Virtual groups meet via the Internet every day. When such groups confront large bodies of information in decision making, the group process often becomes confused and chaotic. Process structuration (Giddens, 1979, 1984; Poole, Seibold, & McPhee, 1985) provides a theoretical framework by which we can understand group processes and outcomes. This study examines the effects of process structuration by means of a training video on maintenance behavior and outcomes in 55 different student virtual decision-making groups from two universities. Results show that trained groups had higher levels of social support, greater participation rates, and greater satisfaction with the group; wasted less time and energy; and made significantly more accurate judgments. We discuss implications for the impact of this type of training on virtual groups and suggest further research.

Keywords: Group Process, Process Structuration, Process Training, Virtual Groups

The Effect of Process Training on Process and Outcomes in Virtual Groups

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Organizations around the world are using virtual groups. Such groups are popular because they make greater participation possible in remote locations. Using the Internet, groups can shrink time zones and distance and join decision-makers from around the world to make important organizational decisions (Duarte & Snyder, 1999). A recent article in *The Wall Street Journal* (Bell, 1999) chronicles the problems that DaimlerChrysler is having getting the correct expertise to the site in the corporation where it is needed. Many global corporations like DaimlerChrysler are finding Internet meetings a necessity to reduce travel costs and to produce the synergy that global mergers and acquisitions promise.

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However, virtual groups have many of the same problems as face-to-face groups. Steiner's (1972) classic work on the traditional meeting structure notes that meetings are often not at all productive. Virtual meetings are no exception to this rule. Groups may suffer from groupthink (Janis, 1982), groupshift (Clark, 1971), social loafing (Comer, 1995), too much conformity (Asch, 1951), counter-productive cohesiveness (Mullin & Cooper, 1994), and a whole catalog of lesser ills. Since participants in virtual groups don't see each other face-to-face, social loafing seems to be a potentially troubling problem.

Process Structuration Theory

As the problems virtual groups work on become more complex and intractable, the resulting group process often becomes more chaotic and unmanageable. One theory that has gained popularity in explaining group phenomena is the Theory of Structuration (Giddens, 1979, 1984; Poole, Seibold, & McPhee, 1985; Barley & Tolbert, 1997; Shaila & Bostrum, 1999). Structuration refers to the process of production and reproduction of social systems by the application of generative rules and resources (Giddens, 1979). Structuration Theory distinguishes between system and structure. For example, the status hierarchy of a group can be regarded as a social system. The structure behind this system consists of rules and resources—norms of how superiors and subordinates should interact, superiors' control over budgets and promotions, and subordinates' control over communication access from lower-level subordinates to the highest levels of the organization. In this thinking, structures are both the medium and the outcome of action. They are the medium because structures provide the rules and resources people must draw on to interact meaningfully. They are its outcome because rules and resources only exist through being applied and acknowledged in interaction—they have no existence apart from the social practices they constitute (Poole, Seibold, & McPhee, 1985).

Whenever structure is employed in action, the activity reproduces the structure by displaying it and confirming it as a meaningful basis for action. New group members watch the established group members. The behavior of the old members reproduces the group's structure. The behavior of new members reproduces the old structure, but often with subtle, evolutionary twists. Structures are properties of interaction systems. They extend over time since social practices do not occur in a split second. They cannot simply be cognitive maps in people's heads because they are intersubjective and only realized as interaction unfolds (Giddens, 1984). The unfolding process reinforces and alters cognitive maps.

Unaided group action and interaction often result in meeting structures that are not productive. One structurationist explanation for poor interaction and low productivity is that group structures can mutually

assist or oppose each others' production and reproduction. Such assistance or opposition can result in mediated or contradicted interpenetration (Giddens 1979; 1984). In mediated interpenetration two structures act in a complementary manner and continue to exist and reinforce one another. In contradicted interpenetration, one structure is weakened or ceases to exist and the other is strengthened.

For instance, the status structure of a group and its communication patterns are two structures. In mediated interpenetration the status structure and the communication patterns could reinforce one another: Equals would discuss things with equals and share the results with subordinates after their discussion. The communication pattern would, therefore, reinforce the status hierarchy. However, if communication becomes all channel (e.g., e-mail), everyone has access to everyone else, and the communication pattern contradicts the status hierarchy. This situation is an example of contradicted interpenetration.

Structurationists have sought manipulations that could ensure mediated interpenetration and a maximally effective unfolding group process. Both interventions occurring prior to group formation and interventions occurring during the group process affect the process structuration. Bostrum, Anson, and Clawson (1993) identify three major structuration intervention strategies: supporting task content, supporting the group process, and group training. Support for ongoing group process is usually termed facilitation, and we next review the process facilitation literature.

Process and Content Facilitation

Process facilitation has an extensive literature. We are particularly interested in process facilitation in electronic meetings, so we will eschew a review of the face-to-face process facilitation literature and concentrate instead on the electronic meetings literature on process facilitation. A number of studies have examined the effect of process facilitation on group outcomes in Group Support Systems (GSS) groups (e.g., Dickson, Partridge, & Robinson, 1993; Partridge, 1992; Wheeler & Valacich, 1996; Shaila & Bostrum, 1999). Since process facilitation is integral to the GSS approach to group decision making, a theory of group facilitation is important to understanding how GSS functions. Bostrom, Anson, and Clawson (1993) defined facilitation as "activities carried out before, during, and after a meeting to help the group achieve its outcomes" (p. 146). Shaila and Bostrum (1999) examined the effects of both content and process facilitation on group processes and outcomes. Here content facilitation meant that the person facilitating the meeting intervened in the subject matter being discussed and made comments and suggestions about the content of the discussion. Process facilitation was focused on things like who contributed, how each person contributed, and whose sug-

gestions were ignored. Shaila and Bostrum concluded that content facilitation actually had a negative impact on meeting processes. On the other hand, they found that process facilitation had a positive impact on the meeting processes. The improved processes had a strong positive impact on satisfaction but no significant effect on quality.

The literature in GSS facilitation has typically focused on three types of outcomes or dependent variables from intervention: improvements in the process, group satisfaction with process and product, and the quality of the product. This study uses all three of these dependent variables since they are well established in the GSS literature (Benbasat & Lim, 1993). Even though we are interested in unfacilitated groups, we will retain the GSS dependent variables.

While GSS is an important electronic aid to decision making, exchanging information and making decisions is more common over e-mail and the Internet rather than in synchronous, single-location environments. Since this is so, many, if not most, of these Internet meetings are held without a facilitator. We should, therefore, be interested in process structuration by means other than facilitation. Thus, we focus this paper on the third approach, namely group training interventions prior to group formation.

Training and Structuration

In an attempt to find a substitute for a process facilitator that could improve the way group structures are produced and reproduced, we follow the suggestion of Bostrum, Anson, and Clawson (1993) to focus on training. Training is one form of facilitation that is known to have an impact on group processes and yet does not require that the facilitator be involved with the group (Schrage, 1995; Clark, 1998). The facilitation is internalized by the group members, and they perform many of the facilitators' functions for themselves. If training as a facilitation method actually improves meeting processes and outcomes, then it provides an inexpensive and clear advantage to unfacilitated groups.

We chose video as the only viable format for training. Since virtual group participants may be joined only by the Internet, only training that could be delivered via Internet would be uniform for all groups. Internet training could be accessed at the trainees' convenience. Such training should be brief and try to encourage group member behavior that is helpful and productive for an Internet meeting. Training should deal with developing a shared vision or goal, developing a sense of team identity, getting to a state of mutual trust, communicating effectively, and enjoying the group process. It should also handle successful interpersonal processes: listening, supporting other group members, differing in a constructive manner, and encouraging everyone's participation. The training should be offered in an entertaining, fast-paced format.

Hypotheses

One effect that might be produced by training is to make group members engage in more maintenance behaviors such as encouraging and supporting, harmonizing, gatekeeping, process observing, following, and setting standards. It has been long established that such behaviors are related to increases in participant satisfaction with group work (Steiner, 1972). Moreover, if such behaviors increase participant satisfaction, it seems equally likely that they will produce better outcomes of the group process, if they produce more participant "buy-in" to the group's work. The expectation that training would increase supportive and participative behavior and produce better group outcomes led to 11 hypotheses:

H1: Trained groups will have higher perceived levels of participation.
H2: Trained groups will have higher perceived levels of social support.
H3: Trained groups will have lower perceived levels of competition.
H4: Trained groups will work together more effectively.
H5: Trained groups will believe that they produced better solutions.
H6: Trained groups will show higher commitment to the ultimate group solution.
H7: Trained groups will be less likely to indicate they want to work with a different group in the future.
H8: Members of trained groups will report wasting less time and energy.
H9: Trained groups will believe that they produced the best solution possible.
H10: Trained groups will perceive they reached consensus more often than will untrained groups.
H11: Trained groups will reach more accurate solutions than will untrained groups.

Method

Student groups met online to choose the best candidate for a university administrative position from among three candidates. Members of 21 groups watched a training video on the Web; members of 35 groups did not.

Subjects

Subjects were 258 college sophomores and juniors from two different universities. All subjects were enrolled in introductory business communication classes. Their participation was part of their course requirements; they received no additional compensation. Most students had previously participated in team projects in other classes or on the job, but none had participated with the currently assigned team. All students had sufficient typing and computer skills to use the Internet and participate in a threaded discussion. All of them had been previously trained to use the computers in their school laboratories. Thus, they were familiar with

the labs and the computers there, so no instruction time on computers was necessary. Groups were made up of five or six students each.

Web Site

A project Web site was constructed on a server dedicated to this experiment. Two back-up servers were also used during high-traffic periods so that students could always log on. The site contained 66 pages including instructions, questionnaires, and evaluation forms. Each student was given a user name and a password to enter the site. Menu-driven instructions provided clarity for each step in the process. As Figure 1 shows, students had to complete each step before they could advance to the next and could not advance to the group work until they had completed all of the individual assignments.

Procedure

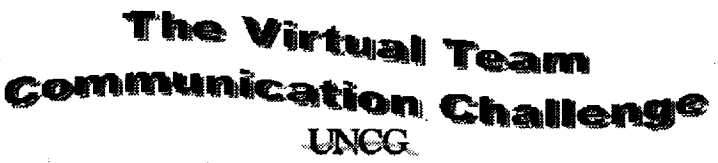
We gave students a position description, résumés of three candidates, and a description of a fictitious university, and asked them to recommend a candidate for the position of international program director. Students could log on and participate in the experiment when they chose to, and from any computer with Internet access. The Web site controlled the experiment and forced students to complete each task in a pre-determined sequence.

We randomly assigned each subject to a group. The six member groups contained an equal number of students from both universities. The five member groups were divided three from one university and two from the other. Each group met online through an asynchronous threaded discussion format. An example of the discussion boxes used is shown in Figure 2. The topics discussed (threads) are listed down the left side of the page and comments on the topics (branches) are listed on the right side of the page. At each posting opportunity, a person can respond to a topic previously posted or can post a new topic for others to respond to.

Before group activities began, students individually rated three candidates for an international programs director's position. After subjects individually read all the materials, they were asked to rate the three candidates on their overall suitability for the job based on the applicant's paper credentials (step 3 in Figure 1). From the project Web site, students then viewed a 20-minute digitized video of each candidate's interview with a professional interviewer and completed a direct magnitude estimation rating of each of the candidates (step 4 in Figure 1). This concluded the individual activities.

Students then participated in a lengthy threaded group discussion (three weeks) as to which of the candidates was best for the job. At the conclusion of this discussion, they attempted to come to a group consensus on the direct magnitude estimation rating for each candidate. All the stimulus materials were displayed, all discussions were carried on, and all

Figure 1.
Computer Screen Tracking Subject Participation



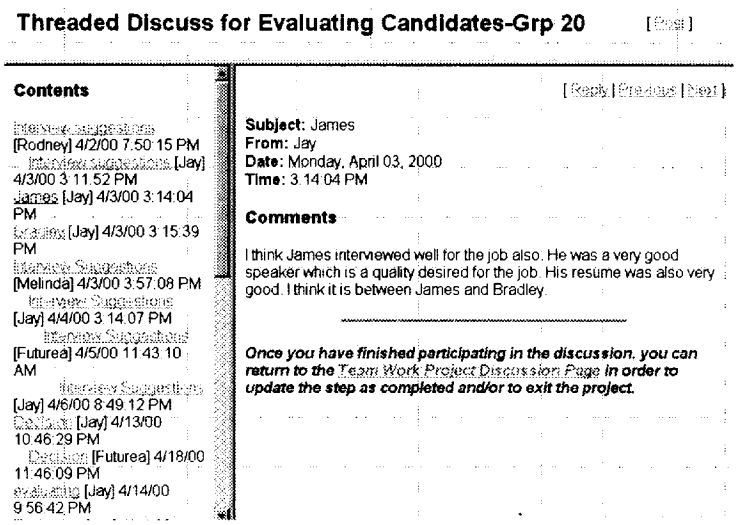
Teamwork Project Individual Status

Welcome Sonja,

Our records indicate that you have completed so far 1 of 22 activities. You should now work on activity 2.
The activities below are required in the project. We hope that you enjoy the project.

Status	No	Activity	Due Date
✓	1	STEP 1 - Registration & Training	
➪	2	Helpful Hints	
	3	Register your participation	(3/24/00)
	4	Learn about high performing teams	
	5	Introductory threaded discussions	
	6	STEP 2 - Reviewing background information	
	7	Information about Pine Ridge State University	
	8	Information about the Open Position	
	9	STEP 3 - Reviewing candidate resumes	
	10	Reviewing On-line Resumes	
	11	Evaluating the Resumes	(3/27/00)
	12	STEP 4 - Reviewing candidate interviews (digitized videos)	
	13	Reviewing Digitized Videos of Interviews	
	14	Evaluating the Interviews	(3/29/00)
	15	STEP 5 - Group discussions and consensus building	
	16	Threaded Discussion for Introductions and Planning Purposes	(3/29/00)
	17	Threaded Discussion for Evaluating Candidates	(4/3/00)
	18	Submitting a Group Consensus Recommendation	(4/14/00)
	19	STEP 6 - Developing the Memo	
	20	Format Instructions for the Report You Must Produce	(4/19/00)
	21	STEP 7 - Post-Simulation Opinions and Impressions	
	22	Debrief and analysis	(4/17/00)

Figure 2.
Computer Screen for a Threaded Discussion



ratings were performed on the Web. The entire experiment was completed in just less than four weeks.

Training

The training was done by digitized video, which subjects could view on the project Web site. Members of 21 groups were exposed to a 15-minute video explaining basic principles that make a group into a team. The video was filmed in a TV studio with the second author making a PowerPoint presentation. The authors made every possible effort to make the video commercial quality. The graphics were professionally done, and a professional TV director supervised the taping. The video emphasized cooperation and support, modeling and encouraging maintenance behaviors. Basic points from the training video script are listed in Figure 3.

Measures

We used three measures in this study: self-report measures of group processes, self-report measures of group outcomes, and an objective measure of the quality of the group's decision.

Group processes were measured by items from the Group Skills Inventory (GSI, cf. Goldman, 1995) and several homemade instruments that we constructed. Initially, we used 72 items. We edited their wording to fit this experiment, and we adopted a common five-point scale for all the

Figure 3.
Basic Elements of Video Training Script

1. Characteristics of "high performing" teams
   a. Shared vision or goal
   b. Sense of team identity
   c. Mutual trust
   d. Effective communication
   e. High level of enjoyment
2. Analyzing group process
   a. What accounts for some groups performing better than others?
3. Effective decisions: Quality and acceptance
4. Synergistic consensus–effective interpersonal and rational process
5. Keys to successful interpersonal process
   a. Listening
   b. Supporting
   c. Differing in a constructive manner
   d. Participating
6. Rational process
   a. Analyze situation
   b. Identify objectives
   c. Consider alternative strategies
   d. Consider possible consequences
7. Differentiate between objectives and actions
8. Advocacy methods less effective than suspending judgment for a while
   a. Be creative and original
   b. Encourage the free flow of ideas
9. Throughout rational process maintain a civil tone and support other group members

items: 0 = Not at all; 1 = To a slight extent; 2 = To a moderate extent; 3 = To a great extent; 4 = To a very great extent. These items were given to a separate sample of 355 subjects prior to the start of this experiment.

These process measures were factor analyzed (principal components) and the rotated solution yielded 14 factors by Kaiser's Criterion (Kaiser, 1970). However, the solution did not evidence simple structure. We went through the factors and chose the strongest three, which captured about 40% of the variance. These three factors were then refined by means of reliability analysis so that the weakest of them had a Cronbach's alpha of .85. The resulting three factors were labeled competition, participation, and support measured by 19, 12, and 7 items, respectively, listed in Appendix A. Each subject in this experiment got a factor score for each of these three process variables. These measures were used at the individual level and also averaged to yield group measures.

Seven self-report outcome measures were (a) worked together effectively

as a group, (b) the group solution was better than your own, (c) you are committed to the group's course of action, (d) you would like to work with a different group of people if given this problem again, (e) group wasted time and energy, (f) group came up with the best possible solution, and (g) group effectively reached consensus. These measures used the same five-point scale used for the process measures and, like the process measures, were used at the individual level and averaged for each group.

To measure the quality of the group's decision, we asked a convenience sample of 15 human resource professionals from a local human resource association, working individually, to rate each of the candidates on a scale of 1 to 100. The average of their ratings was said to be the ideal. The absolute value of the difference between each group's ratings and the expert ratings summed across all three candidates was the distance score. We felt that some measure of the ability of the group to make decisions like human resource experts was necessary as an outcome measure. Thus groups whose estimates were closest to the experts' judgments got the lowest (best) scores. Those groups whose estimates were furthest got the highest (worst) scores.

Results

Training improved both participation and support. However, contrary to hypothesis 3, the training appears to have had little effect on whether subjects perceived competition within groups.

Table 1 shows the correlations among individual-level variables. Most remarkable in this table are the correlations between the process variable support and all the individual outcome variables. The level of support in the groups is strongly predictive of good group outcomes. The level of competition in the groups does not appear to be strongly related to any of the outcome variables whereas the level of participation is positively related to working together and negatively related to wasting time and effort.

In general, one may say that the process variables, participation and support, are related to outcome variables at the individual level. Support is related to all seven outcome variables with a correlation of at least .35 or better. Given the large number of subjects in this experiment, this is a very strong relationship between this process variable and all the self-report outcome measures. It is also interesting to note the disparity in standard deviations between competition and support. Support has a much higher mean even though it encompasses fewer items, but a lower standard deviation. From these values one might assume that there was a very large amount of variability in perceptions of competition both across and within groups.

Table 2 shows the individual level process variables for the trained and untrained groups. The Wilks' Lambda is significant at the .01 level mostly on the strength of the difference found in the support variable. However,

Table 1.
Individual Level Descriptive Statistics (N = 258)

Variable	Mean	SD	Partici-pation	Support	Worked Together	Group Solution Better	Committed to Group Solution	Prefer Different Group	Waste Time & Energy	Best Possible Solution	Consensus
Competition	1.03	0.77	-.42**	-.07	-.04	.07	-.20	.13*	.24**	-.12*	-.24**
Participation‡	2.35	1.08	1.00	.36**	.40**	.23**	.10	-.39**	-.53**	.21**	.15*
Support	2.42	0.83		1.00	.59**	.42**	.35**	-.36**	-.48**	.45**	.43**
Worked Together	3.05	0.95			1.00	.43**	.29**	-.31**	-.43**	.38**	.33**
Group Solution Better	2.52	1.19				1.00	.31**	-.14*	-.21**	.29**	.22**
Committed to Group Solution	3.64	1.04					1.00	-.07	-.04	.53**	.48**
Prefer Different Group	2.76	1.39						1.00	.49**	-.09	-.17**
Waste Time & Energy	2.25	1.16							1.00	-.17**	-.20**
Best Solution Possible	3.53	1.05								1.00	.58**
Consensus	3.61	1.06									1.00

Table 2.
Trained vs. Untrained Groups
Individual Level Process Variables
(*N* = 258)
Wilks' Lambda = 0.85**

	Untrained n = 123		Trained n = 135		
Variable	Mean	Std. Dev.	Mean	Std. Dev.	F
Competition	1.06	0.76	0.98	0.78	0.877
Participation	2.45	1.09	2.20	1.04	3.958*
Support	2.24	0.84	2.68	0.73	23.159**

*$p < .05$
**$p < .01$

Table 3.
Trained vs. Untrained Groups
Individual Level Outcome Variables
(*N* = 258)
Wilks' Lambda = 0.67**

Variable	Untrained n = 123	Trained n = 135	F
The group worked together	2.94	3.20	5.773*
The group solution was better	2.48	2.59	0.624
Committed to group solution	3.61	3.67	0.281
Work with different group	2.97	2.43	11.593**
The group wasted time & energy	2.55	1.80	34.316**
The group produced best solution possible	3.55	3.50	0.149
The group reached consensus	3.54	3.72	2.155

*$p < .05$
**$p < .01$

Table 2 shows that the individual level data support hypothesis 1 and hypothesis 2. Support was 2/3 of a standard deviation higher in the trained group. In a sample as large as this one, that is a substantial difference. There does appear to be an improvement in both participation and support produced by the training. However, contrary to hypothesis 3, the training appears to have had little effect on whether subjects perceived competition within groups. The *F* for this comparison is actually less than one.

Table 3 shows the results of the individual level outcome variables contrasted between the trained and untrained groups. Hypothesis 4, that trained groups should work together more effectively, was supported. Table 3 shows that trained groups did believe that they worked together

more effectively. While the difference between the two group means was not large, there still is an *F* greater than 5.7, a substantial effect. On the other hand, hypothesis 5 did not receive support. There is little difference between the means of the trained and untrained groups, indicating that trained groups did not believe that they produced better solutions than did untrained groups.

Hypothesis 6 was not supported by the data. The contrast between trained and untrained groups produced an *F* of much less than 1.0. The means for the two groups were only .06 apart. Hypothesis 7, on the other hand, does show a significant difference between the trained and the untrained groups. Members of trained groups were much less likely to indicate a preference for working in a different group. This effect is strong with an *F* of almost 11.6. Hypothesis 8 also received support. Trained groups reported that they wasted less time and energy than untrained groups reported. This was the strongest effect in Table 3, with an *F* of 34.3. Clearly, trained groups must have produced a process that at least seemed more efficient and effective than that produced by the untrained groups.

Hypothesis 9 was that trained groups should believe that they produced the best possible solution—or at least they should have believed this more strongly than did untrained groups. However, the data do not support this hypothesis. In fact, there is virtually no difference between the means of the two groups. Hypothesis 10 was that trained groups should perceive that they reached consensus more than untrained groups should. This hypothesis was also not supported by the results.

Table 4 shows the process variables at the group level. The Wilks' Lambda is significant at the .01 level indicating the significance of the difference of the mean vectors for the two groups. However, the univariate analyses reveal that only support is significantly different between the trained and untrained groups. This is a slightly different result than that shown in Table 2. In Table 2, participation is significantly better in the trained group, whereas at the group level of aggregation shown in Table 4 this difference disappears. When all the within group variability is removed by aggregating the scores at the group level, participation is no longer significantly different between trained and untrained groups. Thus, hypotheses 1 and 3 do not receive support from these group level results. Hypothesis 2 that trained groups should have higher levels of social support was buttressed by the group level results. The effect for support loses little of its strength from the individual level of analysis, the *F* value falling only from 23 to 17.

Table 5 shows the outcome variables at the group level of aggregation. Again, the Wilks' Lambda is significant at the .01 level. The univariate *F* tests reveal that the same three outcomes are significant at the group level of aggregation as were significant at the individual level of aggre-

Table 4.
Trained vs. Untrained Groups
Group Level Process Variables
(N = 56 Groups)
Wilks' Lambda = 0.50**

	Untrained n = 35		Trained n = 21		
Variable	Mean	Std. Dev.	Mean	Std. Dev.	F
Competition	1.05	0.43	0.99	0.36	0.486
Participation	2.46	0.60	2.22	0.62	2.663
Support	2.22	0.46	2.70	0.39	17.511**

*p < .05
**p < .01

gation. Thus, hypotheses 4, 7, and 8 received support from the group-level outcome data. Hypotheses 5, 6, 9, and 10 did not receive support. The F ratios are slightly lower in the group analysis of these variables, but the order of relative effect strength remains the same.

Table 6 shows the means of the two groups comparing the absolute deviation of the consensus solution from the ideal solution. One can see that the standard deviation of both groups was large, but the trained group had a significantly smaller standard deviation (Lavene's F = 4.63, p < .05). Apparently, training had the effect of making judgments converge.

As Table 6 shows, the means favor the trained group. The regular univariate ANOVA comparing the trained and untrained groups is significant at the .05 level (F = 8.562, p < .01). So even though group members did not perceive that their groups' solutions were better in the trained than in the untrained groups, the trained groups' solutions were in fact closer to the experts' solutions. Thus, hypothesis 11 that trained groups should produce more accurate judgments than untrained groups received support.

In Table 1, we learned that support was correlated with all the outcome variables. Participation was correlated significantly with all but one of the outcome variables. Since the effect of training on outcomes logically obtains through the process variables, we should examine the effect of training on outcomes holding process constant. Table 7 shows the results of group level ANACOVA on all outcome variables. As noted above, the group's consensus solution was compared with an expert HR solution. The more participation and support that there was in the trained group, the better its solution was.

Table 7 shows the ANACOVA of outcome variables controlling for process variables competition, participation, and support. Although we did not hypothesize direct and indirect effects of training on outcomes, ANACOVA allows us to examine the relationship between trained vs. untrained

Table 5.
Trained vs. Untrained Groups
Group Level Process Variables
(*N* = 56 Groups)
Wilks' Lambda = 0.67**

	Untrained n = 35		Trained n = 21		
Variable	Mean	Std. Dev.	Mean	Std. Dev.	*F*
The group worked together	2.9423	.6247	3.2333	.3486	3.824*
The group solution was better	2.4763	.6179	2.6086	.4879	0.699
Committed to group solution	3.5923	5497	3.6205	.5683	0.034
Work with different group	3.0440	.8736	2.3576	.5540	10.406**
The group wasted time and energy	2.5689	.6653	1.7995	.6241	18.369**
The group produced best solution possible	3.5414	.5255	3.5257	.4218	0.014
The group reached consensus	3.5134	.6293	3.7324	.5217	1.797

*$p < .05$
**$p < .01$

groups and the outcome variables with the process variables held constant. Two of the three outcome variables that were significant in Table 3 are significant in Table 7. In addition, the accuracy of the group solution shows a significant result as well. This indicates that training has both a direct and an indirect effect on outcomes. It has an indirect effect in that it influences the processes as we saw in Table 2. If we control for its effect on the processes, training still has a direct effect on outcomes.

Discussion

The Theory of Process Structuration suggests three potential methods to improve the production and reproduction of group structure and process: (a) content facilitation; (b) process facilitation; and (c) training. We chose the content of our training program with a view to its potential for improving group structure and process. Shaila & Bostrum (1999) demonstrated in GSS groups that content facilitation is not helpful in producing better group outcomes but process facili-

Table 6.
Distance of Group Solution from Ideal

	Mean	Std. Deviation	*n*
Untrained	73.08	32.08	28
Trained	59.65	21.18	21
Total	67.33	28.48	49

Table 7.
ANACOVA on Outcome Variables Between Trained and Untrained Groups Controlling for the Effects of Process Variables

Source	Sum of Squares	*df*	Mean Square	*F*
The group worked together	0.300	1	0.300	2.059
The group solution was better	0.158	1	0.158	0.553
Committed to group solution	0.495	1	0.495	1.755
Work with different group	0.119	1	0.119	0.335
The group wasted time and energy	1.126	1	1.126	6.563**
The group produced best solution possible	0.726	1	0.726	4.776*
The group reached consensus	0.098	1	0.098	0.398
Distance of group solution from ideal	3273.31	1	3273.31	4.581*

*$p < .05$
**$p < .01$

tation is. Our results extend their findings in two ways: First, we show that training can facilitate both group processes and group outcomes. Second, we show that this effect is possible even in the situation where the subjects participate asynchronously and at geographically distributed locations.

These results clearly show that training affects the group process. The training here always improved support and improved participation at least at the individual level of analysis. There was no difference between trained and untrained groups in competition during the discussions. The process variables of support and participation were substantially correlated with outcome variables. The outcome variables showed substantial differences between the groups in the areas of working together effectively, prefer to work with a different group of people next time, and wasting time and energy. These results are in keeping with the face-to-face results of Schrage (1995) and Clark (1998): Training can significantly affect group process and outcomes.

It seems a reasonable inference to suppose the following causal sequence. The training focused group members on supporting others and participating often in the group process. Since this experiment was carried out over a period of several weeks and since students have a lot of other things to do besides work with their groups, the training effect must have been very strong since it lasted for the duration of the group. The training caused better outcomes with both a direct effect on outcomes and also an indirect effect through group process. Training as a means of structuration appears to have a great deal of promise. Even a brief video was able to alter the production and reproduction of group structures during the group interaction.

GSS experiments have shown that group facilitation improves group outcomes (Shaila & Bostrum, 1999). However, it is quite likely that most decision-making in the future will not be located inside the GSS lab. While GSS will clearly continue to play a role, there are simply too many workplace decision-making situations where it will not be possible to get the decision-makers into one room at the same time. The Internet will more and more provide a venue for group meetings. This study shows process training is useful to ensure that such groups make the best possible decisions.

The results of the study are limited by the fact that we used student subjects in a simulated decision-making situation. However, these students had a substantial portion of their course grade riding on the outcome of their performance in the group. It remains to be seen whether these strong participation and support effects will obtain in professional populations making real decisions. We anticipate that they will. The training effect is so strong in this study that it seems likely such a strong effect would, even if it weakened, also obtain in workplace groups. We suggest that other researchers extend our design to diverse groups already using the Internet for their meetings.

Summary and Implications

These results have both practical and theoretical import. On the practical level, training shows great promise in producing better group solutions and more satisfying group interaction. On the theoretical level, these results suggest that future research from a structuration perspective should concentrate on how specific training content affects group process. Specific training features should lead to specific process patterns.

Future research should question whether the training would transfer from the group setting where the training is done to other group settings. How long will the effect last? Is more extensive training merited? Is the "talking head" method best, or should the training concentrate on showing groups in action? Similarly, there is the question of whether an Internet group's prior face-to-face acquaintance would increase the effectiveness of the training.

A number of factors suggest that groups in the future will increasingly interact through electronic media. With the global expansion of business, team members may be geographically dispersed. Busy people faced with scheduling conflicts will turn to online groups. The growing popularity of long-distance education will continue to take the classroom outside the walls of the academic buildings. Virtual groups will play a role not just in business and education, but also in health care, government, and not-for-profit organizations as well. Our study suggests the need to train individuals to work as effective members of a virtual team. Training should lead to higher levels of social support, greater participation rates, greater satisfaction with the group, less wasted time and energy, and more accurate group decisions.

REFERENCES

Asch, S. E. (1951). Effects of group pressure upon the modification and distortion of judgments. In H. Guetzkow (Ed.), *Groups, leadership and men: Research in human relations* (pp. 177-190).Pittsburgh: Carnegie Press.

Barley, S. R., & Tolbert, P. S. (1997). Institutionalization and structuration: Studying the links between action and institution. *Organization Studies, 18,* 93-117.

Ball, J. (1999, Aug. 24) Your career matters: DaimlerChrysler's transfer woes—Workers resist moves abroad—and here. *The Wall Street Journal,* B1.

Benbasat, I., & Lim, L. (1993). The effects of group, task, context, and technology variables on the usefulness of group support systems: A meta-analysis of experimental studies. *Small Group Research, 24,* 430-462.

Bostrum, R. P., Anson, R., & Clawson, V. K. (1993). Group facilitation and group support systems. In L. Jessup and J. Valacich (Eds.), *Group support systems: New perspectives* (pp. 146-169). New York: Macmillan

Clark, R. D., III. (1971). Group-induced shift toward risk: A critical appraisal. *Psychological Bulletin, 76,* 251-270.

Clark, T. (1998). Teaching students to enhance the ecology of small group meetings. *Business Communication Quarterly, 61,* 40-52.

Comer, D. R. (1995). A model of social loafing in real work groups. *Human Relations, 48,* 647-667.

Dickson, G. W., Partridge, J. L., & Robinson, L. H. (1993). Exploring models of facilitative support for GDSS technology. *MIS Quarterly, 17,* 173-194.

Duarte, D. L., & Snyder, N. T. (1999). *Mastering virtual teams*: Strategies, tools, and techniques that succeed . San Francisco: Jossey-Bass.

Giddens, A. (1979). *Central problems in social theory: Action, structure and contradiction in social analysis.* Berkeley: University of California Press.

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration.* Berkeley: University of California Press.

Janis, I. L. (1982). *Groupthink: Pyschological studies of policy decisions and fiascoes.* Boston: Houghton Mifflin.

Kaiser, H. F. (1970). A second generation little jiffy. *Psychometrika, 35,* 401-415.

Mullen, B., & Cooper, C. (1994). The relation between group cohesiveness and performance: An integration. *Psychological Bulletin, 115,* 210-227.

Partridge, J. L. (1992). *An empirical investigation of task and interactional facilitator intervention in the use of group decision support systems.* Ph.D. Dissertation, University of Minnesota.

Poole, M. S., Seibold, D. R., & McPhee, R. D. 1985. Group decision-making as a structurational process. *Quarterly Journal of Speech, 71*, 74-102.

Schrage, M. (1995). *No more teams!* New York: Currency/Doubleday.

Shaila, M., & Bostrum, R. P. (1999). Meeting facilitation: Process versus content interventions. *Journal of Management Information Systems, 15*, 89-114.

Steiner, I. D. (1972). *Group process and productivity.* New York: Academic Press.

Wheeler, B., & Valacich, J. (1996). Facilitation, GSS, and training as sources of process restrictiveness and guidance for structured group decision making: An empirical assessment. *Information Systems Research, 7*(4), 429-450.

Appendix A
Items for Process Measures

COMPETITION SCALE:

1. Was too much time and attention devoted to issues discussed early on?
2. Were certain points made too assertively?
3. Did some members seem more interested in winning the point than in solving the problem?
4. Were ideas opposed too quickly (rather than added to a list of alternatives to be considered)?
5. Were you interrupted by others trying to "sell" their ideas?
6. Did the group get "hung up" on details?
7. Was there a tendency to force the issue?
8. Were differences smoothed over rather than resolved?
9. Were group members competing with each other rather than cooperating?
10. Did the group seem to lose sight of the big picture?
11. Were people's ideas "put down" and negated?
12. Was there an attitude of overconfidence?
13. Did the discussion seem to turn into a contest?
14. Was the discussion more serious or intense than necessary?
15. Were members good at giving criticism (but not necessarily good at taking it)?
16. Did the influence of particular members outweigh their relative knowledge and expertise?
17. Did it appear that being accepted by the group was an issue for certain members?
18. Did members give the impression that their own ideas were undoubtedly the best?
19. Was there a tendency to be unrealistically or unnecessarily precise?

SUPPORT SCALE:

1. Was there a friendly exchange of preliminary thoughts and "rough" ideas?
2. Was the group helpful in crystallizing your ideas?
3. Was the discussion relaxed and open?
4. Did the group accept and build on ideas offered by individual members?
5. Were people really listening to each other?

6. Did you get thoughtful feedback on your ideas and suggestions?
7. Did members actively look to each other for ideas, insights, and opinions?
8. Did the group stay focused on the objective?
9. Was direction and leadership provided without people "taking over"?
10. Was genuine concern shown for people's doubts, reservations?
11. Was cooperation and teamwork maximized?
12. Did members really "get into" the problem and enjoy it?

PARTICIPATION SCALE:

1. Did some members seem to expect others to run the meeting?
2. Was there a need for greater involvement on the part of certain members?
3. Was there a need for greater diversity in viewpoints and opinions expressed by members?
4. Did certain members decline to take on their share of group leadership responsibilities?
5. Did the group seem constrained, limited to certain perspectives?
6. Was more initiative and leadership needed?
7. Did people stay detached (and never fully come together as a team)?