transfer. The organization divided into distinct departments creates formal organizational boundaries which stymie knowledge transfer. Higher centrality represents more interactions which yield more opportunities for circumventing these boundaries. The more workers collaborate on projects, the more they learn from one another and bring those benefits into the organization. This is in accordance with the results of earlier studies (e.g., Burt, 1992; Reagans and McEvily, 2003) which have found that individuals who have broader informal networks are more effective at transferring knowledge. They are able to draw on diverse knowledge and skill bases in order to translate knowledge for others. This study suggests that the workers benefit less from formal network ties.

Reagans and McEvily (2003) examined the effect of informal network structures. This study focuses solely on formal network relationships. The findings illustrate the limitations of formal organizational relationships, while underscoring the importance of informal relationships in creating strong interpersonal ties. The formal interactions in our study provided markedly less support for knowledge transfer when compared to the support that strong informal interactions provided for knowledge transfer that Reagans and McEvily found. The studies together suggest that organizations must support informal informational networks that span organizational boundaries to maximize knowledge transfer. Moreover, collaborative projects may be necessary, but are not sufficient to achieve the most benefits.

Centrality would only affect the front end of the knowledge management model proposed by Nonaka (1994). More connections suggested by higher centrality would increase socialization; there would be more collaborative activities for information sharing. More centrality might have some effect on externalization or knowledge translation. On the other hand, the small magnitude of the centrality parameters might signal the difficulty of communicating across professions. Each department represents a distinct profession with its own language. A significant part of the knowledge transfer process would be translating the professional jargon of other departments. Lower centralization would suggest more people to interpret the experiences of external workers. Centralization, however, is not significantly associated with productivity in this study.

Alternatively, the moderate effect of centrality might indicate that the experiences of other departments while significant, have limited meaning. Because we measured only formal interactions, we cannot gauge of the effects of informal alliances or communities which might more strongly affect productivity. We expect that centrality has limited effects on internalization and combination.

This study found that centrality was not associated with depreciated knowledge. Increased knowledge depreciation represents a potential downside of collaborative work. The inter-disciplinary dialogues associated with collaborative work may reduce productivity as time is spent translating profession-specific jargon and information. Although we expected there to be a moderate positive association between depreciated knowledge and centrality, this was not the case. Instead, inter-departmental collaborations had no effect on depreciated knowledge.

Department centralization, to some degree, represents the way that centrality is enacted within this organization. We found departmental centralization to be deliberate choices on the part of most managers. Some felt that providing all department workers with roughly the same outside interactions was distracting and undermined performance. They preferred to apply a more focused strategy from worker to worker. The heavy interdisciplinary work was concentrated among a few workers. This strategy was riskier because if a highly centralized worker

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left, significant organizational knowledge left with him or her.

Other managers decided to provide relatively equal opportunities for outside connections for all workers. They believed that outside interactions were important learning experiences which accrued valuable knowledge to the department. They also acknowledge that this approach reduced the risk of losing valuable knowledge associated with turnover.

The results did not indicate the superiority of either of these strategies. In other words, the level of intra-departmental centralization was not positively or negatively associated with department productivity. This is consistent with the findings of Sparrowe *et al.* (2001) who did not find a positive association between centralization and job performance among a variety of small work teams. The results suggest that it is more important to optimize the number of interactions between the department and the rest of the organization.

CONCLUSION

This study is important because of the limited research examining the link between network structure and organizational learning and knowledge management processes. The results demonstrate that the volume of interactions is important, although how those interactions are assigned and organized may be less so.

The findings also indicate that while inter-departmental interactions are significant components of organizational learning and knowledge management, what happens within the department remains even more important. People within the same department have the same skills, similar backgrounds and the same professional jargon. Confirming earlier studies, knowledge is more effectively transferred within than across organizational boundaries. A challenge exists in appropriately translating external experiences and making them meaningful to department workers.

One major limitation of this study is that it considers formal interactions only. Informal interactions convey more information on the social norms and processes, e.g., how to circumvent problem people or processes, which may be associated with performance benefits (Podolny and Baron, 1997). We suspect that there is a strong relationship between formal and informal interactions, as the workers frequently form friendly working relationships and must travel to work sites together. We expect that inclusion of informal interactions would only strengthen our findings. This remains an issue for future study. Finally, the small sample size and use of only one site limits the generalizability of the findings. Nonetheless, the results add significantly to the growing discussion of the effects of network structure on productive organizations.

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