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A Realistic Test of Individual Versus Group Consensus Decision Making

Larry K. Michaelsen
Westinghouse Electric Corporation, Pittsburgh, Pennsylvania,
and Division of Management, University of Oklahoma

Warren E. Watson
Department of Management
University of North Texas

Robert H. Black
Merrill Lynch, Pierce, Fenner & Smith, Inc.
Oklahoma City, Oklahoma

Nearly all research on the accuracy of individual versus group decision making has used ad hoc groups, artificial problems, and trivial or nonexistent reward contingencies. These studies have generally concluded that the knowledge base of the most competent group member appears to be the practical upper limit of group performance and that process gains will rarely be achieved. We studied individual versus group decision making by using data from 222 project teams, ranging in size from 3 to 8 members. These teams were engaged in solving contextually relevant and consequential problems and, in direct contrast with previous research, the groups outperformed their most proficient group member 97% of the time. Furthermore, 40% of the process gains could not be explained by either average or most knowledgeable group member scores. Implications for management practice are also discussed.

A fundamental assumption of many widely accepted management and leadership theories is that in an organizational context, group decisions will be better than the decisions of the most knowledgeable group member (e.g., Likert, 1961, 1967; Maier, 1970; Miles, 1975; Vroom & Yetton, 1973). In fact, based almost exclusively on anecdotal evidence (e.g., see Corning, 1986; Peters & Waterman, 1983), this assumption is now close to achieving the status of conventional wisdom. By contrast, evidence from empirical research clearly favors the opposite conclusion; that is, under most circumstances the knowledge base of the most competent group member represents the upper limit of what a group might reasonably be expected to achieve. For example, Hill (1982), who examined nearly 140 related articles, concluded that group performance "was often inferior to the best individual, . . . especially if the committee [group] is trying to solve a complex problem and if the committee [group] contains a number of low-ability members" (p. 535). Other studies not included in the Hill review typically reinforce the same conclusion. Burleson, Levine, and Samter (1984), Libby, Trotman, and Zimmer (1987), and Yetton and Bottger (1982) found no significant differences between group and best member scores, and Fox and Lorge (1962), Miner (1984), and Rohrbaugh (1979) concluded that the best member scored significantly higher than his or her group. Based on these studies, it would appear that ineffective interaction processes are likely to constrain group performance on intellective tasks to the point that group decisions will be of a lower quality than the decision preferred by the group's best member (i.e., *process loss;* Steiner, 1972).

Collins and Guetzkow (1964) postulated that effective interaction should allow groups to combine members' knowledge and produce higher quality decisions than would be made by the group's best member (i.e., an *assembly bonus effect*). The only empirical evidence of this phenomenon we were able to find, however, came from three studies that examined the impact of training subjects in group problem-solving skills or having them use a structured process in reaching a group decision. Hall and Williams (1970) found that 50% (15 of 30) of groups in which members had received "laboratory training in group dynamics" outperformed their best member as compared with 13% (4 of 30) for untrained groups. Nemeroff, Passmore, and Ford (1976) found an assembly bonus effect in 50% (9 of 18) of the groups instructed in "consensus decision making" as compared with 8% (1 of 12) for conventional interacting groups. Neither of these studies, however, found a net gain for group scores over best member scores. The only study in which groups significantly outperformed their best member was Nemeroff and King (1975). They observed an assembly bonus effect in 72% (13 of 18) of groups instructed in "consensus decision making" as compared with 33% (6 of 18) for uninstructed groups. Although others have failed to find an assembly bonus effect in groups that received instruction in consensus decision making (e.g., Burleson et al., 1984), training seems, in some situations, to improve group decision-making effectiveness. Even under the best of conditions, however, there appears to be a substantial discrepancy between the findings of empirical research and the conventional wisdom that groups will routinely outperform their most proficient member.

The lack of empirical support for the superiority of group decisions may be due, in large part, to the artificial nature of the groups, tasks, or settings in which the research has been conducted (see Hackman & Morris, 1976). For example, the vast majority of studies used data from ad hoc groups that existed only for the duration of the data collection effort—usually less than 1 hr. (The only exceptions were Hall & Williams, 1970;

Correspondence concerning this article should be addressed to Larry K. Michaelsen, Division of Management, College of Business, 206 Adams Hall, University of Oklahoma, Norman, Oklahoma 93019.

Nemeroff et al., 1976; and possibly Libby et al., 1987.) Most studies required subjects to work on a task that was both unfamiliar to the subjects and foreign to the setting in which it was used. For example, the commonly used tasks were predicting the order of individual juror decisions shifts from guilty to not guilty after viewing the first 38 minutes of "Twelve Angry Men" and ranking the usefulness of a list of items that were hypothetically available to aid survival after a crash landing on the moon, at sea, or in the subarctic. (The only studies that used contextually relevant tasks were Burleson et al., 1984; Fox & Lorge, 1962; and Libby et al., 1987.) Finally, even though group effectiveness models have virtually always included the reward system as a key causal variable (e.g., Gladstein, 1984; Hackman, 1983), there have been no studies on individual versus group decision making that provided any significant outcome, positive or negative, for either individual or group performance.

In this study, our primary objective was to examine the quality of group versus individual decision making in a situation that was as representative as possible of everyday work situations. Thus, in contrast to previous studies, we collected data from experienced groups engaged in contextually relevant and consequential tasks.

A second focus of this study was to investigate the relationship between group versus individual problem-solving effectiveness and group size. Unless groups are made up of low-ability members, effectiveness appears to increase as a function of size until membership reaches 5 or 6 (Bray, Kerr, & Atkin, 1978; Cummings, Huber, & Arendt, 1974; Laughlin & Branch, 1972; Laughlin, Branch, & Johnson, 1969; Laughlin & Johnson, 1966). Beyond that point, adding additional members appears to be of little value. For example, Bray et al. (1978) found that potential input from additional members in 10-member groups failed to increase their effectiveness over that of 6-member groups. Hill (1982), in trying to reconcile these findings, argued that larger groups are more likely to have a member with needed skills or knowledge but "may have a large proportion of medium- and low-ability members . . . who may hinder performance on complex tasks" (p. 525). Although there have been no empirical investigations with respect to the effect of group size on the probability of achieving an assembly bonus effect, a logical extension of previous research would be that increasing group size beyond 5 or 6 members would reduce the probability that a group would outperform its best member.

In this study, the following three questions are addressed, using data from project teams solving contextually relevant and consequential problems:

1. Does group performance exceed the performance of the average group member?
2. Does group performance exceed the performance of the most knowledgeable group member?
3. Does an assembly bonus effect occur irrespective of group size?

Method

Research Setting and Participants

Subjects were members of 222 team learning groups (see Michaelsen, 1983; Michaelsen, Watson, Cragin, & Fink, 1982; Michaelsen, Watson, & Schraeder, 1985) that formed the basis for instruction in 25 organizational behavior courses taught over a 5-year period. Approximately 85% of 1,334 total subjects came from courses at one of two U.S. university campuses. Of the remaining subjects, 12% were from extension programs around the world (including Saudi Arabia, Panama, and Korea), and just over 2% were enrolled in a management development course taught at a large manufacturing plant in the Midwest.

In the team learning instructional format (see Michaelsen, 1983), the vast majority of class time is spent actually working on group problem-solving tasks. As a normal part of the team learning, (a) students were assigned to a group for the duration of the course; (b) groups were engaged in a variety of activities, including experiential exercises and projects, and six objective and two or more essay exams which, in combination, accounted for at least 50% of the course grade; (c) over the course, the groups spent a minimum of 32 hr working together in class, including about 5 hr working on the objective exams from which the data for this study were obtained. In addition, although no specific figures are available, most groups reported spending at least an equal amount of time working together outside of the class.

In all cases, subjects were assigned to a group by the instructor in an attempt to ensure that potential resources were spread as evenly as possible among the groups. In making group assignments, the instructor (a) asked a specific category of students to stand, (b) randomly assigned each of those standing a number between one and the total number of groups in the class, and (c) repeated Steps 1 and 2 with different categories of students until everyone in the class had been assigned to a group.

The specific categories used in the formation of the groups and the order in which they were used were also determined by the instructor. These decisions were based on information, gathered by a show of hands, on students' work experience and educational and cultural backgrounds. Scarcest categories of resources were allocated first. Thus, in an undergraduate class, the initial category was typically similar to "Those with three or more years of full-time work experience," whereas in a graduate class the initial category might be similar to "Those with an undergraduate degree in engineering."

Because of differences in such factors as class size, physical space limitations, and students occasionally electing to drop the class after the groups were formed, group size ranged from 3 to 8, with an mean group size of 5.97 (SD = .84) members.

Task

Data for the individual versus group decision-making comparisons were collected from a series of individual and group tests that are a normal part of the team learning instruction (see Michaelsen et al., 1985). In team learning, these tests cover concepts from assigned reading material and are given at the beginning of each major instructional unit to provide (a) an incentive for individual student preparation, (b) an opportunity for peer teaching to occur, and (c) a mechanism for identifying concepts that needed further clarification from the instructor before students move on to application-oriented projects and exams. In the actual testing process, individuals complete their tests first. As soon as all members of a group turn in their answer sheets, they are given an additional answer sheet on which they immediately retake the same test as a group.

Both individual and group test scores counted toward the course grade in proportions set by students through an experiential Grade-Weight setting exercise (see Michaelsen, Cragin, & Watson, 1981). On average, the individual scores counted as 10% and group scores counted as 15% of the course grade, with other projects and application exams making up the remainder.

Data consisted of the cumulative scores obtained from a series of six individual and group tests. Each of these tests contained 12 to 18 multiple-choice and true/false questions, for a total of 84 to 101 items in all.

Test questions were approximately 40% recall, 40% application, and 20% analysis and synthesis in their orientation (see Bloom, 1956).

The least difficult items were those that required subjects to recall specific concepts from the assigned readings. For example, subjects were assigned to read the chapter on organizational effectiveness in Gibson, Ivancevich, and Donnelly (1985) and were asked a question (see Appendix, Question 1) that tested their ability to recall specific definitions given in the reading. In responding to this item, over 80% of the individuals correctly recalled that efficiency (Alternative b) was the answer. During the group phase of the testing process, recall items (see Bloom, 1956) seldom presented a problem unless there was active disagreement on which answer alternative was correct. Although this happened quite frequently with this particular item, over 95% of the groups successfully determined which member or members accurately remembered the facts and convinced the dissident member or members to go along with the correct answer.

Both individuals and groups faced a much more difficult task in trying to deal with questions that were designed to assess higher level cognitive skills in the Bloom (1956) taxonomy. For example, students were also assigned to read the classic article by Morse and Reimer (1956) entitled, "The Experimental Change of a Major Organizational Variable" and were asked a question (see Appendix, Question 2) that required them to (a) recall definitions from the Gibson et al. (1985) effectiveness model, (b) recall the specific effectiveness measures that were used in the Morse and Reimer (1956) study and (c) apply the Gibson et al. definitions to rename the Morse and Reimer effectiveness measures. To successfully answer this question, students needed a deeper understanding of the concepts than was required for the recall items for two reasons. One was that, because neither source made direct reference to the other, the correct answer was not specifically given in the reading. In addition, the original name of one of the measures in the Morse and Reimer study, "an index of actual costs/the expected cost for a particular volume of work" (p. 124), was confusing when considered in the context of the Gibson et al. effectiveness model. In the original study, Morse and Reimer (1956) called this measure *productivity,* whereas in Gibson et al.'s study, a ratio measure of this type would be classified as *efficiency.* As a result of these factors, just over half of the individuals and nearly 85% of the groups correctly chose Alternative d as the answer. (Note that satisfaction was also measured by Morse & Reimer, 1956.)

The most difficult test items were those that focused on students' ability to analyze and synthesize the concepts (See Bloom, 1956). Questions of this type required students to derive the correct answer by breaking down the concepts into their component parts and then reconstructing the components to infer relationships in an entirely new situation. For example, a question (see Appendix, Question 3) over the same readings required subjects to (a) understand all of the issues outlined in the application question shown in the Appendix (see Question 2), (b) recall that the hierarchy program was more efficient over a one-year period than was the autonomy program (Morse & Reimer, 1956, pp. 126), (c) understand Gibson et al.'s (1985) concept of efficiency well enough to deduce that, when output declines, reducing costs can still have a positive impact on cash flow (concepts not discussed in the assigned readings), and (d) recognize the logical fallacy of expecting a consistent result from extending contrasting programs to different levels of an organization's hierarchy (i.e., Alternatives c and d). As a result of these factors, only about a third of the individuals and 70% of the groups typically answered this question correctly.

Results

The primary focus of the study involved a comparison of groups' cumulative scores over the six exams with the comparable scores of their average and most knowledgeable member. Descriptive statistics for and correlations between each of the variables under investigation are shown in Table 1. As can be seen, the mean group score of 89.9 was 15.7 (21.2%) above the mean average individual score of 74.2, and 7.3 (8.8%) above the best individual score of 82.6. We also found that all 222 groups outperformed their average member; chi-square tests indicated that the frequency with which this occurred was significant, $\chi^2(2, N = 222) = 444, p < .01$. With respect to the comparison between group scores and best individual scores, we found that 215 of the 222 groups (97%) outperformed their best member, four groups (2%) tied their best member, and only three groups (1%) scored lower than their best member. Chi-square tests also indicated that the frequency with which the groups outperformed their best member was significant, $\chi^2(2, N = 222) = 403, p < .01$.

Table 1
Descriptive Statistics and Correlation Matrix for Group, Best Individual, and Average Individual Scores

Score	*M*	*SD*	1	2	3
1. Group	89.9	5.2	—		
2. Best individual	82.6	6.1	.77*	—	
3. Average individual	74.2	5.9	.77*	.82*	—

Note. $N = 222$.
* $p < .01$.

To examine the effect of group size on the extent to which groups were able to capitalize on their members' knowledge, we correlated group size with the difference between group scores and average and best member scores. We found a significant correlation between group size and the difference between group score and average member score ($r = .16, p < .05$), but the correlation between group size and the difference between group score and best member score ($r = .02, p > .05$) was not significant.

Discussion

The greatest contribution of this study is an unequivocal demonstration that, in a setting similar in many ways to a typical work environment, a vast majority of groups can outperform their most knowledgeable member on decision-making tasks. Thus, it appears that management and leadership theories that advocate group decision making to produce high-quality decisions (e.g., Likert, 1961, 1967; Maier, 1970; Miles, 1975; Vroom & Yetton, 1973) are empirically justified in their prescriptions. Furthermore, any intervention that results in decisions that represent an average quality improvement of 8.8% over a group's most knowledgeable member and produces a process gain in 97% of groups in which it is used clearly has the potential of measurably increasing the effectiveness of most organizations.

These findings also underscore two important guidelines for future research on individual versus group decision making. One is that the research should be conducted under as realistic conditions as possible. The other is a de-emphasis on group versus average member performance as a dependent variable, and an increased focus on conditions that make it possible for groups to outperform their most proficient member.

From a practical standpoint, the key question raised by the study is, "Is it reasonable to expect that the results achieved by the groups in this experimental situation can also be achieved in typical day-to-day work settings?" Based on the extent to which the nature of the groups, reward contingencies, and tasks that are characteristic of the team learning instructional format are likely to be present (or can be created) in settings typical of work organizations, we believe the answer may be "yes".

Group Composition

The minimum of 32 hr of group involvement for subjects in this study was clearly more extensive than in any previous research. As a result, it would seem likely that part of the reason that they were able to capitalize on the intellectual resources of group members was that working together for this relatively extended period had allowed them to develop a mutual sense of trust and understanding. On the other hand, the fact that the groups ended at the conclusion of the school term meant that they were probably more typical of task forces or project teams than ongoing organizational groups. One very plausible argument is that if the groups had been more permanent, their impact on individual members and the magnitude of their process gains may have been even greater. At a minimum, however, we argue that the findings from this study are relevant to the activities of task forces, quality circles groups, and other project groups in ongoing organizational settings.

Reward System

There was a clear and direct tie between individual and group performance and a significant outcome (i.e., course grades) for the subjects in this study. This reward, however, would seem to be less consequential than the salary and promotional opportunities typical of reward systems in work organizations. Thus, work organizations should have a distinct advantage over the current classroom situation with respect to designing reward systems that would promote group decision-making effectiveness. The success of the groups in this study should provide some potentially helpful reward-system parameters. For example, in contrast with many organizational settings in which rewards are based almost exclusively on individual effort or group membership, data from this study suggest that extrinsic rewards for group performance should be at least as important as those for individual contributions.

Task

Probably the greatest area of potential concern in generalizing the results of this study is the nature of the experimental task. On the positive side, the task requirements had a great deal in common with many of the key information-processing aspects of group problem solving in organizations. The overall task involved eliciting input from group members, assessing the validity of their knowledge, and integrating the data into a coherent whole. Although the task in this study was ideally suited to capitalize on the knowledge base of problem-solving groups (see Hill, 1982), there seems to be no reason to suspect that the information-processing aspect of organization decisions would be different in any fundamental way.

On the negative side, the complexity of the experimental task was clearly limited compared with most organizational situations in which decision makers are typically faced with issues that are too broad-based to attack directly. With more complex decisions, it is frequently argued that the first step is breaking the decisions into components (e.g., Kepner & Tregoe, 1965; Plunkett & Hale, 1982). Next is considering each component separately, and the final task is combining the considerations into an overall decision. In this study, the subjects were able to bypass the first step in the decision-making process because the tests contained a series of questions each of which was already focused on a subset of issues from the assigned readings. In addition, the recall items (40% of the total) seldom required students to consider relationships between issues from different questions. Finally, even though the application-, analysis-, and synthesis-oriented questions required the use of higher level information-processing skills (see Bloom, 1956), the issues involved were still relatively limited in scope.

An additional limitation of our study is that in many organizational situations, the right answer is simply not known and it is impossible to provide definitive feedback on either individual or group performance. Thus, caution should be used in generalizing the findings of this study beyond situations characterized by relatively focused problems and in which groups can obtain data on their problem-solving effectiveness within a reasonable length of time. With more complex issues with less potential for immediate feedback, the findings of our study nonetheless suggest that obtaining input from a problem-solving group may be a highly effective way to manage the information-gathering process such that as many known facts as possible come to light.

Another potential concern with the task in this study is that the groups may have benefited from a practice effect because the individual exams were taken first and were identical to the group exams. From a practical standpoint, however, this same dynamic could probably be achieved in organizations by having group members prepare a position paper and circulate it to other group members prior to problem-solving discussions (See Van de Ven & Delbecq, 1971, for a similar prescription given as part of the nominal group technique). This approach would have the added benefit of increasing individual accountability to the group.

A final aspect of the task in our study that differed from typical work settings is that group participants were actively dealing with concepts that related to interpersonal, group, and organizational behavior issues. Based on the fact that the strongest previous support for the efficacy of group decision making came from the Nemeroff and King (1975) study in which groups had received training in group consensus decision making, it may well be that an awareness of group process issues may have been a significant aid to the groups in our study. Similarly, the finding by Erffmeyer and Lane (1984), that groups in which members had been instructed to strive for consensus reached higher quality decisions than groups that were instructed to strive for quality, also suggests that an awareness of group processes may have a positive effect on group decision-making effectiveness. To the extent that a working knowledge of group-related concepts was

a factor in the success of groups in our study, however, it would seem that similar conditions could be created in ongoing organizations through appropriately focused training or organizational development programs. Nonetheless, this is an area toward which future research should be directed.

Group Size

The data clearly show that, within the range of group sizes contained in the study, there is no significant correlation between group size and an assembly bonus effect. Although we found a statistically significant correlation between group size and the difference between group scores and average individual scores, we question the practical significance of this result because this effect accounted for less than 3% of the variability in group scores.

Summary

Past research indicated that the knowledge base of the most competent member of a group represents the upper limit of what a group might reasonably be expected to achieve. In direct contrast, our study clearly demonstrates otherwise. Although group performance is clearly related to the knowledge base of the group's best individual member and the overall capabilities in the group (See Table 1), 40% of the variability in group performance cannot be explained by either of these variables. Furthermore, the magnitude of the process gains obtained in this study underscore the importance of focusing additional research on specifying the dynamics that would result in similar outcomes in ongoing organizational settings.

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Appendix

Examples of Test Question Types

1. In the Gibson et al. effectiveness model, a cost/benefit ratio such as a cost per unit produced would be an example of _____.
   a. productivity
   b. efficiency
   c. satisfaction
   d. adaptiveness
   e. development
2. If Morse and Reimer had been using Gibson's definitions for the variables they measured in the life insurance company, they would have used _____ as (a) name(s) for their measure(s) of effectiveness.
   a. adaptiveness
   b. efficiency
   c. satisfaction
   d. b and c
   e. a, b, and c
3. The management of the life insurance company would be trying to maximize adaptiveness if they made a decision to extend the _____ program to other parts of the organization at a time when cash flow had become a problem that was expected to be a serious concern for at least the next six months due to a decline in insurance sales.
   a. autonomy
   b. hierarchy
   c. autonomy for exempt and hierarchy for non-exempt
   d. autonomy for non-exempt and hierarchy for exempt
   e. none of the above

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