THE QUALITY OF GROUP DECISIONS AS INFLUENCED BY THE DISCUSSION LEADER

NORMAN R. F. MAIER

INTRODUCTION

In industrial training of management personnel (10) I have emphasized the importance of changing attitudes as well as developing skills in group decision methods. By group decision methods I mean that a supervisor functions as a democratic leader and instead of making decisions himself, he solves his problems by conducting a discussion with the individuals who report to him. The goal is to achieve a full meeting of minds as to how the problem should be handled. (1, 2, 3, 4, 5, 11). Many attitudes are in opposition to such group decision methods. Some of these attitudes are negative reactions to change, some are due to lack of faith in human nature and some may have a logical basis.

The first type of reaction is characterized by having many fears, but persons are unable to express the dangers in a specific manner. Such fears as the following are expressed:

(*a*) The stock holders will object.
(*b*) The public will object.
(*c*) The union will object.
(*d*) Bad morale will be created.
(*e*) It will undermine management.

These fears are inconsistent with each other and are too general to permit accurate communication between individuals.

The second type of reaction is represented by such fears as:

(*a*) The group will take over the company.
(*b*) The group will make selfish decisions.
(*c*) Certain individuals will always hold out.
(*d*) Men will set standards as low as possible.

Although procedures have been set up to guard against dangers of this kind, discussions about the procedures are not convincing since the distrust is in human nature.

The third type of reaction is represented by such fears as:

(*a*) The men lack the experience of making decisions.
(*b*) The men lack the overall knowledge for making group decisions.
(*c*) The men do not know enough to make long range decisions.
(*d*) The men lack the intelligence for making good decisions.

Reactions of this kind do not indicate a negative attitude toward men in general but recognize that management personnel represent a select group with reference to these qualities.

It is clear that each of these types of opposition to group decision methods must be treated differently. The first type of opposition must be handled by setting up training for those who seek it and proving by the conduct of conferences that the leader and the training

will be an aid to the job rather than a threat. The second type of opposition is reduced by a more intimate knowledge of the psychology of attitudes, motivation, frustration and non-directive counseling. We have found that group discussions centered in these topics develop respect for man's behaviour. The third type of opposition depends more on the results of experimental tests of the group decision method. Only the third type of opposition need concern us for the purposes of the present report since we are concerned with the problem of solution quality in group decision methods.

The experimental evidence on group decision thus far indicates that a solution worked out by a group is more acceptable to the group than one imposed on the group by an authority. (1, 2, 4, 11, 14). Thus, if acceptance is desired, this method can be depended upon to produce results. However, industry needs more than acceptance of decisions. It needs good decisions too. Must we forego good decisions in order to obtain acceptable decisions?

Group thinking may be regarded as superior to that of an individual since the thinking of a number of individuals is pooled. The evidence available tends to support this view but certain special questions might be raised. Watson (16) found that groups did better than individuals in a problem requiring the building of as many words as possible out of a given set of letters. However, the pooled results of several isolated individuals were superior to those of the same number working together as a group. This is not surprising since the task required merely involved the addition of individual contributions. Thus, one would expect a group of five to do better than the most superior individual working alone but not better than the combined effort of five working alone. Shaw's study (15) is more to the point of our problem. She compared groups in solving what might be called reasoning problems for which one correct solution was possible. Since the solution's value could be objectively determined and did not require acceptance or approval by the group, attitudes were not greatly involved. Her findings support the contention that a group interacting does a better job of solving a problem than a single person. Thus, with twenty-one persons working alone on three different problems, five solutions were produced out of a possible sixty-three, or 7.9%. However, five groups of four each working on the same three problems produced eight out of a possible fifteen solutions, or 53%. Even when we assume that the number of individuals involved is about the same, twenty-one working individually and twenty working in groups, one must recognize that five solutions were produced in one instance and eight in the other. Shaw's further analysis of results indicate that a group's superiority over that of isolated individuals is partly one of evaluating suggestions and rejecting false ideas.

Findings of this type suggest that group thinking is superior to individual thinking. Such a conclusion would have profound practical implications. It would mean that the use of conferences should be extended in business and government and that these conferences should not only be used to disseminate information and achieve co-operation, but that the conferences also be used to solve complex problems. It would mean that even a first line supervisor, using the democratic approach, should have higher quality solutions to problems than a supervisor making autocratic decisions. However, the fact that groups are

superior in thinking to individuals of like knowledge and ability does not preclude the possibility that certain individuals working alone may be superior to a group in their thinking. The supervisor, because he is highly selected and because he has a rich background of experience, may reasonably be regarded as such an individual, and management might be expected to make such a contention. Certainly one would not wish to overlook the possibility of sacrificing high quality or creative solutions, even though they might occur rarely, in order to get group acceptance. It is quite possible that highly creative ideas are made mediocre through group discussion with less creative persons. What can a creative individual do when he needs the support of others in order to put his creative efforts to work?

If the supervisor is the most superior individual in the group, can he be permitted to present his views to the group and so influence the group thinking, or will his views tend to be resisted because he, in effect, will be functioning largely as an autocrat? Is there a way for the supervisor, who is capable of high quality thinking, to influence the group without producing resistance?

Before treating this problem in greater detail it is well to clarify some other matters. In the first place all problems do not raise the issue of solution quality *per se* since the fact of co-operation and support of a plan may be more important than the nature of the plan. The important thing is to get a plan that is acceptable. Thus, if an office is being moved to a new building, it is more important to have an arrangement that is satisfying than to have a particular plan which may be objectively slightly superior to another, in that, let us say, fewer steps to a filing cabinet are required. Good morale may easily compensate for a few extra steps. When the reaction of the group is considered, therefore, the satisfying plan may be more efficient in actual operation than one that a time-and-motion expert might evolve, but which is not as satisfying to the group.

In the second place many problems that require technical knowledge, and seem to demand the services of an expert, may also involve facts that the expert may not have at his disposal. A safety engineer may design what appears to be a very good safety practice, but one which involves extra effort, and later find that such a safety procedure tends to be violated. An example of this type of safety procedure is that which requires a lineman to take a trip up a telephone pole to fasten a pulley in place so that a drop line can be used. This procedure is used so that a workman will not have to carry the line up the pole and run the danger of being pulled down by traffic hitting the cable. The safety engineer, however, may have been unaware of the fact that a foreman may put pressure on the men to increase production. Thus the men are motivated by the foreman to increase production and incidently to take short-cuts, and also motivated by management to practice safety at the expense of production. Can the expert by himself be expected to take all such conflicts in motivation into account when designing safety measures, or must he and the foreman solve problems with a knowledge of the workers' reactions? The democratic procedure would tend to supply the workers' side of the picture and add valuable factual information. In this case we are dealing not merely with obtaining the workers' acceptance of a solution, but rather of obtaining for them the freedom to practice a safe solution even when they approve of safety methods.

In the third place, some solutions may be improved through group discussion, because the men who actually do the work become aware of facts and conditions with which management is likely to be unfamiliar. To compensate for this fact some companies believe it is essential to select all management personnel from the ranks. However, this may not be adequate because (*a*) conditions change from year to year; (*b*) it may be unsafe to generalize from one's own experience; and (*c*) the experience of a worker may vary from one section of the city to another. Thus management objects to the fact that men from a sales department who make deliveries of electrical products, should stop for coffee before even beginning deliveries. If such stops occurred at mid-morning they would make more sense to management. A local factor that is overlooked is that customers do not answer visits made the first thing in the morning, but if a coffee stop is made such useless calls can be reduced. Management might also overlook the value to morale of visits over coffee. By stopping on the way from the garage the men can be in small groups, whereas later in the morning they would be scattered.

A common problem with commercial drivers is that they tend to return to the garage at or before 4.45 rather than 5.00 o'clock. If the foreman criticizes this behavior of early quitting he finds that the men hide behind bill boards. When this problem was discussed in one company, it was found that the following factors were involved:

(*a*) men did not want to start big jobs after 4.00 o'clock
(*b*) some of the men ran out of work
(*c*) when problems occurred in late afternoon the men couldn't reach any one at the office for further instructions; and
(*d*) each man wanted not to be the last man in the garage and get unfavorable parking space.

All of these problems were soluble when the employees' side became known and a solution satisfactory to all was reached by group discussion.

Finally it must be recognized that some problems are purely problems of attitudes so that practically the whole subject matter for the solution is in the group. On one occasion it was necessary for a supervisor to get two out of three girls to work on Sunday. All of them had dates, so none volunteered. The supervisor might have set himself the problem of selecting two girls and he might have tried to be fair by flipping coins or following seniority privileges. In this instance, however, a group discussion was held. The discussion revealed that one girl had a date with some other girls. All three girls agreed that this was not a real date so the girl in question volunteered. The other two girls had dates with men, but one of them was engaged to her date, whereas the other had a date with a new man. All three agreed that the only real date was the one involving a new conquest. This girl was excused from work by agreement of all despite the fact that she had worked less frequently on Sundays than the others. It is clear that the virtue of this solution resides in the fact that it reconciled values and attitudes, not that it had universal application or perfection in its own right.

Problems of the latter type clearly fall into the category for solution by group discussion, whereas some of the others seem that they might profit in varying degrees by cooperation with experts.

PRELIMINARY EXPERIMENT

To highlight the possible value of the expert in solving some problems, at least, I have selected a problem for analysis in which there is one solution which is definitely superior to others. When a single solution has elegance or the quality of an invention, the question of *solution quality* is clearly apparent. In such cases we may rightfully raise the question of how a supervisor or an expert might lead the group to this superior solution.

In factories doing assembly work, the speed of an assembly line is paced by the slowest worker unless arrangements are made to budget the size of the job to fit the personal abilities of each man involved. This can be achieved in a variety of ways all of which are specific to the particular situation and the varied abilities of the individuals involved. In sub-assembly work certain special conditions are present which permit specialized solutions. Can a group of persons solve the problem of increasing production in a sub-assembly job, sometimes called a parasol assembly because the work is laid out in a circle?

To test the problem solving achievements of groups as compared to individuals we presented such a problem to groups of college students all of whom had received training in group decision methods. The problem as given is as follows:

> Visualize a sub-assembly situation in which seven men, working in a circle, assemble a part of a car (carburetor or instrument panel, for example). The article enters the circle at one point, and each person adds his pieces and pushes the unit to the next worker who adds his elements. When the unit leaves the circle, it is a completed part product. This work arrangement is diagrammed in *Figure 1.*
>
> Suppose there are four such parasol sub-assembly stations, each one supervised by a foreman. Suppose further that Station A assembles 85 units per day; Station B, 80 per day; Station C, 60 units per day and Station D, 50 units. It is a fact that Station D previously assembled 60 units. The foreman was dissatisfied with the production and reprimanded the group. Following the reprimand production fell to 50 units per day.
>
> The assembly work is simple and requires a minimum of training for each step. The aptitude requirement is primarily good finger dexterity. The materials for each assembly position are located in bins which are kept supplied by material handlers. Thus each worker has his essential material at his elbow. The job has been analyzed by time-and-motion experts so that the positions are of equal difficulty. Pay is based on hourly rates.
>
> The total factory production is dependent upon receiving the required number of assembled units from these four stations. The production is now so low that the factory production as a whole had to slow down. The desired quota is 300 parts per shift for the four stations combined.
>
> We are concerned with Station C producing at the rate of 60 units. The work piles up at the position of Joe Brown. The unit must pass through him, (position 3) and he always has several piled up waiting for him. Foremen on non-production jobs are not willing to accept Joe as a transfer. Joe is a man of 60 with 30 years of service in the com-

pany. Emphasis on improving production has brought his deficiencies to light.

One of the following two descriptions of Joe was given to each group of persons assigned the task of solving the production problem.

1. Joe is a nice congenial fellow. He is liked by the group of workers, but is slow and unhandy. However, he tries. Joe has to work for a living.

2. The group blames Joe. When men try to hurry him, he argues that they are falling for a speed-up. From time to time there are hard feelings. Joe does not eat with the group but stays alone. He has never been a good worker. His co-ordination is poor, but on previous jobs he got along well with others. In this situation the first evidence of Joe's poor attitude has become apparent.

Twenty groups of four to six college students were asked to play roles of workers in this situation. The groups were obtained from six classes, each of which was divided into three or four such groups. In each group one member was added to play the part of the foreman and one of the group members was given the role of one of the Joes. The others were asked to assume their own roles. The foreman was asked to solve the problem by the method of group discussion. Forty other individuals were asked to solve the problem by themselves, half with the " good " Joe and half with the " bad " Joe.

The solution regarded as having the quality of elegance was that of periodically having the men exchange places, progressing from one position to the next in a counter-clockwise direction. In this manner the fast workers would reduce work piled up in positions occupied by slower workers and at the same time variety would be introduced into the job and make the work less monotonous. By making such progressive changes, the production should be dependent upon the ability of the average man rather than on that of the slowest man. This is an objective fact if we assume there are no adverse attitudes. The special condition which permits this rotation is the fact that the work is simple, requires a minimum of learning, and demands similar aptitudes. The only problem that seems necessary to put the solution into practice is a willingness of the group to adopt it. This willingness, of course, will depend somewhat on the type of Joe that is present, but this is not necessarily important since the poor attitude on Joe's part might be due to his inability to keep up with the group.

An added feature of insight, which conceivably might accompany the solution, is the fact that the solution applies to all of the other groups. Each one is paced by the slowest worker.

The argument against discharging the slowest worker is that it merely creates another " slowest " worker. If discharge is practised, it will either lead to insecurity or a protection of the slow workers. When all members of a team slow down then management is merely not aware of the fact that the pace is set by the slowest worker.

Apparently this elegant solution is difficult to achieve or fully to appreciate, and this might be due to the fact that the actual work situation was not present. The usual solutions obtained from our groups and independent subjects were as follows:

Transfer Joe to another unit.
Give Joe a talking to and warn him.
Transfer Joe to a non-production job.
Retire Joe.
Let the group work it out.
Give part of Joe's work to others.

Divide the men into various units according to ability.
Put Joe in an easier position.
Discharge Joe.

The groups differed in that those with the more pleasant Joe were less inclined to discharge or transfer him. Most groups gave a variety of possibilities, many of which were not solutions but descriptions of how they would go about solving the problem. As can be seen from the above solutions, many of the solutions supplied did not respect the following facts which were given: (1) the foreman is in charge of one unit and cannot influence other units; (2) Joe cannot be transferred; (3) Joe's primary difficulty is low aptitude in finger dexterity; and (4) the positions are equal and require the same aptitude.

None of the groups and none of the individuals produced the desired solution or its equivalent. In three instances an individual in a group mentioned rotating the men, but each was talked out of this line of thinking by other members. These individuals did not appreciate the possibilities of their ideas enough to follow through on their own suggestions. It is apparent from these findings that the elegant solution is not an obvious one.

It was also found that when the instructor presented the solution to three of the classes after the groups had reassembled, the solution was accepted by less than 50 percent of the persons. Arguments against it are illustrated by the following examples: 'It's impractical,' 'If it's good, why isn't it used in industry?' 'No group would go for it'. 'It's no better than ours.' 'That's what we meant when we recommended giving Joe less to do.'

Students who accepted the solution in a few instances saw that the same solution applied to the other units, but mild acceptance rather than a recognition of elegance was the general trend. Thus, under the conditions tested, the elegant solution was neither found nor acceptable when given to the group.

A SECOND EXPERIMENT WITH THE PARASOL ASSEMBLY PROBLEM

A. Relevant aspects of problem solving behavior

Can this solution be stimulated in a group by proper leadership and at the same time produce general acceptance? Experimental work on the nature of thinking and factors which block the development of new ideas may supply some of the answers.

This writer found (6, 7, 8, 9, 13) that an individual's ability to solve reasoning problems is blocked by habitual or first ideas which tend to perpetuate themselves. Suppose one were presented with the problem of building a hat rack in the center of an ordinary room and was given two poles (each seven feet long and about $\frac{3}{4}$ inches square) and one 3 inch table clamp for this purpose. The first or habitual idea would be to attempt to use one pole as a support and to use the other as a leg. This is the obvious first idea because ordinary hat-racks are an upright with three legs. The most one could accomplish with the material given would be a two-legged affair and at best an ingenious person might attempt to use the clamp so as to furnish minor support on the third side. This type of construction would be a most inadequate hatrack. If this solution is rejected by the experimenter as unsatisfactory, further attempts become varied improvements on this basic idea. Thus a characteristic aspect of problem

solving behavior is to persist in working along the line of the first idea regardless of how fruitless it may be. In so doing, the person is kept from exploring further and finding the less obvious idea, that of building a hatrack by wedging a stick between the floor and ceiling. By combining the two sticks and clamping them together at the proper length the combination will fit snugly between the floor and the ceiling and the clamp becomes a hook for the hatrack. This solution becomes a creative invention and is new.

It does not follow that all persons will come upon this unique solution, but the point remains that those who are capable of solving the problem may be prevented from doing so because they are busy trying to devise legs for the type of hatrack first conceived.

In thinking, one's explorations follow particular lines or *directions*. For example, if doctors had the problem of preventing yellow fever, two contrasting lines of thinking would be (*a*) seeking methods of making man immune to germs, and (*b*) finding ways for preventing germs from reaching man.

A direction in thinking is more than a first idea in that it incorporates a number of related ideas. Thus the direction in thinking serves a selective or screening function. One's mind is open to ideas that correspond with the direction and closed to those that do not. In the case of the yellow fever problem, any ideas which are consistent with making man immune to the germ will receive a favorable reception if that is the direction of the thinking of a given investigator, whereas ideas relating to the way germs are carried about will seem silly to him. Our experiments showed that persons who tried to construct a hatrack by supporting it with legs were unresponsive to interruptions that drew attention to the ceiling, or activities that required them to make the stick longer. Thus, when a person who for two hours had tried different ways of building legs was asked to sit in a chair and obtain a package of cigarettes twelve feet away he did so by clamping the two sticks together, but he resented this interruption. However, persons who tried different ways of wedging the stick between the floor and the ceiling, using blocks, chairs, etc., immediately solved the problem when asked to get the cigarettes. These persons had failed to solve the problem because they found no way of producing a tight fit with the stick between the floor and the ceiling, and for them the suggestion was relevant and welcome.

Ideas are constantly suggested by chance events, by the remarks of others, and by the things we look at. However, the ideas that are used or selected depend upon our direction. Thus, one failure to solve problems is due to our inability to react to suggestions when we have a false or fruitless direction. Such directions are far worse than none at all, and this is one reason why many problems are solved when we are engaged in recreational activities, or when we make fresh starts. The direction in thinking has momentum and tends to perpetuate itself. If we are to influence or aid the thinking of others, this can more readily be achieved by recognizing and influencing the direction their thinking is taking. A given idea is plausible only when it is consistent with a direction. Since one approach is likely to be more fruitful than another on a given problem, much depends on the direction the thinking takes.

It was experimentally found (8) that by training individuals in

(*a*) the inadequacies of first ideas,

which are usually obvious and false when difficult problems are presented, and therefore should be rejected;

(*b*) the meanings of different directions, and how they function in selecting ideas; and

(*c*) the importance of keeping the mind receptive to these variations,

problem solving success was greatly increased. It seemed reasonable to suppose, therefore, that the leader might improve a group's thinking by furnishing these types of aids to a group.

One of the blocks to a solution of our group problem is the strong tendency to get rid of Joe. He is the obvious stumbling block, and removing him represents a habitual first idea. If this is the case the leader can accept such a suggestion by writing it down, and add ' That's one possibility, but before we settle on any one approach let's explore some other possibilities.' This should permit the problem to be analyzed further and become the first step toward finding a better solution along a different direction.

The leader may further function to protect Joe. In doing so he lends security to the group and induces constructive approaches. He demonstrates that he is concerned with solving a problem and not with blaming someone. Tendencies to find someone to blame are likewise false and ineffective habitual approaches.

This function of the leader is highly important since he can determine to a considerable degree whether the individuals will be dominated by frustration or whether they will proceed as motivated individuals. As reported elsewhere (12), problem solving proceeds only during motivation; whereas in a frustrated condition people are hostile, childish, and stubborn.

As suggestions are given, the leader may stimulate further analysis. Thus if someone suggests giving Joe less to do he might ask ' What are the different ways in which this can be done?' By listing the suggestions made he can stimulate further thought in the direction of the solution and prevent the dismissal of good ideas without proper consideration. By asking ' Are there any arguments against this?' he can recognize a poor lead, and perhaps have it eliminated by the very person who suggested it.

The leader should also be able to bring about increased congeniality in the group. In protecting Joe; in stating the problem as a production obstacle, rather than as one having to do with persons (who do, and do not, do their share); and in recognizing that differences in work output are always present, and that even the same person feels more like working on some days than others, he can keep the discussion away from blame and fault-finding and direct it into constructive channels.

The use of this technique in leadership implies, of course, that the leader has the ability to distinguish good from poor solutions. This is not always the case. However, when he does have this ability, or when he knows the elegant solution, it seems that he should not be handicapped by being unable to influence the quality of a group's thinking. If, however, he cannot obtain acceptance, then even an elegant solution remains ineffective.

B. Modification of the procedure

In order to determine the conditions essential to obtaining the solution to the Parasol Assembly problem, it was decided to introduce two new factors which were lacking in the first experiment. One of these was to use a leader skilled in practising the procedures

discussed above. A second was to make the problem more realistic by giving each individual a specific role to play. Thus the group members would approach the problem from the point of view of specific individuals on the assembly line and be less inclined to work on the problem from the way each member of the group thought workmen might react.

The roles for the seven men in the production team were as follows:

No. 1, Bill. ' You find you can easily do more work, but have to slow down because Joe gets behind. In order not to make him feel bad, you hold back. You don't want to get Joe into trouble.'

No. 2, Jim. ' You and Bill work closely together, and you usually are waiting for your part from Bill. This waiting for the part is more prevalent in the later part of the day than in the beginning. To keep busy, you often help out Joe who can't keep up. However, you are careful not to let the foreman catch you helping Joe because he might let Joe go.'

No. 3, Joe. ' You work hard, but just aren't as fast as the others. You know you are holding things up but, no matter how you try, you get behind. The rest of the fellows are fine boys and have more energy than you do at your age.'

No. 4, Sam. ' Joe has trouble keeping up, and you sometimes grab Joe's part and finish it for him when the boss isn't looking. Joe is a bit old for the pace set, and he feels the strain. For you the job is easy and you feel the whole job is slowed down too much because of Joe. " Why couldn't Joe be given less to do?" you ask yourself.'

No. 5, Hank. ' You feel a bit uneasy on this job. There isn't enough to do, so you have to act busy. If only Joe could speed up a bit. Why don't they move him out of the group? Is the company so blind that they can't see where the production trouble is?'

No. 6, George. You are able to keep up with the pace, but on the last assembly job you were pressed. Fortunately Joe is slower than you are so he keeps the pressure off you. You are determined that Joe shall not be moved off the job. Somebody has to protect people from speed-up tactics.'

No. 7, Harry. ' You get bored doing the same operations over and over again. On some jobs you get variety by working fast for a while, then slowly. On this job you can't work at a good pace because the parts aren't fed to you fast enough. It gets you down to keep doing exactly the same thing over and over in slow motion. You are considering getting a job in some place where they can keep a man busy.'

FIRST EXPERIMENTAL PROCEDURE AND REACTIONS

Before beginning the experiment, the same objective facts in the assembly situation previously described were presented. The group was told that these were the things that anyone would know from being on the job. Each person was then given a slip of paper on which one of the above roles was described, and requested to play the part assigned to him as accurately as possible. The group was told, ' These roles described how each of you feel about the job situation. Naturally what you say and how you interact with

each other will depend on how the situation develops. Your comments and feelings are to be guided both by your roles and by what ensues in the conference.'

The stage was then set for acting out the situation. A diagram of the assembly operation was set in the foreground (*Figure 1*) and the members were seated in the order in which each worked on the line. The performance was witnessed by an audience, no member of which was familiar with the solution, but all were made familiar with the problem. The presence of the audience gave each person in the experiment a sense of responsibility, but did not seem to be detrimental to the effectiveness with which the persons played their roles.

The writer acted as the foreman in six such role-taking demonstrations, which were given in connection with a program of human relations training. He introduced the problem as follows: ' Boys, I stopped the assembly line this morning because I thought it would be a good idea if we had an opportunity to talk things over from time to time. You fellows are closer to the job than I am, and there may be some things that you have ideas and feelings about that might make things more pleasant if we have a chance to iron them out. Do you think talks like this are worth having?' The response, of course, is agreement.

The next step was to ask, ' How is the material coming through?' ' Are the parts O.K.?' ' Do the material handlers keep you supplied?' These questions usually bring about the answer that these things are satisfactory When some problems are raised, these are discussed.

Next the group was asked, ' How is the line being paced?' ' Do you feel we are driving you too hard?' These questions arouse disagreement, and the point of issue is therefore set up on the blackboard as a problem. The situation is further explored to determine whether there are other problems. The question of monotony then arises and this is recorded as another problem. From this point on, the procedure is one of solving problems.

In the six groups of industrial personnel in which this procedure was used, five of them reached a unanimous agreement on the systematic rotation plan as a solution to the problem. In the sixth group the unanimous solution was to determine whether positions were equally difficult by rotating at daily intervals. After this was tried, and if no differences were found, the rotation was to be at intervals (the frequency to be determined by experience) so as to distribute the load. Thus this group supplied two solutions, the first of which was to test the positions, and the second of which was the elegant rotation solution. The reason why this group held off with the daily rotation plan was because Joe insisted that his position was difficult. This was an obvious " face-saving " reaction.

In no instance did one single individual supply the desired final solution. Rather it developed out of the variety of suggestions made for giving men an opportunity to work at a pace that suited them. Except for the one group, the agreement was always to give the rotation plan a trial for a week and to start immediately. The frequency of changing positions varied from one per hour to once every two hours. It was agreed to reconsider the problem after a week in order to improve the plan.

Observers agreed that the leader did not furnish the solution in any instance. Rather his contributions were in the form of summarizing, encouraging

analysis, interpreting, supplying information, and preventing hurt feelings. Observers familiar with the solution felt that there was some guidance in the manner of questioning and the wording of suggestions of others, but observers unfamiliar with the solution could not determine the solution the leader favored. In no instance were these observers able to anticipate the solution or point to the leader's bias. Thus it seems that a knowledge of the solution is necessary if the observer is to detect the leader's specific contribution. To what extent did the leader's skill promote the solution, and to what extent did the nature of the roles assigned make the solution inevitable?

C. The next step in the experiment introduced controls

To determine the part played by each of these two modifications, college students again were used. Groups of eight were created, with each of the seven roles being played by a member of the group and the eighth member being the foreman. The foreman's role, as assigned to him, was as follows:

The Foreman: Hal Benton.

'You are the new foreman in Station C and have been instructed to get production up. The job has been analyzed by time-and-motion study men and the amount of work at each position is practically the same. The No. 3 position (Joe's position) is, however, slightly easier than the others in that one less motion is required. Undoubtedly the previous foreman put him there to reduce the bottleneck. You have received training in group-decision methods and are going to try to work out your problem by this method. You have therefore stopped the production line for a discussion. You understand that what you do is your problem. You cannot pass Joe off to another foreman. You find Joe a likeable person and it is your impression that Joe gets along well with the other men in the unit.'

Since this experiment was performed during the beginning of the course in Industrial Psychology the foremen conducted themselves according to their own version of what a conference should be. In assigning the foreman's role the person was merely asked to sit down and talk the problem over with his men, and see if an agreeable solution could be found.

As controls, two other groups of persons were to work alone and conduct themselves as experts. They were to present us with a recommendation of the action that should be taken. A specific request was that they were to report a solution and not a procedure that they would use to find the solution.

One of these groups had only the problem to work from. The other group was given the roles and was told that these would furnish an idea of the way the different men felt about things on the job.

The condition of the trained leader was also repeated. Five leaders previously trained in democratic leadership conducted eleven group discussions with groups of seven students each. They duplicated the situation of the trained leader already described, but their groups consisted of students rather than men in industry. It is also important to note that the trained leader condition not only included some conference skills, but also a knowledge of the elegant solution to aid him in his use of the reasoning principles. In tabulating results we have combined these eleven groups with the six previously described, making a total of seventeen groups led by trained leaders.

In order that these trained leaders

would duplicate as much as possible the author's preliminary tests, certain procedures were outlined. The major points emphasized in these instructions were as follows:

1. Do not present the problem as a production problem, but instead determine from the group whether they have problems.
2. Recognize all suggestions, but influence direction in thinking by asking for further suggestions.
3. Protect individuals from criticism of other group members by interpreting all remarks in a favorable light.
4. Keep the discussion problem-centered, and see that no one is blamed or criticized by you.
5. Make a list of all suggestions, so that methods of fitting pace of work to individuals, methods for reducing monotony, methods for increasing pride in work, etc., are included.
6. When the list is fairly complete, probing questions may be asked. 'How can we change things to combine some of these features?'
7. Good leads may be kept in the discussion by asking, 'How would that work out?' 'How can we avoid confusion?'
8. Do not hasten the solution by capitalizing on the first good lead, or in any other way reflect your preferences.
9. Always work toward the ideal of removing undesirable features from the job. Make your objective one of resolving differences in the group.

The second experiment thus contained four groups: two groups which solved the problem as individuals—one without a knowledge of the roles, and another with a knowledge of the roles; and two groups made up of teams—one set of teams led by untrained leaders, and another set of teams led by trained leaders. In both sets of teams the individuals played the roles assigned to them.

D. The results and their meaning

In *Table 1* we have summarized the solutions obtained under the four experimental conditions. The solutions are divided into seven groups as follows: (A) The elegant solution, which involves systematic rotation in order to spread the work, so that differences in ability will not interfere with production; (B) Solutions which recognize differences in ability and arrange for some way of permitting the more capable to aid the less capable; (C) Solutions which are directed at Joe, and suggest improving him; (D) Solutions which suggest promoting Joe, the slow worker; (E) Solutions which recommend removing Joe, other than through promotion; (F) Solutions which recognize the next poorest man (George) as a problem; and (G) Solutions which violate the stated conditions of the problem or which seem inconsistent with these stated conditions. Classified under these categories the more specific solutions suggested can be found.

In classifying the solutions it was frequently found that more than one change was suggested. Thus one solution might be to promote Joe and to discharge George; another, to give Joe help and to warn George; and still another might be to train Joe, and, if this does not work, to discharge him. In classifying these two-step solutions we have scored each part of the solution as $\frac{1}{2}$ in the table. In one instance two recommendations about George and one about Joe were made, and these were scored as $\frac{1}{4}$, $\frac{1}{4}$ and $\frac{1}{2}$, respectively. Whenever a *1* appears in the table, it

indicates that the solution can be classified as a unit. Thus a solution might suggest putting various men in different positions and still be classified as " put fast workers next to slow workers."

In considering these classifications, it is apparent that, next to the rotation solution, the most feasible group of solutions is that in which the more superior individuals in some way help out the others. Probably the least effective solutions are those violating the conditions of the problem (class 6) and we may consider these as instances of failures.

For purposes of comparing the results of the different groups it is well to examine *Table 2*, in which only the major groupings are used. This table shows the percentage of instances that each type of solution was recommended under the four experimental conditions.

The elegant solution is primarily confined to the solution in which the trained leader is used and was obtained in 73.5 per cent of the groups. (The instructed leaders obtained this solution in seven out of eleven instances.) This solution never was recommended by individuals without a knowledge of the roles and occurred only once in each of the other two conditions.

The other co-operative solution, in which the less capable receive help from the more capable, was recommended only 25.8 per cent of the time by individuals having only the problem to work from. However, with a knowledge of the roles this solution was recommended 54.8 per cent of the time, or more than twice as often. Thus, with some insight in the human side of the problem, co-operative solutions seem more feasible. When, however, the roles are played out and the individuals can interact, this co-operative solution is suggested 72.4 per cent of the time, even when the leader is untrained. Thus mere discussion with the members of the group causes co-operation to emerge. When the leader is skilled, nearly all of the groups that did not find the elegant solution of co-operation, find the other co-operative solution. Thus the reason that only 17.7 per cent of these groups recommend the second co-operative solution is the fact that most of them have found the more elegant solution.

Individuals working alone and without roles concentrate their solutions on some way of removing Joe. Joe is a bottleneck and the problem is to attack the location of the bottleneck. Thus 50 per cent of their solutions take this form, some being generous in their treatment of Joe, others less generous. Undoubtedly the degree of generosity is due to the fact that the situation is not one loaded with emotion.

Individuals working alone, but with roles, recommended removing Joe only 9.5 per cent of the time. The nature of Joe's role has made them generous and lenient, and instead of hurting him, they attack George as a problem to be dealt with. Usually the mention of George in the solution is combined with other recommendations, yet the total proportion of such solutions is 17.5 per cent. From *Table 1* it can be seen that George was mentioned in a solution fourteen times by this group, not at all by individuals working without roles (which is not surprising since the nature of the individuals had to be assumed) and only twice by forty-six groups working as teams and where George was able to express his views.

Impractical solutions occurred infrequently in all groups. Individuals working without roles only violated the conditions of the problem 14.5 per cent of the time; individuals working with a knowledge of the roles did so on

10.7 per cent of their solutions; groups working with an untrained leader violated the conditions 15.5 per cent of the time; and groups working with a trained leader did so only in 8.8 per cent of their solutions.

The fact that a group working with an untrained leader violates the conditions of the problem hardly more often than does an individual working alone is of particular interest. It shows that divided responsibility, even if not controlled by a trained leader, seems about as effective as when the individual is given full responsibility as an expert.

E. Implications of results

It is apparent that a skilled leader can greatly improve the quality of a group's thinking. This is shown by the fact that only with the trained leader does the elegant solution occur with any dependable degree of frequency. Thus a leader with creative ideas can cause a group to be creative if he has the skill in conference procedures. However, even when the leader lacks skill and has no knowledge of a creative solution, he does better with a group than when working alone. The fact that people are different in ability and cannot work at the same pace is most likely to be recognized when there is group discussion. The solution of helping out the slower workers is practical if the faster workers are willing to do this. The roles make this willingness apparent, yet a mere knowledge of the roles does not bring out this solution as frequently as does a discussion between these individuals.

The individual who works without a knowledge of the roles and attitudes seldom assumes that employees are willing to help out each other and hence he seldom recommends the idea. In a sense he is correct in this opinion since, if he asked employees to help each other, they would very likely oppose the idea. Without the benefit of this form of co-operation this type of solution is not often entertained or analyzed further by a person and hence most of his efforts are directed toward techniques which do not recognize the fact that people are different. He tends to overlook therefore the fact that a new bottleneck will be created when one is removed.

Since any solution involving co-operation between human beings requires acceptance, and since even lesser quality solutions with acceptance might be more effective than higher quality solutions without acceptance, we must inquire further into the problem of the leader's ability to achieve acceptance. Does the leader who is skilled in obtaining the elegant solution pay a price by obtaining less acceptance of the solution?

F. The problem of acceptance

The results on the frequency with which the solution reached by a group was unanimously accepted as the best solution are shown in *Table 3*. In this analysis we have divided the groups led by trained leaders into two subgroups: (*a*) those led by instructors trained by the author and made up of student personnel, and (*b*) those led by the author and made up of industrial rather than student personnel. This separation is made because the results differ somewhat.

It will be seen that even the untrained leaders obtained full agreement in 62.1 per cent of their attempts. The group led by untrained leaders in which the elegant solution was obtained in seven out of eleven instances reached unanimous agreement in 72.7 per cent of the tests. In six out of the seven cases in which the elegant solution was obtained, unanimous agreement was reached. As

already reported the writer obtained unanimous agreement in all instances.

The trend in results is clear. Acceptance is not sacrificed for quality; rather with higher quality solutions acceptance increases. This does not mean that one depends on the other, but rather that both are influenced by the leader.

Of interest also is the fact that in most instances in which unanimous agreement is not reached, Joe is the obstacle. This seems surprising at first, since Joe stands to gain the most from the rotation solution. George, who also stands to be protected by the solution, also objects, but he is somewhat less likely to hold out. In analyzing the actual process of the conferences, the reason for Joe's opposition becomes apparent however. Frequently he is mentioned as slow, old, a bottleneck, or an obstacle. He then defends himself, and, if the leader is unable to prevent such statements or to gloss them over, Joe remains hostile and unco-operative. Thus the obstacle in reaching unanimous agreement is not primarily one of unwillingness to help out others, but rather is one of hurt pride.

SUMMARY AND CONCLUSIONS

In summary, these experiments show that a leader, if skilled and possessing ideas, can conduct a discussion so as to obtain a quality of problem-solving that surpasses that of a group working with a less skilled leader and without creative ideas. Further he can obtain a higher degree of acceptance than a less skilled person. However, even an unskilled leader can achieve good quality solutions and a high degree of acceptance. The democratic leadership technique is, therefore, not only a useful procedure for obtaining acceptance and co-operation, but is also effective for improving solution quality. Even when the leader possesses exceptional ability in solving technical problems, he need not sacrifice this ability in order to maintain group goodwill. Rather can he learn to conduct conferences in such a manner as to stimulate thinking and thereby have his ideas rediscovered and accepted. Frequently it is felt that one must impose new ideas on groups because groups tend to resist change. Our experiments indicate that this can be circumvented by proper conference procedures. However, if a group resists reaching a solution that a leader regards as of high quality, he can assume that if he imposed the solution upon the group, it would not be given a fair test.

It also seems likely that if a group failed to reach a solution after considerable discussion, the leader might suggest one. How his suggestions will be received will of course depend upon his relation to the group. The nature of the conference and the attitudes displayed will give him a clue as to whether this can be done. However, it will always improve the motivation if the solution can be elicited from the group.

The question unanswered by these experiments is whether or not a leader can achieve an elegant solution when he has no knowledge of the elegant solution. We found it necessary to supply him with the solution so as to guide him in the use of leading questions and taking the group out of false lines of thought. However, if he lacked the knowledge of the solution, one can assume that the solution reached would at least be as good as the one obtained from our unskilled leaders.

TABLE 1

Types of Solutions Presented

Conditions for Solving	*Individual (Without roles)*	*Individual (With roles)*	*Group (Untrained leader)*	*Group (Trained leader)*
No. of Cases	31	41	29	17
A. Elegant Solution (Rotation)	0	1	1	111111½111111
Total	0	1	1	12½
B. Give less capable less to do.				
1. Reorganize job on same position will have less work	1½	111½11½	11111	1
2. Put fast workers next to slow so they can help out	1111	111½111	111½111	0
3. Hire additional man	0	1	0	0
4. Joe periodically changes place with a faster man	1	111	11	11
5. Exchange Joe and Harry periodically	0	0	11	0
6. Those who can to help Joe (and George)	1½	111	1111	0
7. Other ways for doing some of Joe's work	0	11½½½	1½	0
Total	8	23	21	3
C. Change Joe's make-up				
1. Train Joe	½	0	0	0
2. Put pressure on Joe	½	0	0	0
3. Improve Joe's attitude	½	0	0	0
Total	1½	0	0	0
D. Promote Joe to foreman	1½	1½½	½	0
Total	1½	2	½	0
E. Get rid of Joe.				
1. Dismiss Joe	1	1	1	0
2. Retire Joe	1111½	½½	0	0
3. Transfer Joe	11111½1111½	1½½	0	0
Total	15½	4	1	0
F. George mentioned in solution.				
1. Dismiss George	0	1½½½	0	0
2. Transfer George	0	1½½½½½	½	0
3. Put pressure on George	0	½½	0	0
4. Exchange George and Harry	0	½	0	0
5. Put George in Joe's position	0	½	½	0
Total	0	7½	1	0
G. Solutions violating stated conditions.				
1. Put Joe in No.1 Position to take off pressure	11	0	11	0
2. Put Joe in No. 7 Position (no help)	1½	11	1	0
3. All help Joe in No. 1 Position to build stock pile	1	0	0	0
4. Have each do full assembly	0	0	1	0
5. Introduce piece rate	0	½	0	0
6. Let men solve problem themselves	0	1	0	0
7. Rotate until each finds best position	0	0	½	½
8. Match ability in all 4 assembly units	0	1	0	0
9. Leave situation unaltered	0	0	0	1
Total	4½	4½	4½	1½

TABLE 2

Relative Frequency of Each Type of Solution

Conditions for Solving	*Individual (Without roles) per cent*	*Individual (With roles) per cent*	*Group (Untrained leader) per cent*	*Group (Trained leader) per cent*
Number of cases	31	42	29	17
A. Elegant solution	0.0	2.3	3.4	73.5
B. Give less capable less to do ...	25.8	54.8	72.4	17.7
C. Change Joe's make-up ...	4.8	0.0	0.0	0.0
D. Promote Joe to foreman ...	4.8	4.7	1.7	0.0
E. Get rid of Joe	50.0	9.5	3.4	0.0
F. George mentioned in solution...	0.0	17.5	3.4	0.0
G. Solutions violating stated conditions	14.5	10.7	15.5	8.8
Total	99.9	99.9	99.8	100.0

TABLE 3

Acceptance of Solution Under Different Leaders

Type of Leader	*No. of groups*	*Per cent unanimous agreement was obtained*
Untrained leader	29	62.1
Instructed leader	11	72.7
Most highly trained leader ...	6	100.0

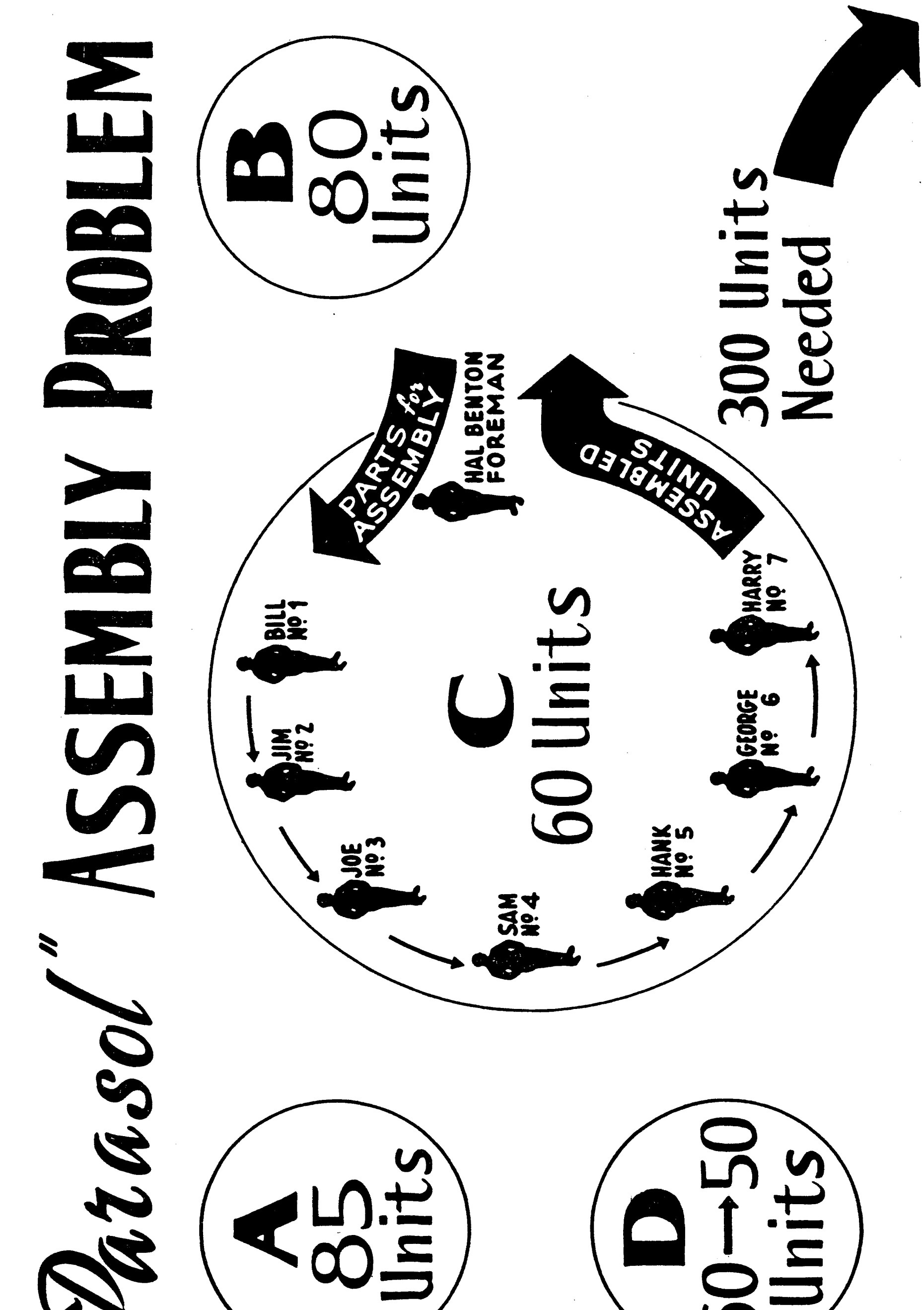

FIGURE 1

Diagram of 4 sub-assembly stations. The stations represent 4 groups of men who work in teams and assemble a part of a car. All groups do the same work and the combined assembled units are used to supply the production line. The combined output is 275 units, just 25 short of what is needed. The foreman of Station C wishes to raise his group's production. He has a bottle neck in Joe at the No. 3 position. Work piles up at this position and Joe seems unable to keep up the pace. How can the problem of low production at Station C be solved?

BIBLIOGRAPHY

1. BRADFORD, L. P., and LIPPITT, R., "Building a Democratic Work Group." *Personnel* 1945, 22, 2-12.
2. COCH, L., and FRENCH, J. R. P., "Overcoming Resistance to Change." *Human Relations*, 1948, 1, 512-532.
3. LEWIN, K., "The Dynamics of Group Action." *Educ. Leadership*, 1944, 1, 195-200.
4. LEWIN, K., "Group Decision and Social Change." (pp. 330-344) *Readings in Social Psychology.* (Ed. by T. M. Newcomb and E. L. Hartley) Henry Holt and Co., New York, 1947, pp. 672.
5. LIPPITT, R., "An Experimental Study of the Effect of Democratic and Authoritarian Group Atmospheres." Univ. Ia. *Study Child Welf.*, 1940, 16, 43-195.
6. MAIER, N. R. F., "Reasoning in Humans. I. On Direction." *J. Comp. Psychol.*, 1930, 12, 115-143.
7. MAIER, N. R. F., "Reasoning in Humans. II. The Solution of a Problem and its Appearance in Consciousness." *J. Comp. Psychol.*, 1931, 12, 181-194.
8. MAIER, N. R. F., "An Aspect of Human Reasoning." *Brit. J. Psychol.*, 1933, 24, 144-155.
9. MAIER, N. R. F., "Reasoning in Humans. III. The Mechanisms of Equivalent Stimuli and Reasoning." *J. Exp. Psychol.* 1945, 35, 349-360.
10. MAIER, N R. F., "A Human Relations Program for Supervision." *Indust. and Labor Rel. Rev.*, 1948, 1, 443-464.
11. MAIER, N. R. F., *Psychology in Industry.* Houghton Mifflin Co., Boston, 1946. Pp. 463.
12. MAIER, N. R. F., *Frustration: The Study of Behavior Without a Goal.* McGraw-Hill Book Co. Inc., New York, 1949. Pp. 264.
13. MAIER, N. R. F., and RENINGER, H. W., *A Psychological Approach to Literary Criticism.* D. Appleton & Co., New York, 1933. Pp. 154.
14. PRESTON, M. G., and HEINTZ, R. K., "Effects of Participatory vs. Supervisory Leadership on Group Judgment." *J. Abn. and Soc. Psychol.*, 1949, 44, 345-355.
15. SHAW, MARJORIE E., "A Comparison of Individuals and Small Groups in the Rational Solution of Complex Problems." *Amer. J. Psychol.*, 1932, 44, 491-504.
16. WATSON, G. B., "Do Groups Think More Efficiently Than Individuals?" *J. Abn. and Soc. Psychol.*, 1928, 23, 328-336.

* * *

BIOGRAPHICAL NOTE

DR. NORMAN R. F. MAIER is professor of psychology at the University of Michigan where he has been active since 1931. He received his Ph.D. in psychology from the University of Michigan in 1928 and spent the year 1925-26 in graduate work at the University of Berlin studying Gestalt psychology. After obtaining his Ph.D. he was for two years a National Research Council Fellow at the University of Chicago working with K. S. Lashley. Dr. Maier has published numerous experimental studies on reasoning (in both animals and human beings); brain functions in higher processes; animal neurosis and frustration; and human relations in industry. He is the author of five books including: *Principles of Animal Psychology* (with T. S. Schneirla); *Psychology in Industry;* and *Frustration.* Dr. Maier feels that all of his work has a central theme—the study of behavior in a problem situation.