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Knowledge Type and Communication Media Choice in the Knowledge Transfer Process

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Many researchers have written that knowledge is the key ingredient in gaining a competitive advantage (e.g., Gnyawali *et al.*, 1997; Kogut and Zander, 1992) and that knowledge is a firm's main inimitable resource (Grant, 1996b). One important implication of this research is that in order for firms to maximize the competitive advantage arising from knowledge, knowledge must be effectively transferred within organizations. What is absent in the literature, however, is information on how organizations accomplish this task (Spender and Grant, 1996). While the importance of research on knowledge sharing has been well documented (e.g., Dodgson, 1993), very little empirical research exists that offers practical guidelines for organizations seeking to manage the knowledge transfer process.

Research on knowledge transfer in organizations has been conducted from a variety of theoretical perspec-

tives including individual psychology, strategic management, and organization theory. The psychology literature has focused on individual knowledge transfer processes and outcomes, such as how task experience affects performance on other tasks or the extent and accuracy of recall (Argote *et al.*, 2000). In contrast, the strategy literature has focused on organizational outcomes like firm success and competitive advantage (e.g., Grant, 1996b; Zander and Kogut, 1995). Zander and Kogut (1995) have shown that increasing degrees of knowledge codifiability and teachability speed knowledge transfer. Organization theory researchers have been concerned with organization forms and how they affect the knowledge transfer process (Darr *et al.*, 1995; Argote *et al.*, 2000). What ties these diverse approaches together is the belief that knowledge transfer within organizations is a key component of organizational learning, a topic that is also

JOURNAL OF MANAGERIAL ISSUES Vol. XIX Number 1 Spring 2007

the focus of considerable attention (Dodgson, 1993).

In this research we propose that one way organizations manage the knowledge-sharing process is to select appropriate communication media for the property or type of knowledge to be transferred. Our survey of 287 employees in five hospitals provides support for our hypotheses, and our results were consistent across three administrative levels: hospital administrators, nursing directors, and staff nurses. Communication media classified as having low-media richness were most likely to be chosen to share information or explicit knowledge, whereas media classified as having high-media richness were most likely to be chosen to transfer know-how or tacit knowledge (Daft and Lengel, 1986; Grant, 1996b; Nonaka, 1991).

In the next sections we discuss the literature that addresses knowledge and knowledge transfer, and develop our hypotheses by building on the strategic management and organization theory literatures. We then present the methods and results of our empirical analysis, followed by a discussion section that addresses the implications of our study for both researchers and managers. Finally, we conclude with a summary of the overall study, limitations, and directions for future research.

THEORETICAL BACKGROUND

Knowledge and Knowledge Transfer

Throughout the 1990s and early 2000s, both researchers and practitioners (e.g., Desenberg, 2000; Govindarajan and Fisher, 1990; Kogut and Zander, 1992; Narasimha, 2000; Zander and Kogut, 1995) have discussed the importance of knowledge

transfer within organizations. The idea that knowledge transfer is necessary to an organization's success has become the focal point of strategy and the strategic planning process (Liebeskind, 1996). Knowledge has emerged as the most strategically significant resource of the firm (Grant, 1996b).

Knowledge may be defined as information whose validity has been established through test of proof and can therefore be distinguished from opinion, speculation, beliefs, or other types of unproven information (Liebeskind, 1996). This definition of knowledge consists of two primary classifications: information (explicit knowledge) and know-how (tacit knowledge) (Nonaka, 1991; Simmonds *et al.*, 2001). Information is knowledge that can be transmitted without loss of integrity once the syntactical rules required for deciphering it are known. Thus, knowledge as information implies knowing what something means, and that it can be written down (Grant, 1996b; Nonaka, 1994). Know-how is more complex than information. Know-how is the accumulated practical skill or experience that allows one to do something efficiently. Know-how has a personal quality that makes it difficult to formalize and to communicate because it involves both cognitive and technical elements and is not easy to write down (Grant, 1996b; Nonaka, 1994).

Knowledge transfer within organizations is one important way for organizational members to learn from one another and to create new knowledge. It may be described as the process through which one organizational unit (individual, group, department, etc.) is affected by the experience of another (Argote *et al.*,

2000). There are many reasons that knowledge transfer is vital to organizations. First, high resource sharing and knowledge transfer may yield a synergistic cost advantage, providing a shared resource at a lower cost if different parts of the organization had produced or created it separately (Brush, 1996; Govindarajan and Fisher, 1990; Gupta and Govindarajan, 1986; Porter, 1987). Second, knowledge transfer enables organizational members to identify and to respond appropriately to critical environmental situations and to adapt more quickly (Zajac and Bazerman, 1991). Third, knowledge transfer allows members to obtain more complete information and to make better informed decisions (Gnyawali *et al.*, 1997). Finally, organizations create new knowledge by integrating complementary knowledge held separately by organizational members (Anand *et al.*, 2003; Grant, 1996a).

In this study, we adopt the organizational learning perspective of Dodgson (1993) who argues that individuals are the primary learning entity in organizations and that it is the individual that creates organizational forms that encourage learning and knowledge transfer. If individuals transfer knowledge to other organizational members, then the organization has learned. Organizational learning results in associations, cognitive systems, and memories that are shared by organizational members (Fiol and Lyles, 1985). Our purpose is therefore to use the theoretical literature to explain how organizations transfer knowledge, and offer managerial implications as a consequence of our empirical analyses.

Many factors are involved in transferring knowledge within organizations. The literature has identified

several characteristics of knowledge, knowledge sources, knowledge recipients, and contextual situations that act to either promote or inhibit knowledge transfer. Additionally, there are a wide range of mechanisms that may be used to share organizational knowledge. As discussed above, a central attribute of knowledge is its tacitness. Imperfectly understood and idiosyncratic features of knowledge increase the difficulty of knowledge transfer and application (Lesser and Fontaine, 2004; Szulanski, 1996). Moreover, knowledge without a proven record of past usefulness may also be more difficult to transfer (Szulanski, 1996).

Relationships between knowledge sources and recipients are also an important determinant of knowledge transfer or diffusion (Strang and Soule, 1998). Cohesion through strong ties such as close social relations, organizational cultures, or a shared superordinate identity promotes knowledge sharing in a number of ways. These include frequent interaction, pressures for conformity, increased trust, and individuals feeling more comfortable sharing knowledge with those belonging to the same group (Kane *et al.*, 2005; Strang and Soule, 1998; Wang and Nicholas, 2005). In addition, weak ties such as those between individuals in overlapping social circles play a role in knowledge sharing through the spreading of news or information (Strang and Soule, 1998).

Characteristics of knowledge providers and recipients that are likely to intervene in the knowledge-sharing process include absorptive capacity, the ability to exploit outside sources of knowledge (Cohen and Levinthal, 1990; Szulanski, 1996), levels of motivation, (Szulanski, 1996), and spa-

tial proximity (Schenkel, 2004; Strang and Soule, 1998). Lastly, variations in organizational contexts with respect to formal structures and systems may affect the number of attempts and outcomes of attempts to transfer knowledge (Szulanski, 1996). Interconnected organizations such as franchises or chains can transfer knowledge more readily across their respective units (Argote *et al.*, 2000).

Firm-specific contexts also affect the choice of knowledge transfer mechanisms. These mechanisms include personnel movement, managerial expatriation, technology transfer, patents, and interorganizational relationships such as joint ventures (Argote *et al.*, 2000; Downes and Thomas, 2000; Wang and Nicholas, 2005). Underlying these organizational-level mechanisms are the important social interaction processes of communication and training. Social processes involve the sharing, combining, and storing of knowledge through natural means such as meals or driving to customer sites, or more formal means such as company meetings or events (Argote *et al.*, 2000; Fontaine and Millen, 2004; Schenkel, 2004).

While there are a variety of influences and mechanisms involved in the knowledge transfer process, we elected to investigate the roles of knowledge tacitness and communication media selection in the knowledge-sharing process. The critical distinction between tacit and explicit knowledge lies in their transferability and suitable transfer mechanisms across individuals, space, and time (Grant, 1996b). Thus, media selection is of particular importance in the knowledge transfer process as media differ in richness, which is the ability of information to change under-

standing within a time interval (Carlson and Davis, 1998; Daft and Lengel, 1986).

Daft and Lengel (1986), in their seminal work on media richness, argued that organizational members could improve performance by matching media characteristics to the needs of the organization. Rich media are personal and involve face-to-face contact, while media of lower richness are impersonal and rely on rules, forms, procedures, or databases. According to media richness theory, messages should be communicated on channels with sufficient and appropriate media richness capacities (Lengel and Daft, 1988). Equivocal messages require media high in immediate feedback (e.g., face-to-face contact or telephone), whereas unequivocal messages can be adequately carried by lean media (such as written documents) (Webster and Treviño, 1995). Messages transferred on channels that are inappropriate to the situation run a higher risk of being ineffective (cf., Carlson and Zmud, 1999) or inefficient. Media richness theory has generally been supported in the literature (Webster and Treviño, 1995), although there is mixed support for its applicability to new communication media such as electronic mail (e.g., Markus, 1994). While other studies discuss the strength of ties and knowledge transfer type (Hansen, 1999; Reagans and McEvily, 2003), this study tests whether or not the richness of the communication media chosen to share knowledge is related to the type of knowledge transferred (information or know-how).

Information is knowledge that is analyzable, which means that the knowledge may be easy to understand because it is universally accepted as

fact and is general in nature. When tasks are analyzable, the uncertainty levels are lower and less complex; therefore, a leaner media selection is sufficient to meet information needs and thus transfer knowledge defined as information (Daft and Lengel, 1986). Information may be easier to transfer as it can be written down (Grant, 1996b). Know-how is defined as knowledge that is not analyzable, which means that it is difficult to identify and explain because of its complexity and because it encompasses the owner's accumulated experience, intuition, and judgment. Sharing know-how often raises uncertainty because it may give rise to multiple interpretations and because know-how is difficult to write down (Grant, 1996b). Tasks of this type require rich media (Daft and Lengel, 1986) that allow for rapid feedback and multiple cues so that communicators can align their mental models. Since the effectiveness of organizational learning in the knowledge transfer process is dependent on the context (Gnyawali *et al.*, 1997), it may be important to use an appropriate medium at the right time. Thus, a potential problem could arise when organizational members use inappropriate media to transfer information and know-how. Using lean media to transfer know-how will not allow for face-to-face interaction and may therefore not be the most effective way to transfer know-how. Likewise, attempting to transfer information via rich media may be inefficient, perhaps exhausting the limits of the media and not leaving room to transfer know-how. It is likely that failure to transfer complex and important knowledge will be quickly noticed, but the use of costly channels to share

explicit knowledge might be overlooked.

Knowledge-sharing Activities

As discussed above, the need for organizations to transfer knowledge has been well documented. The literature has also provided evidence that knowledge transfer leads to better decision making (Gnyawali *et al.*, 1997), and that knowledge-sharing increases task effectiveness (Hansen and Haas, 2001). Gupta and Govindarajan (2000) have shown that the richness of transmission channels is positively associated with the inflows and outflows of knowledge between a multinational corporation and its subsidiary. What has not been examined is how organizations transfer knowledge. This study directly addresses this issue by proposing that the communication media chosen to transfer knowledge in organizations will be dependent on the type of knowledge to be transferred, as is predicted by media richness theory (Daft and Lengel, 1986).

We propose that communication media, when used as key knowledge-sharing activities, may be classified according to three categories: technology-assisted communication, meetings, and training methods. Each of these categories has elements that are high in media richness and that are low in media richness. We propose that know-how transfer will require more face-to-face interaction, and will require a rich communication medium. Similarly, the less face-to-face interaction required by information transfer will allow for the use of a leaner communication medium. For this research, we assessed the choice of fifteen communication media that are used as knowledge-shar-

ing activities and vary according to their media richness. A description of these activities and the means of their selection is described in the following sections.

Technology-assisted Communication.

Videoconferencing is considered a rich medium as it provides individuals with the opportunity for face-to-face dialogue, which acts as a vehicle for sorting out complex knowledge. Technology-assisted communication components that are low in media richness include e-mail, teleconferencing, and databanks. Telephone communication is lower in richness than face-to-face dialogue or videoconferencing as it denies users cues such as facial expressions or body language (Purdy *et al.*, 2000). Electronic mail and databanks are considered leaner media because they are non-interactive, impersonal, and are good for transferring less complex knowledge such as rules, forms, and procedures. Lean media might be chosen to transfer knowledge that can be articulated in documents and software (Zander and Kogut, 1995).

- H1a: High-media richness technology-assisted communication (videoconferencing) will be used more for know-how transfer than for information transfer purposes.
- H1b: Low-media richness technology-assisted communication (databanks, e-mail, and teleconferencing) will be used more for information transfer than for know-how transfer purposes.

Meetings. Meetings can be formal or informal in nature. The degree of formality determines the richness of the communication medium. Informal meetings, such as face-to-face retreats and after-work socials, may be considered high in media richness. Informal meetings provide organizational members the opportunity to

network across organizational boundaries. When relationships exist amongst employees because of social networking, organizational members are more motivated to transfer knowledge (Reagans and McEvily, 2003). In addition, the prevalence of social networks increases organizational members' ability to transfer complex knowledge to a heterogeneous audience (Reagans and McEvily, 2003). Informal meetings require face-to-face interaction, which is the richest media of all, allowing participants to provide feedback so that misunderstandings may be reduced before they cause problems (Barnard, 1938; Daft and Lengel, 1986). Informal meetings are therefore likely to be used for know-how transfer.

In contrast, formal meetings and seminars/conferences are considered low in media richness. Although formal meetings also require face-to-face interaction, this type of interaction is less personal and more procedural, so formal meetings may be considered low in media richness. Formal meetings are an excellent venue to transfer less complex knowledge that can be easily communicated. For example, strict meeting agendas about topics like budgets or goals tend to be information-oriented. Additionally, the weak networking ties developed at seminars are likely to impede the transfer of complex knowledge (Hansen, 1999). Weakly tied individuals are more likely to share news or information as the communication channel capacity of a weak tie is restricted (Strang and Soule, 1998).

- H2a: High-media richness meetings (face-to-face meetings, informal/social events, and retreats) will be used more for know-how transfer than for information transfer purposes.

- H2b: Low-media richness meetings (seminars/conferences and formal meetings) will be used more for information transfer than for know-how transfer purposes.

Training Methods. The training methods that are higher in media richness include, but are not limited to, mentoring, simulation games, role-playing, and job rotation. Once again, these methods are considered richer media because they require more face-to-face interaction, rapid feedback, and the ability to transfer complex knowledge or know-how. Training methods that are lower in media richness include videotapes and instructional lectures (Mondy *et al.*, 1999). These methods involve one-way communication, do not require direct personal contact, and are appropriate media for relaying codifiable knowledge, such as rules and procedures. We therefore propose that training methods such as videotapes and instructional lectures transfer information.

- H3a: High-media richness training and development (mentoring, simulation games, job rotation, and role-playing) will be used more for know-how transfer than for information transfer purposes.
- H3b: Low-media richness training and development (instructional lectures and video tapes) will be used more for information transfer than for know-how transfer purposes.

METHODS

We chose to examine organizations from a single industry that were similar in size to increase internal validity. We also chose to examine multiple units of analysis within the sampled firms. Specifically, our sample consisted of five hospitals with 250 to 500 beds in the southwestern United States. Choosing a smaller

sample and exploring multiple levels in each hospital provided the richness or depth that is needed in order to draw meaningful conclusions. The three levels analyzed included administrators, nursing directors, and staff nurses. This multi-level approach allowed us to assess how knowledge is transferred at each level and check for consistencies and differences across levels.

Research Instrument

The research instrument consisted of a questionnaire that was developed using information gleaned from one-on-one interviews of a sample of employees from the five hospitals. The purpose of the interviews was to identify the variety of knowledge-sharing activities used in the sampled hospitals and act as an aid in increasing the face validity of the research instrument. The lead author conducted 30-minute, one-on-one interviews with 15 employees at three organizational levels within the hospitals: five administrators, five nursing managers and five staff nurses. The interviews were conducted at each hospital's facilities and were tape recorded and transcribed. The protocol consisted of a set of general questions asked of each participant to decrease bias and increase replicability (Yin, 1984).

A large preliminary list of knowledge-sharing activities was condensed and refined by analyzing the transcriptions to determine how the participants transferred knowledge within the hospitals. This shorter list of activities was used to develop the research questionnaire. Each knowledge-sharing activity used in the survey was operationalized after reviewing the list of common responses from the interviews. Four questions

were asked for each knowledge-sharing activity. The first pair of questions asked about information transfer (explicit knowledge), while the second pair of questions asked about know-how transfer (tacit knowledge). Thus, the survey is balanced. The four questions for each knowledge-sharing activity came directly from the one-on-one interviews, and were categorized as either transferring information or know-how based on the responses from the protocol. A five-point scale was used ranging from never to very frequently (see the Appendix for questionnaire items).

Research Design

The initial contact with each hospital was made by telephone to ask for participation in the study. Nine hospitals were contacted and five agreed to participate. The administrators provided a list for selection of the employees. Every administrator and every nursing director was included in the sampling frame, whereas the remaining participants were selected from the nursing staff. The instrument was delivered to each employee in the sample at the hospital with a cover letter that assured anonymity. Completed questionnaires were returned to the administrative offices and picked up by the researcher. Six weeks was chosen as the data collection period.

Two mailings were used to collect the data. In the first mailing, a cover letter and research instrument were mailed to 100 employees at all levels through the hospital mail system in each of the five participating hospitals. The first mailing resulted in 206 usable responses for a total adjusted response rate of 41.2%. After a period of two weeks, a cover letter and re-

search instrument were sent to respondents who had either not completed the instrument properly or had not returned a research instrument. The second mailing resulted in 81 usable responses for a total adjusted response rate of 27.6%. Therefore, for all five hospitals combined, a total of 287 usable instruments were returned for a final response rate of 57.4%.

Data Analysis Procedures

An exploratory factor analysis was used to assess the unidimensionality of the multi-item scales. A principle component factor analysis using a varimax rotation was performed using the fifteen knowledge-sharing activities proposed to measure the two types of knowledge transferred (information and know-how). The evaluation of dimensionality of items in the two-factor model yielded both expected and unexpected results (see Table 1).

The items hypothesized to measure information transfer loaded on their hypothesized factor, and all items had factor loadings that exceeded .50, except for formal meetings which had a factor loading of .473. One item in this construct (seminars) had a factor loading exceeding .30 on both factors. The items hypothesized to measure know-how transfer loaded as we expected, except for videoconferencing and simulation. Videoconferencing did not load on know-how transfer, whereas simulation loaded on both factors. All other items had factor loadings exceeding .50. Therefore, the factor structure of the model has adequate discriminant validity. Reliability levels for both information and know-how transfer were also adequate, as both constructs had coef-

Table 1. Factor Structure¹

	Factor 1 Information Transfer	Factor 2 Know-how Transfer
Knowledge-sharing Activity²	4.106 24.38%	2.532 19.87%
<i>Technology-assisted communication</i>		
Videoconferencing (H)	.491	.355
Databanks (L)	.774*	.135
Teleconferencing (L)	.704*	.110
E-mail (L)	.730*	.246
<i>Meetings</i>		
Face-to-face (H)	.143	.619*
Social events (H)	.164	.523*
Retreats (H)	.191	.628*
Seminars (L)	.653**	.396**
Formal meetings (L)	.473*	.181
<i>Training methods</i>		
Mentors (H)	.216	.551*
Simulation (H)	.525**	.518*
Job rotation (H)	.204	.672*
Role-playing (H)	.244	.723*
Lecture (L)	.630*	.249
Videotape (L)	.602*	.183

¹Values directly below each factor indicate the eigenvalues and percent of variation explained.

²H = high-media richness; L = low-media richness.

*Indicates items loading on hypothesized factor.

**Indicates items containing cross loadings on multiple factors.

ficient alpha values exceeding .70. Information transfer had a coefficient alpha of .81, whereas know-how transfer had a coefficient alpha of .79. (The correlation matrix is available upon request.)

The statistical analysis consisted of several steps. For each knowledge-sharing activity, the two responses for information transfer were summed and the two responses for know-how transfer were summed. Each knowledge-sharing activity therefore had two scores, one for information transfer and one for know-how transfer, with possible scores ranging from 2 to 10. These scores were the values used in all of the statistical analyses, as our purpose was to determine if communication media were used more for know-how transfer or for information transfer. A multiple analysis of variance was used to test for an overall difference between how information and know-how are transferred, while one-way analyses of variance were used to test the hypotheses. The independent variables were know-how and information, while the knowledge score for know-how and information was the dependent variable.

RESULTS

Results of the multiple analysis of variance test showed that there is a difference in how information and know-how are transferred ($F = 31.95$, p value = .000). Table 2 presents results of the one-way analysis of variance tests (by administrative level) used to test the hypotheses. Table 3 presents a summary of the use (or non-use) of knowledge-sharing activities for each administrative level. Specifically, we report in Table 3 the percentage of each administrative level with scores greater than two (us-

age between "not very often" and "very frequently") to aid in interpretation of the results. Although we also analyzed our data by hospital, the results were virtually in alignment with the results by administrative level, so for brevity we report only the results by level. Hospital three had a relatively low response rate, but the results from this hospital were consistent with the results of the other four hospitals. We discuss the few differences across the hospitals after reporting the results of our hypothesis tests according to administrative level. Table 4 presents a summary of our research findings.

Hypothesis 1a proposed that high-media richness technology-assisted communication (videoconferencing) would be used more for know-how transfer purposes than for information transfer purposes. As can be seen in Table 2, Hypothesis 1a was not supported for any of the three administrative levels. Hypothesis 1b states that low-media richness technology-assisted communication (databanks, e-mail, and teleconferencing) would be used more for information transfer purposes rather than know-how transfer purposes. As shown in Table 2, databanks and e-mail were used more for information transfer than know-how transfer across three administrative levels. Teleconferencing was used as hypothesized by administrators and nursing directors, but not staff nurses.

Hypothesis 2a states that high-media richness meetings (face-to-face meetings, informal/social events, and retreats) would be used more for perceived know-how transfer than for information transfer. As shown in Table 2, all three of these activities were used more for know-how transfer across all three administrative levels

Table 2. ANOVA Results by Administrative Level

	High Media Richness Activities	F	P-value	Means ¹ Information	Means ¹ Know-how	Low Media Richness Activities	F	P-value	Means ¹ Information	Means ¹ Know-how
Administrators N = 29	Videoconferencing	.09	.77	5.24	5.41	Databanks	48.00	.00	7.21	3.62
	Face-to-face	38.35	.00	5.00	8.03	E-mail	99.78	.00	9.31	4.93
	Social Events	17.20	.00	4.52	6.66	Teleconferencing	14.95	.00	6.59	4.62
	Retreats	21.83	.00	5.14	7.79	Seminars	.01	.92	8.34	8.31
	Mentors	11.36	.00	6.00	8.07	Formal Meetings	1.05	.31	7.45	6.90
	Simulation	1.23	.27	8.07	8.45	Lectures	13.60	.00	7.41	5.03
	Job Rotation	13.31	.00	5.90	7.80	Videotapes	31.07	.00	8.10	4.72
	Role-playing	26.82	.00	4.93	7.97					
			1.92	.17	5.45	4.73				
Nursing Directors N = 33	Videoconferencing	18.85	.00	6.45	8.53	Databanks	50.11	.00	7.73	4.12
	Face-to-face	3.30	.07	5.61	6.52	E-mail	67.28	.00	9.48	5.70
	Social Events	12.25	.00	5.12	7.21	Teleconferencing	12.12	.00	6.12	4.36
	Retreats	.42	.52	7.61	7.91	Seminars	1.15	.22	8.30	7.70
	Mentors	.06	.81	8.18	8.06	Formal Meetings	2.24	.14	7.85	7.03
	Simulation	11.36	.00	6.30	7.93	Lectures	11.75	.00	8.03	6.15
	Job Rotation	16.61	.00	5.42	7.76	Videotapes	23.01	.00	8.18	6.15
	Role-playing									
			.40	.53	3.51	3.39				
Staff Nurses N = 213	Videoconferencing	23.61	.00	6.82	7.85	Databanks	114.53	.00	6.07	3.70
	Face-to-face	22.87	.00	6.08	7.08	E-mail	43.80	.00	5.84	3.96
	Social Events	13.49	.00	3.90	4.90	Teleconferencing	1.20	.28	3.80	3.57
	Retreats	1.30	.26	7.80	7.58	Seminars	24.36	.00	7.86	6.90
	Mentors	9.83	.00	7.67	7.04	Formal Meetings	.86	.35	7.16	6.97
	Simulation	4.56	.03	6.16	6.61	Lectures	22.54	.00	6.95	5.91
	Job Rotation	23.81	.00	5.24	6.50	Videotapes	83.38	.00	8.20	6.35
	Role-playing									

¹Means range from 2 to 10 as responses were summed for each individual (two questions for information and two questions for know-how).

Table 3. Use of Knowledge-sharing Activities by Administrative Level¹

	Administrators N = 29	Nursing Directors N = 33	Staff Nurses N = 213
Videoconferencing	82.8	78.8	41.3
Face-to-face	93.1	98.5	95.5
Social Events	84.5	95.5	94.8
Retreats	91.4	86.4	52.6
Mentors	89.7	97.0	97.7
Simulation	100.0	97.0	96.7
Job Rotation	96.6	95.5	94.1
Role-playing	96.6	87.9	78.7
Databanks	81.0	84.8	71.2
E-mail	93.1	90.9	57.0
Teleconferencing	87.9	87.9	47.0
Seminars	100.0	97.0	96.9
Formal Meetings	96.6	93.9	96.5
Lectures	82.8	90.9	92.5
Videotapes	84.5	98.5	95.1

¹Expressed as a percentage.

(although social events were only marginally significant for nursing directors). Hypothesis 2b states that low-media richness meetings (seminars/conferences and formal meetings) would be used more to transfer information rather than know-how.

Overall, Hypothesis 2b was only minimally supported. As can be seen in Table 2, only staff nurses used seminars more to transfer information than know-how. Formal meetings were not used differently by any administrative level.

Table 4. Summary of Results of Hypothesis Tests¹

<i>Technology-assisted Communication</i>	
H1a Videoconferencing (H)	No support
H1b Databanks, E-mail, Teleconferencing (L)	Moderate support
<i>Meetings</i>	
H2a Face-to-face, Social Events, Retreats (H)	Full support
H2b Seminars, Formal Meetings (L)	Minimal support
<i>Training Methods</i>	
H3a Mentors, Simulation, Job Rotation, Role-playing (H)	Moderate support
H3b Lecture, Videotape (L)	Full support

¹H = high-media richness; L = low-media richness.

Hypothesis 3a proposed that high-media richness training and development (mentoring, simulation games, job rotation, and role-playing)

would be used more for know-how transfer than for information transfer. Results in Table 2 show that hypothesis 3a was moderately sup-



ported. Job rotation and role-playing and were used as expected by all three administrative levels. Mentoring was used more for know-how transfer only by administrators, whereas simulation was used more for know-how transfer only by staff nurses. Hypothesis 3b stated that low-media richness training and development (instructional lectures and videotapes) would be used more for information transfer than for know-how transfer. Table 2 shows that this hypothesis was fully supported for all three administrative levels.

As discussed above, there were few differences that could be attributed to the unique circumstances in each of the hospitals. Simulation, job rotation, and formal meetings were the only activities in which test results varied from the results by administrative level that we have reported above. In hospital five, simulation was used as expected, whereas in hospitals one, two, and four, simulation was used more for information transfer, opposite to the direction that we have hypothesized. Job rotation was used as expected in hospitals three and five, but results were not significantly different in hospitals one, two, and four. Finally, formal meetings were used more for information transfer only in hospital five. In hospital three, it was used more for know-how transfer, opposite to our predictions. In hospitals one, two, and four, the results for formal meetings were not significant.

DISCUSSION

Media richness theory (Daft and Lengel, 1986) advises that organizational members prefer rich media for ambiguous communications and lean media for unequivocal communica-

tions (Daft *et al.*, 1987). The majority of the knowledge-sharing activities that we examined were used as specified by media richness theory. Thus, our findings help to explain how organizational members manage the knowledge transfer process by using appropriate communication media as knowledge transfer mechanisms. Specifically, hospital administrators, nursing directors, and staff nurses in five hospitals more often chose rich media to share know-how, and lean media to share information. The findings of this study also provide interesting insights into the knowledge transfer process. In contrast to those that suggest that different levels of analysis might have significant effects on research findings in communication media choice research (Webster and Treviño, 1995), we found relatively consistent results across three hospital administrative levels, depending on the knowledge-sharing activity examined.

Some suggest that individuals have media styles such that some media are favored regardless of circumstances (Rice and Case, 1983) and that individuals may choose to communicate in a more familiar way and not an appropriate way (Rice *et al.*, 1992). Also, the choice of media might be correlated with organizational level, as top managers tend to prefer face-to-face communication to leaner media choices (Rice and Shook, 1990; El-Shinnawy and Markus, 1998; Carlson and Davis, 1998). In our study, 11 of the 15 knowledge-sharing activities that we examined were used similarly across the three administrative levels. Results were different by level only for the use of mentors, simulations, teleconferencing, and seminars. Even so, for each of these four activities, two of the

three administrative levels used the activity in similar ways (see Table 2). These findings suggest that the type of knowledge to be transferred was the primary driver of media choice. An important conclusion from this study is that the knowledge transfer process appears to be a critical organizational concern, so media choice is made carefully and thoughtfully. All but one hypothesis (H1a) was at least partially supported. A second interpretation might be, at least for the technology-assisted communication activities, that there may be little difference between how the communication media are used across administration levels because of the pervasiveness of technology. As advances in communication technology have become more common-place, people at all organizational levels have developed the necessary skills to use it effectively in the workplace.

The use of videoconferencing for sharing know-how was not supported, although it was used by the majority of administrators and nursing directors in our research (see Table 3). It may be that videoconferencing is a knowledge transfer mechanism that is used to transfer both information and know-how. A second interpretation is that we might have used an artificial distinction between videoconferencing and teleconferencing; the process of using these two knowledge-sharing activities may not be very different. While it is true that videoconferencing allows for additional information in the form of visual cues, teleconferencing contains quite a wide array of informational cues including real-time feedback, inflection, timing of response, and multiple participants. The non-finding for videoconferencing could be that a primary consideration for its use in-

volves how structured is the interaction between participants. That is, it is possible that there are unmeasured structure/formality characteristics that may influence the interactions between participants. Both videoconferencing and teleconferencing might structure the order of response. Formality concerns might therefore need to be given special care when technology is used as a surrogate for physical meetings.

The results for formal meetings were particularly interesting. This knowledge-sharing activity was added to the study after conducting the one-on-one interviews. Many employees mentioned this activity in the course of their discussion. The lack of a significant difference in the use of formal meetings was therefore a surprise. Perhaps knowledge transfer in formal meetings is influenced by the type of agenda unique to each meeting or to individual differences. Attitudes toward particular meeting agendas and other meeting participants, or individual preferences for procedural order or "free" group discussion are likely to intervene in the knowledge transfer process within group discussions (Pavitt, 1993).

Our study's participants supported the use of e-mail as a lean medium, applicable to transferring information. Previously, Markus (1994) has shown that e-mail could be used as a rich medium, but the interview portion of this study suggested that hospital employees were frustrated when e-mail was used to discuss complex issues. It is easy to overuse e-mail and to use it in place of face-to-face communication, although it is not an effective substitute for face-to-face meetings. It can be very frustrating to communicate through electronic

mail when a message's content is ambiguous and difficult to explain in writing (Daft and Lengel, 1986).

A surprising result of this study is that mentoring was used more to transfer know-how only by the administrators. It is possible that mentoring transfers both information and know-how for the nurses and the nurse directors, so it might be a vital component of the training and development process. Unlike mentoring, job rotation appeared to be an important way to share know-how for all three administrative levels. Perhaps lateral moves give employees a chance to learn different skills to better serve the organization's purpose.

The results for the role-playing, lectures, and videotapes were all in the expected direction, and for all three levels. These results suggest that the hospital employees believed that role-playing was appropriate for sharing know-how, whereas lectures and videotapes are too lean for doing so. The participants of our study seem to believe that role-playing is an effective training and development tool by aiding employees to "think outside the box," despite some comments in the interviews that revealed some employees' discomfort with participating in role-playing. Apparently, the different learning styles of employees should be considered when developing a curriculum for training purposes.

One implication of our study is that managers should be aware of how knowledge is transferred within their organizations and educate employees on the appropriate use of communication media. Inappropriate media might be used if individuals do not understand which media to use to transfer a given type of knowledge. If rich media were used to share infor-

mation, knowledge-sharing would not be efficient, whereas if lean media were used to share know-how, knowledge-sharing would not be effective. A second important managerial implication involves the importance of networking between organizational members. According to Reagans and McEvily (2003), knowledge transfer will be more likely to occur between individuals who communicate frequently with each other, or who have an emotional attachment to one another. Organizational members might be more willing to share knowledge if they have a personal stake with other individuals in the organization. Also, relationships between organizational members may increase a person's ability to share complex knowledge, such as know-how, within heterogeneous groups. Therefore, encouraging employees to engage in more face-to-face meetings, social events, retreats, and mentoring might lead to more successful know-how transfer. A firm's social network might promote interaction, collaboration, and the diffusion of tacit knowledge (Droege and Hoobler, 2003). In our research, we modeled social activities as direct influences on knowledge-sharing, as supported by our interviews of hospital personnel and research (Fontaine and Millen, 2004). In other organizations or industries, however, social activities might serve as only preconditions to knowledge transfer. Thus, once individuals develop strong ties, they may be more likely to engage in transferring knowledge through other knowledge-sharing mechanisms.

LIMITATIONS AND DIRECTIONS

As is common in all empirical research, there are methodological and

operational factors that may work independently or in combination to limit the validity of the findings from this study. Due to the sample chosen for this study, our findings might be generalizable only to the health care industry. Because hospitals are unique in that they operate on a twenty-four hour basis, the employees that work night shifts may feel that they are removed from some of their organization's activities. Thus, they might feel that they do not have access to certain knowledge-sharing activities and might not be able to participate in knowledge-transferring processes. Also, the majority of the nurses at all five hospitals were female, which is typical of the industry, but it is possible that this factor could have influenced the results. Additionally, since there is a nursing shortage across the United States, an understaffed hospital environment could have influenced the time available to transfer knowledge.

Nonetheless, our findings might be generalizable to other professional or technical businesses such as law firms or computer-related companies, where managers and workers are more similar in terms of education and training. Thus, results across administrative levels in these settings might be the same as the results in our hospital setting. However, in more traditional organizations (i.e., manufacturing or transportation organizations) — here there is a wide range of education levels, compensation, organizational and personal goals, and tasks — there may be more significant differences across administrative levels. An interesting extension to this study would be to examine other factors unique to health care, such as professional certification, continuing education, or HI-

PAA regulations, to assess their impact on the knowledge-transfer process within the healthcare industry.

The results of this study serve as a basis for further research on the subject of knowledge transfer; more empirical research would help to develop a better understanding of this process. Additional research using larger samples across multiple industries is warranted so that reliable scales to measure the knowledge transfer process within organizations can be developed. It may be important, however, to account for industry and organizational differences that define the mechanisms used for knowledge transfer. Note that we observed some differences across administrative levels and across the hospitals in our study. We analyzed fifteen knowledge-sharing activities, as one-on-one interviews revealed these activities to be important to hospital employees in transferring knowledge. Nonetheless, there may be additional communication media that might be useful to organizations for sharing knowledge such as voice mail, memos, knowledge-management systems, and an employee intranet. Future researchers could incorporate these and other activities to help explain more of the knowledge transfer process. The knowledge-sharing activities that were not significant in this study (videoconferencing and formal meetings) could also be re-examined. Future research might also expand our model and examine different knowledge categories as well. It is possible that different knowledge-sharing activities can transfer not only task-oriented knowledge (information or know-how) but also knowledge about behavioral norms and expectations. Organiza-

tional culture may therefore be a particularly strong influence on the knowledge transfer process. Both theoretical studies (Dodgson, 1993; Fiol and Lyles, 1985; Nielsen and Ciabusch, 2003) and empirical work (Smith *et al.*, 2005) conclude that culture must be conducive to knowledge-sharing for knowledge transfer to successfully occur. Hence, future studies should investigate the influence of cultural dimensions on the knowledge transfer process.

The findings of this study begin to shed light on the knowledge transfer process; however, our focus did not allow us to explain the effectiveness of knowledge transfer. Future studies could focus on how organizations could effectively transfer information and know-how. Past conceptual research has presented evidence that knowledge transfer might be a competitive advantage, but no study has empirically tested the economic impact associated with transferring in-

formation and know-how correctly. Future research could concentrate on the long-term economic effect of implementing organization-wide knowledge transfer processes. In addition, future research should include additional qualitative case studies in order to identify salient variables and causal connections.

As a final point, the definitions of media richness, knowledge, information, and know-how used in this study were those that have been theoretically accepted in the literature. However, these constructs are worded as if their meaning is dichotomous. It is possible that these terms may be more properly described on a continuum and not as dichotomies. If this is the case, then these dichotomous definitions reduced the quality of the proposed relationships. Perhaps future research could find a better way to either measure or define media richness, knowledge, information, and know-how.

APPENDIX

Questions from Research Instrument

- 1 — NEVER
- 2 — NOT VERY OFTEN (LESS THAN 25%)
- 3 — SOMETIMES (25% - 49.9%)
- 4 — USUALLY (50% - 75%)
- 5 — VERY FREQUENTLY (MORE THAN 75%)

Participation in videoconferencing allows you to

1. Discuss regulatory information.
2. Solve organizational problems that are easy to identify and explain.
3. Talk to a consultant.
4. Solve organizational problems that are hard to identify and explain.

Face-to-face meetings are used to

1. Schedule meetings.
2. Discuss training and development opportunities.
3. Deal with customer complaints.
4. Discuss organizational problems that are difficult to identify and explain.

When socializing with your co-workers you

1. Discuss policies and procedures.

2. Discuss training and development opportunities.
3. Discuss the political environment at work.
4. Discuss how to solve problems that are difficult to identify and explain.

Retreats

1. Are productive for updating people on the day-to-day activities that explain what is going on in the organization.
2. Are productive for discussing information that is easy to identify and explain.
3. Allow you to build leadership qualities.
4. Allow you to meet people throughout the organization and learn what they do (i.e, network).

Mentors primarily teach

1. Basic clinical information.
2. Information that is easy to understand.
3. Professionalism.
4. The internal politics of the organization.

Simulation games (e.g., mock codes) primarily teach

1. Basic clinical information.
2. Information that is easy to understand and explain.
3. Knowledge that is difficult to identify and explain.
4. How to handle a local disaster.

Working in more than one department

1. Primarily teaches you basic clinical information.
2. Primarily teaches you policies and procedures.
3. Has helped you understand how the organization operates as a whole.
4. Has helped you understand organizational politics.

Role-playing

1. Primarily teaches basic clinical information.
2. Primarily teaches information that is easy to understand.
3. Helps you put yourself in other's situation and learn how they feel.
4. Helps you problem solve by demonstrating different perspectives.

The data banks (internet, intranet) are used

1. For benchmarking purposes.
2. To look up hospital policies and procedures.
3. To discuss the internal politics of the hospital.
4. To solve organizational problems that are difficult to identify and explain.

E-mail is used to

1. Schedule meetings.
2. Send documents.
3. Deal with customer complaints.
4. Discuss organizational problems that are difficult to identify and explain.

Participation in teleconferencing is useful to

1. Benchmark.
2. Discuss regulatory requirements.
3. Discuss how to do a new medical procedure.
4. Discuss organizational problems that are difficult to identify and explain.

Attending seminars and conferences is a good way to

1. Be updated on current trends.
2. Compare your organization's process to others and determine how your organization measures up to the industry (i.e., benchmarking).
3. Network with other hospitals.
4. Learn how to respond to industry changes that are hard to explain and identify.

Formal meetings are productive

1. When discussing information that is easy to identify and explain.
2. For updating people on the day-to-day activities that explain what is going on in the organization.
3. For problem solving.
4. When discussing information that is hard to identify and explain.

Instructional lectures are a good way to

1. Refresh your memory on basic information.
2. Be informed about budget concerns.
3. Openly discuss problems that are hard to identify and explain.
4. Problem solve.

Videotapes are a good tool to

1. Use to refresh your memory on basic information.
2. Use to learn factual information.
3. Learn concepts that are difficult to identify and explain.
4. Problem solve.

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Overreward and the Impostor Phenomenon	95
<i>William C. McDowell, Nancy G. Boyd and Wm. Matthew Bowler</i>	

The selection process within organizations is susceptible to shortcomings that can have profound implications for the newly hired individual as well as the organization. Yet overreward in the selection process has received very little attention in the literature. In this article we investigate the impostor phenomenon as an outcome of overreward and its influence on organizational commitment and organizational citizenship behaviors. It is further suggested that the influence of the impostor phenomenon on these outcomes will be influenced by an individual's core self-evaluations, as well as equity sensitivity. Implications for future research and practice are also suggested.

Knowledge Type and Communication Media Choice in the Knowledge Transfer Process.....	111
<i>Samantha R. Murray and Joseph Peyrefitte</i>	

The literature suggests that transferring knowledge may lead to a competitive advantage, synergistic cost advantages, and better implementation of organizational strategies, but there is little empirical evidence to guide organizations in managing the knowledge transfer process. This research explores how organizations use communication media to transfer or share knowledge. Building upon media richness theory (Daft and Lengel, 1986), we hypothesize that rich media would be used more often to transfer know-how or tacit knowledge, and lean media would be used more often to transfer information or explicit knowledge. The results of our survey of 287 employees in five hospitals provided support for our hypotheses and were relatively consistent for hospital administrators, nursing directors, and staff nurses. These findings suggest that the knowledge transfer process appears to be a critical organizational concern, as the type or property of knowledge appeared to be the primary driver of media choice.

An Exploratory Examination of Voice Behavior from an Impression Management Perspective	134
<i>Jerry Bryan Fuller, Tim Barnett, Kim Hester, Clint Relyea and Len Frey</i>	

Continuous improvement of work processes, policies, or products is a primary source of competitive advantage for

