Effects of Professional Experience and Group Interaction on Information Requested in Analyzing IT Cases

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ABSTRACT. The authors investigated the effects of professional experience and group interaction on the information that information technology professionals and graduate accounting information system (AIS) students request when analyzing business cases related to information systems design and implementation. Understanding these effects can contribute to the success of the college classroom and corporate training learning environments. The results suggest that as the amount of professional experience increases, the number of information requests that match the information requests determined by a master panel (*matched* answers) also increase. In addition, higher numbers of matched answers by novices were associated with being in established groups prior to completing the experimental case individually.

Keywords: AIS students, group interaction, information requested, information systems design and implementation, unstructured cases

The purpose of the present study was to determine whether membership in certain types of groups can enhance the quality of information requests by novices analyzing realistic business cases involving unstructured information systems design and implementation. We analyzed whether participants (novice or experienced) benefited from interaction in established groups as opposed to ad hoc groups prior to analyzing the experimental case individually.

We found that with increasing levels of professional experience, the number of information requests that match the information requests of a master panel (*matched* answers) also increases. This is consistent with prior evidence that more experienced professionals are better at information gathering (e.g., Lehmann & Norman, 2005; Schmidt, Norman, & Boshuizen, 1990; Stevens, Lopo, & Wang, 1996). In an extension of this previous research, we found that novices in established groups had higher matched information scores than did novices in ad hoc groups when completing the experimental case individually after extended group interaction.

The results of our study have educational and training implications. First, if researchers and educators can understand how professionals evaluate a situation and request information, educators will be in a better position to structure the college classroom experience and the corporate training environment to enhance learning. Bonner, Libby, and Nelson (1997) suggested that understanding the particular aspects of knowledge that auditors need is necessary before educators and firms can determine the best ways to organize the instruction of auditors. We expect the same is true of information technology (IT) professionals.

Second, if established groups are found to be an effective way to help new graduates and new professionals to learn critical problem-solving skills in unstructured environments, this finding would lead to recommendations on the use of group interaction to educate and train new professionals to practice addressing these types of issues with their clients.

Background and Hypothesis Development

Effects of Experience Levels

Many researchers analyzing differences in problem-solving strategies have examined the differences in performance between experts and novices. Schmidt et al. (1990) suggested that one phenomenon that could not be explained in the medical expertise literature was that experts gathered less, rather than more, data. The authors suggested that because experts rapidly assess a case in terms of previous cases, they can focus

on the information needed for confirmation of their diagnosis, whereas novices progress step-by-step to diagnose a case. In the same way, IT professionals must diagnose the problem presented by their employer or client and develop recommendations to solve the problem. Much as in the medical profession, these unstructured problems often require additional information to identify what issues need to be addressed to provide recommendations.

Stevens et al. (1996) confirmed that students requested additional tests and information seldom used by experts. Their requests reflected those recommended in textbooks or labs. Researchers would expect that accounting information system (AIS) graduate students would similarly use their textbook knowledge to develop their additional information requests to confirm their diagnosis of an IT problem. IT professionals would be more likely to rely on knowledge gained from their experience in the field, requesting fewer items than would novices.

In the accounting literature, Lehmann and Norman (2005) found that experts requested less information and fewer tests to confirm audit judgments than did intermediate-level personnel and that intermediate-level personnel requested less than did novices. Abdolmohammadi and Wright (1987) found similar results by using a structured task for auditors.

On the basis of these studies, in the present study, we developed the following hypotheses (H_n):

H_1: Higher levels of professional experience will be associated with fewer additional information requests to confirm decisions.

H_2: Higher levels of professional experience will be associated with higher information-requested scores (i.e., requests that more closely match those of the master panel).

Effects of Group Interaction

Researchers have studied knowledge transfer on subsequent tasks (e.g., Beane & Lemke, 1971; Hollingshead, 1998, 2000; Laughlin & Barth, 1981; Laughlin & Sweeney, 1977; Lehmann, Heagy, & Willson, 2006, Olivera & Straus, 2004). Lehmann et al. suggested that novices show performance improvement in problem representation after interaction with established groups. Novices who had worked in established groups performed as well as the experienced professionals. Laughlin and Barth found evidence of individual learning after practicing the Mastermind task as a group, and Olivera and Straus found that training in a group or even observing the group process resulted in better subsequent individual performance on brain teasers. Even 10 min of group collaboration can affect student performance (e.g., Fall, Webb, & Wise, 1995; Wise & Behuniak, 1993). Webb (1997) and Webb, Chizhek, Nemer, and Sugrue (1998) indicated below-average eighth-grade students who worked in groups of mixed abilities had significant improvement after group interaction. Beane and Lemke and Hollingshead (2000) suggested that having groups with either different levels of ability or an expert facilitates transfer.

Based on these studies, we tested the following hypothesis:

H_3: Novice and experienced participants who had group interaction in established groups will have higher information-requested scores than will those who had ad hoc group interaction.

METHOD

Sample

We drew participants from a regional public accounting firm ($n = 7$), a chapter of the Information Systems Audit and Control Association (ISACA; $n = 23$), and three graduate accounting information course sections in a medium-sized, upper-level university in the Southwest ($n = 62$). ISACA's membership includes professionals with accounting training, as well as professionals in the design, development, implementation, auditing, and security of accounting information systems. The cases used in the experiment were similar to the types of cases used in the AIS classes. We felt that the graduate AIS students were qualified to participate because they had been exposed to textbook materials needed to respond to the cases.

We visited the regional accounting firm participants in their offices. The managing partner (an alumnus of the university) encouraged them to participate. The ISACA participants completed the case during a monthly technical meeting as part of a training session on working with groups. After they completed the individual case and turned in their responses, we led a discussion of the recommended answers. Of the participants, 6 received gift cards in a random drawing, and all participants received 1 hr of continuing professional education credit.

Of the participating ISACA members, 2 had no previous experience in the IT field. Of the 62 students who participated, 18 had IT experience. The students completed the experiment in the classroom and earned extra credit.

Most participants listed accounting ($n = 41$), management information systems (MIS; $n = 8$), or accounting/MIS ($n = 4$) as their majors. The sample included 52 men and 40 women. Of those who reported certifications, 26 had either the certified public accountant certification or the certified information systems auditor certification (see Table 1).

Procedure and Task

Our experimental task consisted of a series of three unstructured, open-ended cases that we had developed (see Appendix A). Time limits for working each case were established for all participants as follows: 15 min for each individual case and 20 min for the group case. During the semester, undergraduate students were able to finish similar cases in 15–20 min (when working in groups). Prior research has found mixed results with respect to the effect of time constraints on performance. Therefore, we cannot rule out the possibility that the time constraint may have affected our results.

We assembled a master panel to develop answers to our cases. This panel comprised highly experienced individuals: an independent IT consultant with more than 32 years of professional experience in retail, energy, and technology; an IT auditor from a Big-Four public accounting firm with more than 18 years of professional auditing experience; and a systems implementation expert,

TABLE 1. Descriptive Statistics of Participants

Variable	Full sample	Ad hoc		Established	
		Novice	Experienced	Novice	Experienced
Gender	$n = 92$	$n = 19$	$n = 28$	$n = 28$	$n = 17$
Male	52	6	20	11	15
Female	40	13	8	17	2
Major (reported)	$n = 91$	$n = 19$	$n = 28$	$n = 27$	$n = 17$
Accounting	41	14	15	7	5
MIS	8	1	4	2	1
Accounting/MIS	4	2	1	1	0
Other[a]	38	2	8	17	11
Certification (reported)	$n = 91$	$n = 3$	$n = 27$[b]	$n = 28$	$n = 17$
CPA	10	0	8	0	2
CISA	16	0	16	0	0
Other[c]	18	0	15	1	2
None/not reported[d]	59	19	0	27	13

Note. Only one of the established novices had a certification. For the two experienced groups, this category indicates those who did not have the certifications listed at the time of the experiment.
[a]Other major (e.g., computer science, finance, general business). [b]Twelve of the ad hoc experienced participants had more than one certification. [c]Other certification (e.g., CISSP, software-specific certification). [d]None/not reported: The ad hoc novices were not asked about certifications.

whose more than 7 years of employment with an independent risk consulting firm included an extensive range of IT experience in various industries and areas of practice. We instructed our panel members to respond to the following questions listed in Appendix A for all three cases:

1. Summarize the situation confronted by the client (company).
2. Indicate your solution to the problem.
3. Indicate other information you would request to justify your solution.

The initial agreement among our panel members was better than 80%. We adjusted the case materials and continued discussions with panel members until a final consensus on the answers was reached (see Appendix B).

Two independent coders who were graduate research assistants coded responses to Question 3. These coders were neither aware of the hypotheses nor provided with any demographic information about the participants. The coders had high agreement (≥ 74%). Where discrepancies occurred, the coders discussed these and reached 100% agreement. A third independent coder also graded the participants' answers for the question against the composite answers developed by the master panel. No partial credit was given, although the wording of the requested information did not have to be exact (e.g., a participant's response "indicate location and customer bases of each store" was considered a match to the master panel's response "collect demographics of each store"). Appendix B shows some examples of matched and not matched responses.

Dependent Variables

The dependent variables were related to the participants' responses to the third question for the video case. We counted the number of information items requested (raw video info) to test H_1. The items of information requested were graded against the response from our master panel (graded video info) to test H_2 and H_3.

Independent Variables

The independent variable for H_1 and H_2 was months of experience (novice vs. experienced). Type of group interaction (ad hoc vs. established type of group [GRP]) was used with experience (novice vs. experienced participants [EXPGRP]) to test H_3 (factor: EXP × GRP). The groups were formed on the basis of a quick survey that asked for their names and the number of years of IT experience that they had. We then formed groups based on experience levels. These quick surveys were administered to the professionals as they entered the meeting area and to the students during the semester. The established groups were either (a) students who worked in the same group for the entire semester and who had IT experience or (b) professionals who had worked together on their work teams prior to this study. The ad hoc groups were formed randomly, and the students and professionals in these groups had never worked together before.

As shown in Tables 1 and 2, the Experience × Group interaction groups were the following:

*Ad hoc novice groups (*n = *19).* These were graduate students (17) and ISACA members (2) with no professional experience in systems. They had not worked together in groups prior to the experiment. They completed a sample case individually as practice (hospital case), then a case (aeronautics case) in groups of 3–5, and finally a case (video case) individually. Steiner (1972) indicated that with a *discretionary task* (i.e., one in which members can solve the problem however they desire and with no specific requirements to take into account as to which members' conclusions are preferred), group size is not related to the ability of the group to be productive. However, process losses increase with increases in the size of the group. With a difficult task, productivity

TABLE 2. Descriptive Statistics of Information Requested

			Ad hoc				Established			
	Full sample (n = 92)		Novice (n = 19)		Experienced (n = 28)		Novice (n = 28)		Experienced (n = 17)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Raw video info	2.33	1.61	2.21	1.75	2.18	1.61	2.32	1.25	2.76	2.02
Graded video info	0.64	0.86	0.21	0.42	0.79	0.99	0.82	0.67	0.59	1.12
Months experience	57.35	88.19	0.00	0.00	144.64	105.33	0.04	0.19[a]	72.06	47.94

Note. Raw video info = number of pieces of information requested; graded video info = number of pieces of information requested that match the case answers; ad hoc novice = participants with no professional experience who interacted in ad hoc groups formed solely to perform the experiment; ad hoc experienced = participants with professional experience who interacted in ad hoc groups formed solely to perform the experiment; established novice = participants with no professional experience who interacted in established groups for at least 4 months prior to the experiment; established experienced = participants with professional experience who interacted in established groups for at least 4 months prior to the experiment.
[a]One student had completed a 1-semester internship.

is a function of group size up to a point. But once a certain group size is reached, there are neither productivity gains nor a change in the probability that at least one person in the group can solve the problem. On the basis of our experience with work groups and student groups, we tried to keep group membership to 4 individuals per group to maximize efficiency given the nature of the task and the time limitations. Because of our administering the experiment in several sessions, we ended up with two groups of 3 members and two other groups of 5 members. Each case was handed in to a proctor before starting the next case.

*Ad hoc experienced groups (*n = *28).* Of the participants in ad hoc groups that included members with IT experience, 21 were ISACA chapter members (*M* professional experience = 171.43 months). Also, 7 were graduate students with MIS experience (*M* MIS experience = 64.29 months) who had not worked in groups prior to the experiment. These participants followed the same experimental procedures as those of the ad hoc novices.

*Established novice groups (*n = *28).* The 28 novices in established groups were graduate students who had worked on cases similar to those in the experiment throughout a semester. These students worked the hospital and aeronautics cases individually after completing the video case. Analysis of variance (ANOVA) determined that there were no order effects (i.e., the order of completion of the cases was not significantly associated with the dependent variables).

The groups were established at the beginning of the semester on the basis of random assignment without regard to the resources of each group member. Members worked 14 similar unstructured, open-ended cases during the semester in their groups. The video case was the first case that they worked on individually.

*Established experienced groups (*n = *17).* Of the established experienced groups' participants (*M* professional experience = 119.14 months), 7 were members of a regional information systems design and implementation firm who had worked in teams prior to the experiment. After the experiment, feedback from these participants indicated that the cases in the experiment were very similar to situations that their teams regularly faced when developing new systems for clients.

The 7 members of these groups worked the three experimental cases in the same order as did the ad hoc groups. The other 10 participants were graduate students (*M* professional experience = 39.10 months) who had IT experience and had worked in established student groups over a semester.

RESULTS

H_1 and H_2

Because of the two dependent variables (raw video info and graded video info) we used a multiple analysis of variance (MANOVA) to test H_1 and H_2. Regression was also used to analyze H_2. In these tests, experience was used as a continuous variable (covariate) and not as a grouping variable.

As shown in Table 3, the MANOVA results suggest that the raw number of items requested (H_1) did not differ as a function of the number of months of experience (p = .62). However, there were significant differences in the graded information requested (H_2) with months of experience (p = .00). The results of a regression on the graded video info (see Table 4) indicated that with more professional experience, the graded information-requested score was higher; that is, the participants' requests more closely matched those of the master panel. Although we expected to find that higher levels of professional experience were associated with fewer raw information requests, we found no support for that hypothesis (H_1). However, there was support for H_2 (higher levels of professional experience associated with higher information-requested scores).

H_3

To test H_3, we performed a priori contrasts on the one-way ANOVA. Participants were placed into one of four groups that we described earlier: ad hoc novice, ad hoc experienced, established novice, established experienced (fixed factor: EXP × GRP). The ANOVA results with the graded score

as the dependent variable showed a significant association between graded information scores and the combination of experience ($p \leq .00$) and group ($p \leq .02$), showing support for H_3 (see Table 5). When we contrasted the two ad hoc groups with the two established groups, the established groups were no different from the ad hoc groups ($p < .26$; results not shown in Table 5). We suspect that this finding was due to the fact that the regression results showed that professional experience and the graded information-requested scores were positively related. We expect the type of group interaction (where 0 = established group and 1 = ad hoc group) to be inversely related to graded information scores. Consequently, we suggest that certain combinations of the type of group interaction and the experience level affect the graded score.

To investigate this further, we compared the two novice groups (ad hoc vs. established—Contrast 1) and the established novice group to each of the two experienced groups (ad hoc—Contrast 2; established—Contrast 3). As shown in Table 6, there were no significant differences between the established novice group's graded information-requested score and those of the two experienced groups (Contrasts 2 and 3). Furthermore, the established novice group had significantly higher ($p < .02$) graded video info scores than did the ad hoc novice group (Contrast 1). These results support H_3 for the novices but not for experienced professionals.

TABLE 3. Multiple Analysis of Variance Results for Tests of Hypothesis 1 and Hypothesis 2

Source	Dependent variable	Sum of errors	*df*	*M*	*F*	*p*
Corrected model	Raw video	0.64	1	0.64	0.24	.62
	Graded video	7.95	1	7.95	12.08	.00
Intercept	Raw video	368.62	1	368.62	140.63	.00
	Graded video	13.00	1	13.00	19.76	.00
Experience	Raw video	0.64	1	0.64	0.24	.62
	Graded video	7.95	1	7.95	12.08	.00
Error	Raw video info	235.91	90	2.62		
	Graded video	59.22	90	0.66		
Total	Raw video info	739.00	92			
	Graded video	105.00	92			
Corrected total	Raw video	236.55	91			
	Graded video	67.16	91			

Note. Raw video = number of pieces of information requested; graded video = number of pieces of information requested that match the case answers; experience = number of months of professional IT experience.

TABLE 4. Regression Results for Tests of Hypothesis 2

	Unstandardized coefficients		Standardized coefficients		
Variable	*B*	*SE*	β	*t*	*p*
Constant	2.392	.202	—	11.859	.000
Experience	–0.001	.002	–.052	–0.495	.622

Note. Dependent variable = graded information requested; independent variable = experience (number of months of professional IT experience).

TABLE 5. Analysis of Variance Results for Tests of Hypothesis 3

Source	Sum of errors	*df*	*M*	*F*	*p*
Corrected model	11.64	2	5.82	9.33	.00
Intercept	10.36	1	10.36	16.61	.00
Experience	10.89	1	10.89	17.46	.00
GRP	3.69	1	3.69	5.92	.02
Error	55.52	89	0.62		
Total	105.00	92			
Corrected total	67.16	91			

Note. Dependent variable = graded video info (number of pieces of information requested that match the case answers); independent variables = experience (number of months of professional IT experience) and GRP (type of group interaction [ad hoc = 1, established = 0]).

DISCUSSION

Working with established groups could help novices to learn the information-gathering techniques of more experienced professionals. This method could enable educators and trainers to better prepare students to tackle the challenges of unstructured decision making by enhancing critical-thinking skills in working through these cases over a period of time while in the protected environment of the classroom. Also, it might be helpful to assign new hires to a stable group situation in a protected training environment to learn the process of information gathering to aid in the development of solutions. We hope that this type of practice would make such new graduates and new professionals more valuable to their employers more quickly.

As expected, we found that greater professional experience was associated with higher information-gathering scores. However, we also analyzed the interaction of experience level (novice vs. experienced) with group interaction type (ad hoc vs. established) and found that novices who interacted for at least 4 months with their established groups that were working on similar cases did not differ in

TABLE 6. Contrast Results for Tests of Hypothesis 3

	Ad hoc		Established	
Contrast	Novice	Experienced	Novice	Experienced
1	1	0	–1	0
2	0	1	–1	0
3	0	0	1	–1

Contrast results

Graded video info	Contrast	Value of contrast	*SE*	*t*	*df*	*p*
Assume equal variances	1	–0.61	.26	–2.45	88	.02
	2	0.00	.22	–0.16	88	.87
	3	0.23	.26	0.90	88	.37
Not assume equal variances	1	–0.61	.16	–3.85	45	.00
	2	0.00	.23	–0.16	47	.88
	3	0.22	.30	0.78	23	.45

Note. ad hoc novice = participants with no professional experience who interacted in ad hoc groups formed solely to perform the experiment; ad hoc experienced = participants with professional experience who interacted in ad hoc groups formed solely to perform the experiment; established novice = participants with no professional experience who interacted in established groups for at least 4 months prior to the experiment; established experienced = participants with professional experience who interacted in established groups for at least 4 months prior to the experiment; EXP = number of months of professional IT experience; GRP = type of group interaction (ad hoc = 1, established = 0). All *p* values are two-tailed.

their information-requested scores from either of the experienced groups (ad hoc vs. established). Furthermore, the novices in established groups outperformed the novices in ad hoc groups. Researchers of transactive knowledge have demonstrated this superior performance by novices in established groups (e.g., Hollingshead, 2000; Lewis, Lange, & Gillis, 2005; Liang, Morland, & Argote, 1995; Wegner, 1986, 1995; Wegner, Erber, & Raymond, 1991). Transactive knowledge is enhanced by the knowledge of the individual members and an understanding of who knows what within the team's information base. Researchers have compared these memory systems to computer networks (Wegner, 1995) and found evidence for these systems in students (Liang et al.), personal relationships (Wegner et al., 1991), top management teams (Rau, 2006), and organizational groups (Brandon & Hollingshead, 2004). In the present research, we showed that a similar system can be developed even in established groups consisting of individuals with no experience in solving complex and unstructured IT cases, reinforcing the importance of using realistic cases in the classroom and professional training.

Contrary to our expectations, we did not find a decrease in the raw number of information requests with more experience. We suspect that this result might be because our novices in established groups acted more like the expert-like novices described by Stevens et al. (1996), as indicated by the novices in established groups having higher scores than the novices in ad hoc groups.

Limitations and Suggestions for Further Research

Researchers' ability to generalize the results of a quasi-experiment beyond similar types of individuals and tasks is limited (Shadish, Cook, & Campbell, 2002). Although including professionals added richness to the present sample, we were required to perform the experiment in locations outside the laboratory environment. In addition, the coding of written protocol is labor-intensive and may not be totally objective.

The time limitations set for response to the cases constrained the ability of the participants to generate ideas other than those that came immediately to mind, and this constraint may have had an effect on the ability of participants to fully develop their recommendations or to access their entire knowledge base. An informal survey of some participants revealed that they did not feel rushed but, in fact, focused more quickly on developing their responses because they knew they had a limited amount of time. Future researchers might address the issues of the time limitation and how it affects a group's interaction.

We did not study the process of group interaction or the process of transactive memory (e.g., seeing if the groups identified the expertise of the group members; observing the allocation of information or tasks among the group members). Because of the small numbers of requested information items in each of the groups, we could not perform statistical analysis such as chi-square to review patterns of information gathering among the different experience levels. Future researchers could further investigate how groups communicate and gather information, how they come to agreement, and whether all members participate to enhance their learning. (For a review of group-processing research since 1989, see Kerr & Tindale, 2004. For examples of such experiments, see Hollingshead, 2001; Laughlin, Zander, Knievel, & Tan, 2003; Marxen, 1990; Watson, Michaelsen, & Sharp, 1991.)

NOTES

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REFERENCES

Abdolmohammadi, M., & Wright, A. (1987). An examination of the effects of experience and task complexity on audit judgments. *Accounting Review, 62*(1), 1–13.

Beane, W. E., & Lemke, E. A. (1971). Group variables influencing the transfer of conceptual behavior. *Journal of Educational Psychology, 62*, 215–218.

Bonner, S., Libby, R., & Nelson, M. (1997). Audit category knowledge as a precondition to learning from experience. *Accounting, Organizations, and Society*, *22*, 387–410.
Brandon, D. P., & Hollingshead, A. B. (2004). Transactive memory systems in organizations: Matching tasks, expertise and people. *Organization Science, 15*, 1526–5455.
Fall, R., Webb, N. M., & Wise, N. (1995, April). *Group discussion and large-scale language arts assessment: Effects on students' comprehension.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.
Hollingshead, A. B. (1998). Group and individual training: The impact of practice on performance. *Small Group Research*, *29*, 254–280.
Hollingshead, A. B. (2000). Perceptions of expertise and transactive memory in work relationships. *Group Processes and Intergroup Relations, 3*, 257–267.
Hollingshead, A. B. (2001). Cognitive interdependence and convergent expectations in transactive memory. *Journal of Personality and Social Psychology*, *81*, 1080–1089.
Kerr, N. L., & Tindale, R. S. (2004). Group performance and decision making. *Annual Review of Psychology*, 55, 623–655.
Laughlin, P. R., & Barth, J. A. (1981). Group-to-individual and individual-to-group problem-solving transfer. *Journal of Personality and Social Psychology*, 41, 1087–1093.
Laughlin, P. R., & Sweeney, J. D. (1977). Individual-to-group and group-to-individual transfer in problem solving. *Journal of Experimental Psychology: Human Learning and Memory*, *3*, 246–254.
Laughlin, P. R., Zander, M. L., Knievel, E. M., & Tan, T. K. (2003). Groups perform better than the best individuals on letters-to-numbers problems: Informative equations and effective strategies. *Journal of Personality and Social Psychology*, *85*, 684–694.
Lehmann, C. M., Heagy, C. D., & Willson, V. (2006). *A realistic test of transfer: Do novices in established groups represent problems similarly to experienced professionals after group interaction?* Working paper, University of Houston–Clear Lake.
Lehmann, C. M., & Norman, C. S. (2005). Teaching business students to recognize a firm in distress: What information is important to experts? *Journal of Education for Business, 81*, 91–98.
Lewis, K., Lange, D., & Gillis, L. (2005). Transactive memory systems, learning and learning transfer. *Organization Science, 16*, 581–598.
Liang, D. W., Morland, R., & Argote, L. (1995). Group versus individual training and group performance: The mediating factor of transactive memory. *Personality and Social Psychology Bulletin, 21*, 384–393.
Marxen, D. E. (1990). A behavioral investigation of time budget preparation in a competitive audit environment. *Accounting Horizons*, *4*, 47–57.
Olivera, F., & Straus, S. G. (2004). Group-to-individual transfer of learning: Cognitive and social factors. *Small Group Research*, *35*, 440–465.
Rau, D. (2006). Top management team transactive memory, information gathering, and perceptual accuracy. *Journal of Business Research*, *59,* 416–424.
Schmidt, H. G., Norman, G. R., & Boshuizen, H. P. A. (1990). A cognitive perspective on medical expertise. *Academic Medicine, 65*, 611–621.
Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* Boston: Houghton Mifflin.
Stevens, R. H., Lopo, A. C., & Wang, P. (1996). Artificial neural networks can distinguish novice and expert strategies during complex problem-solving. *Journal of the American Medical Informatics Association, 3*, 131–138.
Watson, W., Michaelsen, L. K., & Sharp, L. (1991). Member competence, group interaction, and group decision-making: A longitudinal study. *Journal of Applied Psychology, 76*, 803–809.
Webb, N. (1997). Assessing students in small collaborative groups. *Theory Into Practice, 36*, 205–213.
Webb, N. M., Chizhik, A., Nemer, K., & Sugrue, B. (1998). Equity issues in collaborative group assessment: Group composition and performance. *American Educational Research Journal, 35,* 607–651.
Wegner, D. M. (1986). Transactive memory: A contemporary analysis. In B. Mullen & G. R. Goethals (eds.), *Theories of group behavior* (pp. 185–208). New York: Spinger.
Wegner, D. M. (1995). A computer network model of human transactive memory. *Social Cognition, 13*, 319–339.
Wegner, D. M., Erber, R., & Raymond, P. (1991). Transactive memory in close relationships. *Journal of Personality and Social Psychology, 61*, 923–929.
Wise, N., & Behuniak, P. (1993, April). *Collaboration in student assessments.* Paper presented at the annual meeting of the American Educational Research Association, Atlanta, GA.

APPENDIX A
Case Materials

Polk Memorial Children's Hospital Case

Polk Memorial Children's Hospital operates a centralized purchasing system for drugs, medical and administrative supplies, food, and other consumables. Departmental, laboratory, and office managers submit purchase requisitions and the central purchasing department issues purchase orders to vendors. Some purchase orders request one-time deliveries, whereas others, typically for routinely needed items, call for regular deliveries over a period of time. The centralized system enables the hospital to shop around among vendors and negotiate larger volume discounts. It also facilitates internal control by separating the authorization of purchases from dealing with particular vendors.

Until recently, the hospital's purchasing system functioned along traditional lines. Purchase orders were prepared and mailed to vendors. When supplies were urgently needed, purchasing clerks would phone in orders to vendors and later confirm them in writing. However, 9 months ago, the hospital administrator announced conversion to an electronic data interchange (EDI) system for purchasing. The goal was to handle at least 90% of purchases by electronic purchase orders within 1 calendar year of the announcement date.

Some problems had to be overcome. Polk Memorial Children's Hospital and the 20–30 largest vendors already had the necessary computer hardware resources to implement the EDI system and proven commercial software was available for immediate installation. But many smaller vendors had inadequate computer facilities. Although these vendors had a strong incentive to come on board, their ability to do so within the 12-month time window was doubtful.

The hospital is considering helping these vendors acquire the necessary resources to receive and process electronic purchase orders. You were hired as a consultant to advise the hospital on what to do about the small vendors who are having problems complying with the deadline.

Paper Moon Aeronautics Case

You have just been promoted to Chief Information Officer at Paper Moon Aeronautics. Paper Moon has a contract with NASA to provide supplies for the international space station project. These supplies include connectivity and accessory products for the computers on the station, toiletries for the residents, lab supplies for the botanical experiments, and CD players for psychological support.

Because of this NASA contract, Paper Moon has grown substantially. The accounting system has been pushed beyond its limits and office space is extremely cramped. When you joined the company, the company had six employees housed in a small office in a strip center off NASA Road 1. Now the company employs 50 people along with 2 engineering co-op students (1 from Texas A&M and 1 from the University of Texas), who work during the summer. Sales have increased to about $10 million annually.

(appendix continues)

APPENDIX A (cont.)

EDI has been success fully implemented, allowing Paper Moon to expand its customer base to include Bowing Corporation and Lockweed Martian Aerospace. Both firms are large aerospace contractors who certify hardware for NASA's space station and space shuttle programs. Because of Paper Moon's expertise in the development and manufacture of lab equipment, other international partners in the space station have expressed interest in working with Paper Moon to develop research tools for use on the space station.

As a result of the company's growth, Paper Moon desperately needs a new accounting system. Rather than pay the high cost of hiring an outside consultant or consulting firm, the CEO has asked you to make recommendations to executive management for a new system. The goal of the system is to reduce the labor-intensive activities such as manually printing checks to pay vendors, manually printing invoices to customers, keeping track of employee benefits, taxes, etc. The CEO requests that a budget for the new system be a part of your recommendations.

Bay Area Video Case

Andrea Clark founded Bay Area Video several years ago. The single store prospered and she now owns three local stores. Each has a full-time manager who hires students and others to work on a part-time basis. Every week Andrea forwards advance notices of forthcoming videos to each store manager. Store managers submit purchase requests to Andrea, who consolidates them and places the orders. As managers perceive the desirability of adding to the existing inventory of particularly popular films, these are added to the weekly purchase requests and Andrea places a consolidated purchase order. When store managers notice that films are no longer being rented, those films are placed on sale.

When her first store opened, Andrea selected a certified public accountant (CPA) to maintain her accounting records and handle all payroll and bill paying. She gets a monthly income statement from the CPA around the 10th of each month that shows total sales broken down by type and a detailed balance sheet. Although these reports are useful to gauge her progress and Andrea has no criticism of the accounting reports, she has a feeling that she is unable to monitor individual store operations as closely as was possible when she had only one. Also, store managers are having difficulty monitoring their inventory.

APPENDIX B
Examples of Matched and Not Matched Responses to the Case Question Portion of the Grading Sheet Used to Record Matched Responses to Case Question 3

Question 3: Additional information and testing you would request (check all that apply)

- Demographics of each store (to review demand driven by demographics). _____
- Data currently being captured. _____
- Current accounting software's reporting capabilities. _____
- Controls currently in place. _____
- Details of information that needs to be captured at each store. _____
- Timing of required reports. _____
- Review of past decisions to see if they'd change with up-to-date information. _____
- Explore technology alternatives, including point-of-sale or other methods, to collect and report necessary information to the right people. _____

Total additional information items requested _____

Examples of responses that did not match the master panel's responses

"Lots of training information"
"Track payroll and hours for each store employee"
"How much would the software cost?"
"Cost/benefit of keeping the CPA"
"Is the owner wanting to sell the business?"
"Full description of entire transaction/business flow"
"Estimate of shrinkage loss"
"How to track inventory theft/unreturned videos"