Overcoming Resistance to Change

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OVERCOMING RESISTANCE TO CHANGE[1]

by LESTER COCH AND JOHN R. P. FRENCH, JR.

INTRODUCTION

It has always been characteristic of American industry to change products and methods of doing jobs as often as competitive conditions or engineering progress dictates. This makes frequent changes in an individual's work necessary. In addition, the markedly greater turnover and absenteeism of recent years result in unbalanced production lines which again makes for frequent shifting of individuals from one job to another. One of the most serious production problems faced at the Harwood Manufacturing Corporation has been the resistance of production workers to the necessary changes in methods and jobs. This resistance expressed itself in several ways, such as grievances about the piece rates that went with the new methods, high turnover, very low efficiency, restriction of output, and marked aggression against management. Despite these undesirable effects, it was necessary that changes in methods and jobs continue.

Efforts were made to solve this serious problem by the use of a special monetary allowance for transfers, by trying to enlist the cooperation and aid of the union, by making necessary layoffs on the basis of efficiency, etc. In all cases, these actions did little or nothing to overcome the resistance to change. On the basis of these data, it was felt that the pressing problem of resistance to change demanded further research for its solution. From the point of view of factory management, there were two purposes to the research: (1) Why do people resist change so strongly? and (2) What can be done to overcome this resistance?

Starting with a series of observations about the behavior of changed groups, the first step in the overall program was to devise a preliminary theory to account for the resistance to change. Then on the basis of the theory, a real life action experiment was devised and conducted within the context of the factory situation. Finally, the results of the experiment were interpreted in the light of the preliminary theory and the new data.

BACKGROUND

The main plant of the Harwood Manufacturing Corporation, where the present research was done, is located in the small town of Marion, Virginia. The plant produces pajamas and, like most sewing plants, employs mostly women. The plant's population is about 500 women and 100 men. The workers

[1] Grateful acknowledgements are made by the authors to Dr. Alfred J. Marrow, president of the Harwood Manufacturing Corporation, and to the entire Harwood staff for their valuable aid and suggestions in this study.

The authors have drawn repeatedly from the works and concepts of Kurt Lewin for both the action and theoretical phases of this study.

Many of the leadership techniques used in the experimental group meetings were techniques developed at the first National Training Laboratory for Group Development held at Bethel, Maine, in the summer of 1947. Both authors attended this laboratory.

are recruited from the rural, mountainous areas surrounding the town, and are usually employed without previous industrial experience. The average age of the workers is 23; the average education is eight years of grammar school.

The policies of the company in regard to labor relations are liberal and progressive. A high value has been placed on fair and open dealing with the employees and they are encouraged to take up any problems or grievances with the management at any time. Every effort is made to help foremen find effective solutions to their problems in human relations, using conferences and role-playing methods. Carefully planned orientation, designed to help overcome the discouragement and frustrations attending entrance upon the new and unfamiliar situation, is used. Plant-wide votes are conducted where possible to resolve problems affecting the whole working population. The company has invested both time and money in employee services such as industrial music, health services, lunch-room, and recreation programs. In the same spirit, the management has been conscious of the importance of public relations in the local community; they have supported both financially and otherwise any activity which would build up good will for the company. As a result of these policies, the company has enjoyed good labor relations since the day it commenced operations.

Harwood employees work on an individual incentive system. Piece rates are set by time study and are expressed in terms of units. One unit is equal to one minute of standard work: 60 units per hour equal the standard efficiency rating. Thus, if on a particular operation the piece rate for one dozen is 10 units, the operator would have to produce 6 dozen per hour to achieve the standard efficiency rating of 60 units per hour. The skill required to reach 60 units per hour is great. On some jobs, an average trainee may take 34 weeks to reach the skill level necessary to perform at 60 units per hour. Her first few weeks of work may be on an efficiency level of 5 to 20 units per hour.

The amount of pay received is directly proportional to the weekly average efficiency rating achieved. Thus, an operator with an average efficiency rating of 75 units per hour (25 per cent. more than standard) would receive 25 per cent. more than base pay. However, there are two minimum wages below which no operator may fall. The first is the plantwide minimum, the hiring-in wage; the second is a minimum wage based on six months' employment and is 22 per cent. higher than the plant-wide minimum wage. Both minima are smaller than the base pay for 60 units per hour efficiency rating.

The rating of every piece worker is computed every day and the results are published in a daily record of production which is shown to every operator. This daily record of production for each production line carries the names of all the operators on that line arranged in rank order of efficiency rating, with the highest rating girl at the top of the list. The supervisors speak to each operator each day about her unit ratings. Because of the above procedures, many operators do not claim credit for all the work done in a given day. Instead, they save a few of the piece rate tickets as a " cushion " against a rainy day when they may not feel well or may have a great amount of machine trouble.

When it is necessary to change an operator from one type of work to another, a transfer bonus is given. This bonus is so designed that the changed operator who relearns at an average rate will suffer no loss in earnings after

change. Despite this allowance, the general attitudes toward job changes in the factory are markedly negative. Such expressions as, " When you make your units (standard production), they change your job," are all too frequent. Many operators refuse to change, preferring to quit.

THE TRANSFER LEARNING CURVE

An analysis of the after-change relearning curves of several hundred experienced operators rating standard or better prior to change showed that 38 per cent. of the changed operators recovered to the standard unit rating of 60 units per hour. The other 62 per cent. either became chronically sub-standard operators or quit during the relearning period.

The average relearning curve for those who recover to standard production on the simplest type job in the plant (Figure 1) is eight weeks long, and, when smoothed, provides the basis for the transfer bonus. The bonus

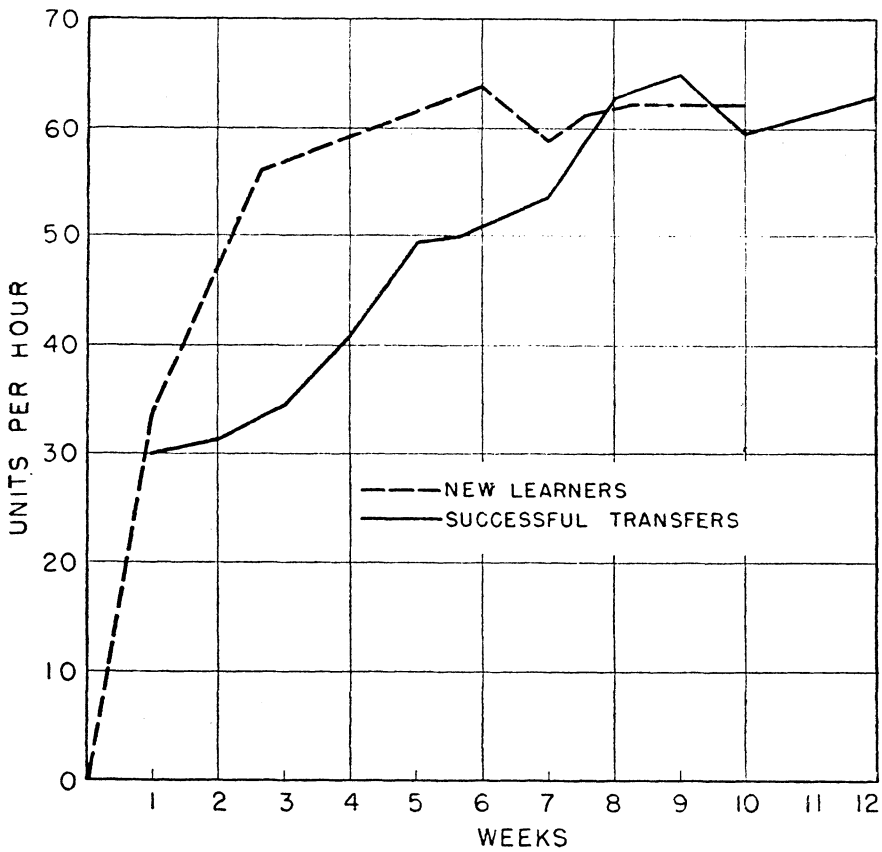

Figure I. A comparison of the learning curve for new, inexperienced employees with the relearning curve for only those transfers (38 per cent.) who eventually recover to standard production.

is the percent. difference between this expected efficiency rating and the standard of 60 units per hour. Progress is slow for the first two or three weeks, as the relearning curve shows, and then accelerates markedly to about 50 units per hour with an increase of 15 units in two weeks. Another slow progress area is encountered at 50 units per hour, the operator improving only 3 units in two weeks. The curve ends in a spurt of 10 units progress in one week, a marked goal gradient behavior. The individual curves, of course, vary widely in length according to the simplicity or difficulty of the job to be relearned; but in general, the successful curves are consistent with the average curve in form.

It is interesting to note in Figure I that the relearning period for an experienced operator is longer than the learning period for a new operator. This is true despite the fact that the majority of transfers—the failures who never recover to standard—are omitted from the curve. However, changed operators rarely complain of " wanting to do it the old way," etc., after the first week or two of change; and time and motion studies show few false moves after the first week of change. From this evidence it is deduced that proactive inhibition or the interference of previous habits in learning the new skill is either non-existent or very slight after the first two weeks of change.

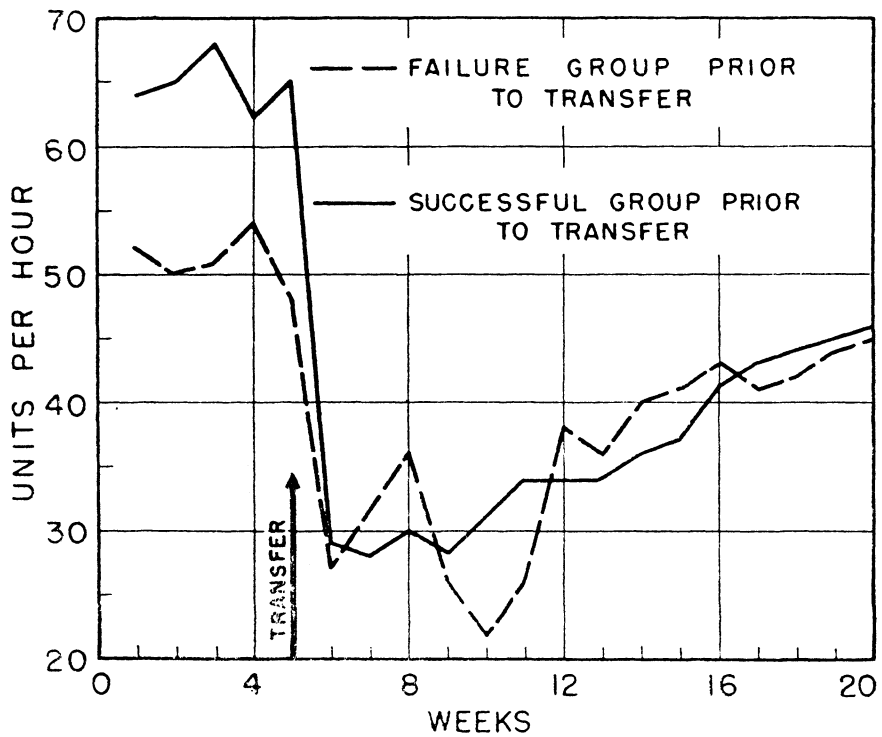

Figure II. The drop in production and the rate of recovery after transfer for skillful and for sub-standard operators.

Figure II, which presents the relearning curves for 41 experienced operators who were changed to very difficult jobs, gives a comparison between the recovery rates for operators making standard or better prior to change, and those below standard prior to change. Both classes of operators dropped to a little below 30 units per hour and recovered at a very slow but similar rate. These curves show a general (though by no means universal) phenomenon: that the efficiency rating prior to change does not indicate a faster or slower recovery rate after change.

A PRELIMINARY THEORY OF RESISTANCE TO CHANGE

The fact that relearning after transfer to a new job is so often slower than initial learning on first entering the factory would indicate, on the face of it, that the resistance to change and the slow relearning is primarily a motivational problem. The similar recovery rates of the skilled and unskilled operators shown in Figure II tend to confirm the hypothesis that skill is a minor factor and motivation is the major determinant of the rate of recovery. Earlier experiments at Harwood by Alex Bavelas demonstrated this point conclusively. He found that the use of group decision techniques on operators who had just been transferred resulted in very marked increases in the rate of relearning, even though no skill training was given and there were no other changes in working conditions.(2)

Interviews with operators who have been transferred to a new job reveal a common pattern of feelings and attitudes which are distinctly different from those of successful non-transfers. In addition to resentment against the management for transferring them, the employees typically show feelings of frustration, loss of hope of ever regaining their former level of production and status in the factory, feelings of failure, and a very low level of aspiration. In this respect these transferred operators are similar to the chronically slow workers studied previously.

Earlier unpublished research at Harwood has shown that the non-transferred employees generally have an explicit goal of reaching and maintaining an efficiency rating of 60 units per hour. A questionnaire administered to several groups of operators indicated that a large majority of them accept as their goal the management's quota of 60 units per hour. This standard of production is the level of aspiration according to which the operators measure their own success or failure; and those who fall below standard lose status in the eyes of their fellow employees. Relatively few operators set a goal appreciably above 60 units per hour.

The actual production records confirm the effectiveness of this goal of standard production. The distribution of the total population of operators in accordance with their production levels is by no means a normal curve. Instead there is a very large number of operators who rate 60 to 63 units per hour and relatively few operators who rate just above or just below this range. Thus we may conclude that:

(1) There is a force acting on the operator in the direction of achieving a production level of 60 units per hour or more. It is assumed that the strength of this driving force (acting on an operator below standard) increases as she gets nearer the goal—a typical goal gradient (see Figure I).

On the other hand restraining forces operate to hinder or prevent her from reaching this goal. These restraining

forces consist among other things of the difficulty of the job in relation to the operator's level of skill. Other things being equal, the faster an operator is sewing the more difficult it is to increase her speed by a given amount. Thus we may conclude that:

(2) The strength of the restraining force hindering higher production increases with increasing level of production.

In line with previous studies, it is assumed that the conflict of these two opposing forces—the driving force corresponding to the goal of reaching 60 and the restraining force of the difficulty of the job—produces frustration. In such a conflict situation, the strength of frustration will depend on the strength of these forces. If the restraining force against increasing production is weak, then the frustration will be weak. But if the driving force toward higher production (i.e., the motivation) is weak, then the frustration will also be weak. Probably both of the conflicting forces must be above a certain minimum strength before any frustration is produced; for all goal-directed activity involves some degree of conflict of this type, yet a person is not usually frustrated so long as he is making satisfactory progress toward his goal. Consequently we assume that:

(3) The strength of frustration is a function of the weaker of these two opposing forces, provided that the weaker force is stronger than a certain minimum necessary to produce frustration.(1)

An analysis of the effects of such frustration in the factory showed that it resulted, among other things, in high turnover and absenteeism. The rate of turnover for successful operators with efficiency ratings above standard was much lower than for unsuccessful operators. Likewise, operators on the more difficult jobs quit more frequently than those on the easier jobs. Presumably the effect of being transferred is a severe frustration which should result in similar attempts to escape from the field.

In line with this theory of frustration, and the finding that job turnover is one resultant of frustration, an analysis was made of the turnover rate of transferred operators as compared with the rate among operators who had not been transferred recently. For the year September, 1946, to September, 1947, there were one hundred and ninety-eight operators who had not been transferred recently, that is, within the thirty-four week period allowed for relearning after transfer. There was a second group of eighty-five operators who had been transferred recently, that is, within the time allowed for relearning the new job. Each of these two groups was divided into seven classifications according to their unit rating at the time of quitting. For each classification the percent. turnover per month, based on the total number of employees in that classification, was computed.

The results are given in Figure III. Both the levels of turnover and the form of the curves are strikingly different for the two groups. Among operators who have not been transferred recently the average turnover per month is about $4\frac{1}{2}$ per cent.; among recent transfers the monthly turnover is nearly 12 per cent. Consistent with the previous studies, both groups show a very marked drop in the turnover curve after an operator becomes a success by reaching 60 units per hour or standard production. However, the form of the curves at lower unit ratings is markedly different for the two groups. The non-transferred operators show a gradually increasing rate of turnover up to a

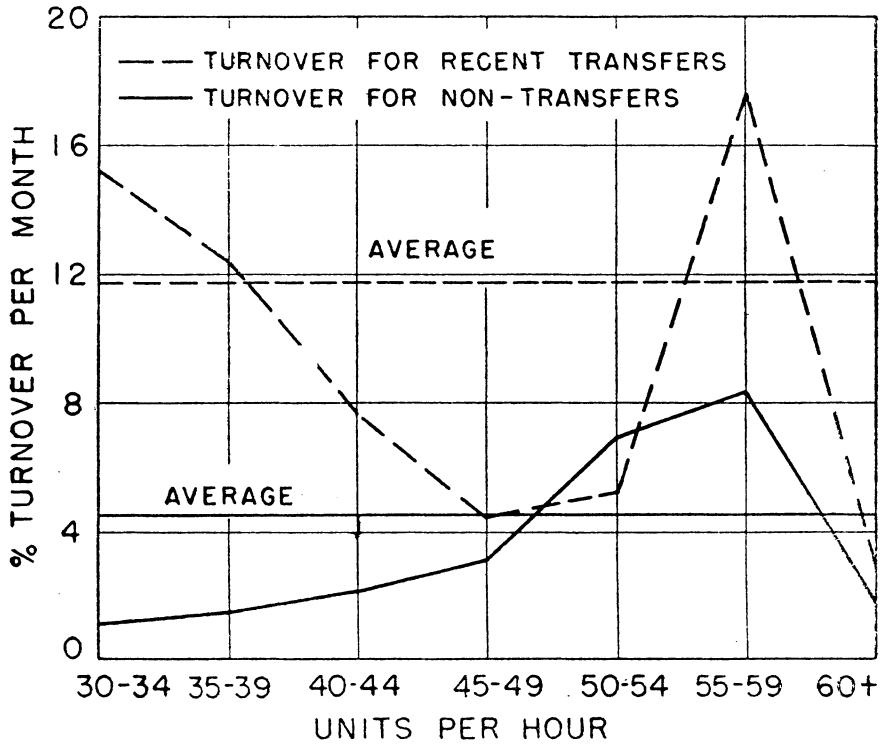

Figure III. The rate of turnover at various levels of production for transfers as compared with non-transfers.

rating of 55 to 59 units per hour. The transferred operators, on the other hand, show a high peak at the lowest unit rating of 30 to 34 units per hour, decreasing sharply to a low point at 45 to 49 units per hour. Since most changed operators drop to a unit rating of around 30 units per hour when changed and then drop no further, it is obvious that the rate of turnover was highest for these operators just after they were changed and again much later just before they reached standard. Why?

It is assumed that the strength of frustration for an operator who has *not* been transferred gradually increases because both the driving force towards the goal of reaching 60 and the restraining force of the difficulty of the job increase with increasing unit rating. This is in line with hypotheses (1), (2) and (3) above. For the transferred operator on the other hand the frustration is greatest immediately after transfer when the contrast of her present status with her former status is most evident. At this point the strength of the restraining forces is at a maximum because the difficulty is unusually great due to proactive inhibition. Then as she overcomes the interference effects between the two jobs and learns the new job, the difficulty and the frustration gradually decrease and the rate of turnover declines until the operator

reaches 45—49 units per hour. Then at higher levels of production the difficulty starts to increase again and the transferred operator shows the same peak in frustration and turnover at 55—59 units per hour.

Though our theory of frustration explains the forms of the two turnover curves in Figure IV, it hardly seems adequate to account for the markedly higher level of turnover for transfers as compared to non-transfers. On the basis of the difficulty of the job, it is especially difficult to explain the higher rate of turnover at 55—59 units per hour for transfers. Evidently additional forces are operating.

Another factor which seems to affect recovery rates of changed operators is the amount of we-feeling. Observations seem to indicate that a strong psychological sub-group with negative attitudes toward management will display the strongest resistance to change. On the other hand, changed groups with high we-feeling and positive cooperative attitudes are the best relearners. Collections of individuals with little or no we-feeling display some resistance to change but not so strongly as the groups with high we-feeling and negative attitudes toward management. However, turnover for the individual transfers is much higher than in the latter groups. This phenomenon of the relationship between we-feeling and resistance to change is so overt that for years the general policy of the management of the plant was never to change a group as a group but rather to scatter the individuals in different areas throughout the factory.

An analysis of turnover records for changed operators with high we-feeling showed a 4 per cent. turnover rate per month at 30 to 34 units per hour, not significantly higher than in unchanged operators but significantly lower than in changed operators with little or no we-feeling. However, the acts of aggression are far more numerous among operators with high we-feeling than among operators with little we-feeling. Since both types of operators experience the same frustration as individuals but react to it so differently, it is assumed that the effect of the in-group feeling is to set up a restraining force against leaving the group and perhaps even to set up driving forces toward staying in the group. In these circumstances, one would expect some alternative reaction to frustration rather than escape from the field. This alternative is aggression. Strong we-feeling provides strength so that members dare to express aggression which would otherwise be suppressed.

One common result in a sub-group with strong we-feeling is the setting of a group standard concerning production. Where the attitudes toward management are antagonistic, this group standard may take the form of a definite restriction of production to a given level. This phenomenon of restriction is particularly likely to happen in a group that has been transferred to a job where a new piece rate has been set; for they have some hope that if production never approaches the standard, the management may change the piece rate in their favor.

A group standard can exert extremely strong forces on an individual member of a small sub-group. That these forces can have a powerful effect on production is indicated in the production record of one presser during a period of forty days.

	In the group
Days	*Production per day*
1— 3	46
4— 6	52
7— 9	53
10—12	56

Days	*Production per day*
Scapegoating begins	
13—16	55
17—20	48
Becomes a single worker	
21—24	83
25—28	92
29—32	92
33—36	91
37—40	92

For the first twenty days she was working in a group of other pressers who were producing at the rate of about 50 units per hour. Starting on the thirteenth day, when she reached standard production and exceeded the production of the other members, she became a scapegoat of the group. During this time her production decreased toward the level of the remaining members of the group. After twenty days the group had to be broken up and all the other members were transferred to other jobs leaving only the scapegoat operator. With the removal of the group, the group standard was no longer operative; and the production of the one remaining operator shot up from the level of about 45 to 96 units per hour in a period of four days. Her production stabilized at a level of about 92 and stayed there for the remainder of the twenty days. Thus it is clear that the motivational forces induced in the individual by a strong sub-group may be more powerful than those induced by management.

THE EXPERIMENT

On the basis of the preliminary theory that resistance to change is a combination of an individual reaction to frustration with strong group-induced forces it seemed that the most appropriate methods for overcoming the resistance to change would be group methods. Consequently an experiment was designed employing two variations of democratic procedure in handling groups to be transferred. The first variation involved participation through representation of the workers in designing the changes to be made in the jobs. The second variation consisted of total participation by all members of the group in designing the changes. A third control group was also used. Two experimental groups received the total participation treatment. The three experimental groups and the control group were roughly matched with respect to: (1) the efficiency ratings of the groups before transfer; (2) the degree of change involved in the transfer; (3) the amount of we-feeling observed in the groups.

In no case was more than a minor change in the work routines and time allowances made. The control group, the eighteen hand pressers, had formerly stacked their work in one-half dozen lots on a flat piece of cardboard the size of the finished product. The new job called for stacking their work in one half dozen lots in a box the size of the finished product. The box was located in the same place the cardboard had been. An additional two minutes per dozen was allowed (by the time study) for this new part of the job. This represented a total job change of 8.8 per cent.

Experimental group 1, the thirteen pajama folders, had formerly folded coats with pre-folded pants. The new job called for the folding of coats with unfolded pants. An additional 1.8 minutes per dozen was allowed (by time study) for this new part of the job. This represented a total job change of 9.4 per cent.

Experimental groups 2 and 3, consisting of eight and seven pajama

examiners respectively, had formerly clipped threads from the entire garment and examined every seam. The new job called for pulling only certain threads off and examining every seam. An average of 1.2 minutes per dozen was subtracted (by time study) from the total time on these two jobs. This represented a total job change of 8 per cent.

The control group of hand pressers went through the usual factory routine when they were changed. The production department modified the job, and a new piece rate was set. A group meeting was then held in which the control group was told that the change was necessary because of competitive conditions, and that a new piece rate had been set. The new piece rate was thoroughly explained by the time study man, questions were answered, and the meeting dismissed.

Experimental group 1 was changed in a different manner. Before any changes took place, a group meeting was held with all the operators to be changed. The need for the change was presented as dramatically as possible, showing two identical garments produced in the factory; one was produced in 1946 and had sold for 100 per cent. more than its fellow in 1947. The group was asked to identify the cheaper one and could not do it. This demonstration effectively shared with the group the entire problem of the necessity of cost reduction. A general agreement was reached that a savings could be effected by removing the " frills " and " fancy " work from the garment without affecting the folders' opportunity to achieve a high efficiency rating. Management then presented a plan to set the new job and piece rate:

(1) Make a check study of the job as it was being done.
(2) Eliminate all unnecessary work.
(3) Train several operators in the correct methods.
(4) Set the piece rate by time studies on these specially trained operators.
(5) Explain the new job and rate to all the operators.
(6) Train all operators in the new method so they can reach a high rate of production within a short time.

The group approved this plan (though no formal group decision was reached), and chose the operators to be specially trained. A sub-meeting with the " special " operators was held immediately following the meeting with the entire group. They displayed a cooperative and interested attitude and immediately presented many good suggestions. This attitude carried over into the working out of the details of the new job; and when the new job and piece rates were set, the " special " operators referred to the resultants as " our job," " our rate," etc. The new job and piece rates were presented at a second group meeting to all the operators involved. The " special " operators served to train the other operators on the new job.

Experimental groups 2 and 3 went through much the same kind of change meetings. The groups were smaller than experimental group 1, and a more intimate atmosphere was established. The need for a change was once again made dramatically clear; the same general plan was presented by management. However, since the groups were small, all operators were chosen as " special " operators; that is, all operators were to participate directly in the designing of the new jobs, and all operators would be studied by the time study man. It is interesting to note that in the meetings with these two groups, suggestions were immediately made in such quantity that the steno-

grapher had great difficulty in recording them. The group approved of the plans, but again no formal group decision was reached.

Results

The results of the experiment are summarized in graphic form in Figure IV. The gaps in the production curves occur because these groups were paid on a time-work basis for a day or two. The control group improved little beyond their early efficiency ratings. Resistance developed almost immediately after the change occurred. Marked expressions of aggression against management occurred, such as conflict with the methods engineer, expression of hostility against the supervisor, deliberate restriction of production, and lack of cooperation with the supervisor. There were 17 per cent. quits in the first forty days. Grievances were filed about the piece rate, but when the rate was checked, it was found to be a little " loose."

Experimental group 1 showed an unusually good relearning curve. At the end of fourteen days, the group averaged 61 units per hour. During the fourteen days, the attitude was cooperative and permissive. They worked well with the methods engineer, the training staff, and the supervisor. (The supervisor was the same person in the cases of the control group and experimental group 1). There were no quits in this group in the first forty days. This group might have presented a better learning record if work had not been scarce during the first seven days. There was one act of aggression against the supervisor recorded in the first forty days. It is interesting to note that the three special representative operators in experimental group 1 recovered at about the same rate as the rest of their group.

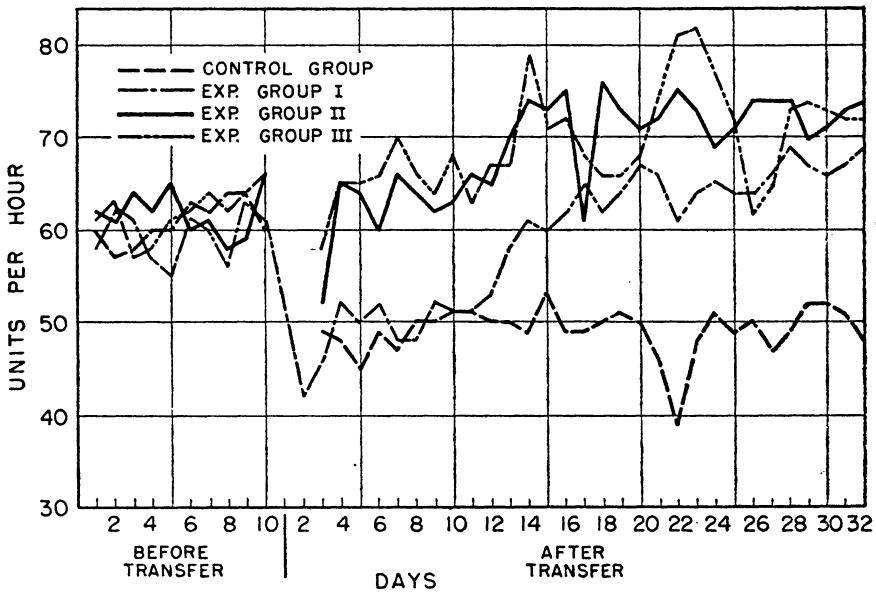

Figure IV. The effects of participation through representation (group 1) and of total participation (groups 2 and 3) on recovery after an easy transfer.

Experimental groups 2 and 3 recovered faster than experimental group 1. After a slight drop on the first day of change, the efficiency ratings returned to a pre-change level and showed sustained progress thereafter to a level about 14 per cent. higher than the pre-change level. No additional training was provided them after the second day. They worked well with their supervisors and no indications of aggression were observed from these groups. There were no quits in either of these groups in the first forty days.

A fourth experimental group, composed of only two sewing operators, was transferred by the total participation technique. Their new job was one of the most difficult jobs in the factory, in contrast to the easy jobs for the control group and the other three experimental groups. As expected, the total participation technique again resulted in an unusually fast recovery rate and a final level of production well above the level before transfer. Because of the difficulty of the new job, however, the rate of recovery was slower than for experimental groups 2 and 3, but faster than for experimental group 1.

In the first experiment, the control group made no progress after transfer for a period of 32 days. At the end of this period the group was broken up and the individuals were reassigned to new jobs scattered throughout the factory. Two and a half months after their dispersal, the thirteen remaining members of the original control group were again brought together as a group for a second experiment.

This second experiment consisted of transferring the control group to a new job, using the total participation technique in meetings which were similar to those held with experimental groups 2 and 3. The new job was a pressing job of comparable difficulty to the new job in the first experiment. On the average it involved about the same degree of change. In the meetings no reference was made to the previous behavior of the group on being transferred.

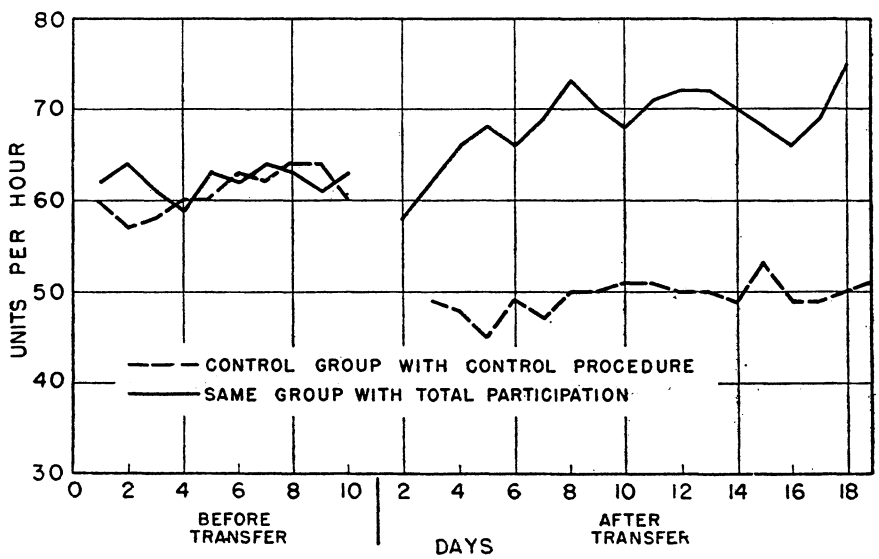

Figure V. A comparison of the effect of the control procedure with the total participation procedure on the same group.

The results of the second experiment were in sharp contrast to the first (see Figure V). With the total participation technique, the same control group now recovered rapidly to their previous efficiency rating, and, like the other groups under this treatment, continued on beyond it to a new high level of production. There was no aggression or turnover in the group for 19 days after change, a marked modification of their previous behavior after transfer. Some anxiety concerning their seniority status was expressed, but this was resolved in a meeting of their elected delegate, the union business agent, and a management representative. It should be noted in Figure V that the pre-change level on the second experiment is just above 60 units per hour; thus the individual transfers had progressed to just above standard during the two and a half months between the two experiments.

INTERPRETATION

The purpose of this section is to explain the drop in production resulting from transfer, the differential recovery rates of the control and the experimental groups, the increases beyond their former levels of production by the experimental groups, and the differential rates of turnover and aggression.

The first experiment showed that the rate of recovery is directly proportional to the amount of participation, and that the rates of turnover and aggression are inversely proportional to the amount of participation. The second experiment demonstrated more conclusively that the results obtained depended on the experimental treatment rather than on personality factors like skill or aggressiveness, for identical individuals yielded markedly different results in the control treatment as contrasted with the total participation treatment.

Apparently total participation has the same type of effect as participation through representation, but the former has a stronger influence. In regard to recovery rates, this difference is not unequivocal because the experiment was unfortunately confounded. Right after transfer, experimental group number 1 had insufficient material to work on for a period of seven days. Hence their slower recovery during this period is at least in part due to insufficient work. In succeeding days, however, there was an adequate supply of work and the differential recovery rate still persisted. Therefore we are inclined to believe that participation through representation results in slower recovery than does total participation.

Before discussing the details of why participation produces high morale, we will consider the nature of production levels. In examining the production records of hundreds of individuals and groups in this factory, one is struck by the constancy of the level of production. Though differences among individuals in efficiency rating are very large, nearly every experienced operator maintains a fairly steady level of production given constant physical conditions. Frequently the given level will be maintained despite rather large changes in technical working conditions.

As Lewin has pointed out, this type of production can be viewed as a quasi-stationary process—in the on-going work the operator is forever sewing new garments, yet the level of the process remains relatively stationary. Thus there are constant characteristics of the production process permitting the establishment of general laws.

In studying production as a quasi-

stationary equilibrium, we are concerned with two types of forces: (1) forces on production in a downward direction, (2) forces on production in an upward direction. In this situation we are dealing with a variety of both upward forces tending to increase the level of production and downward forces tending to decrease the level of production. However, in the present experiment we have no method of measuring independently all of the component forces either downward or upward. These various component forces upward are combined into one resultant force upward. Likewise the several downward component forces combine into one resultant force downward. We can infer a good deal about the relative strengths of these resultant forces.

Where we are dealing with a quasi-stationary equilibrium, the resultant forces upward and the forces downward are opposite in direction and equal in strength at the equilibrium level. Of course either resultant forces may fluctuate over a short period of time, so that the forces may not be equally balanced at a given moment. However, over a longer period of time and on the average the forces balance out. Fluctuations from the average occur but there is a tendency to return to the average level.

Just before being transferred, all of the groups in both experiments had reached a stable equilibrium level at just above the standard production of 60 units per hour. This level was equal to the average efficiency rating for the entire factory during the period of the experiments. Since this production level remained constant, neither increasing nor decreasing, we may be sure that the strength of the resultant force upward was equal to the strength of the resultant force downward. This equilibrium of forces was maintained over the period of time when production was stationary at this level. But the forces changed markedly after transfer, and these new constellations of forces were distinctly different for the control and the experimental groups.

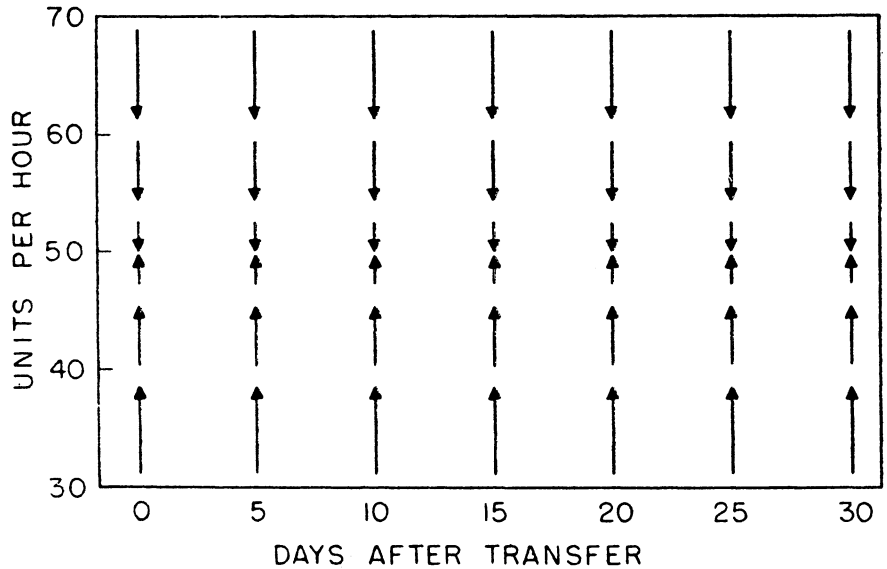

Figure VI. A schematic diagram of the quasi-stationary equilibrium for the control group after transfer.

For the control group the period after transfer is a quasi-stationary equilibrium at a lower level, and the forces do not change during the period of thirty days. The resultant force upward remains equal to the resultant force downward and the level of production remains constant. The force field for this group is represented schematically in Figure VI. Only the resultant forces are shown. The length of the vector represents the strength of the force; and the point of the arrow represents the point of application of the force, that is, the production level and the time at which the force applies. Thus the forces are equal and opposite only at the level of 50 units per hour. At higher levels of production the forces downward are greater than the forces upward; and at lower levels of production the forces upward are stronger than the forces downward. Thus there is a tendency for the equilibrium to be maintained at an efficiency rating of 50.

The situation for the experimental groups after transfer can be viewed as a quasi-stationary equilibrium of a different type. Figure VII gives a schematic diagram of the resultant forces for the experimental groups. At any given level of production, such as 50 units per hour or 60 units per hour, both the resultant forces upward and the resultant forces downward change

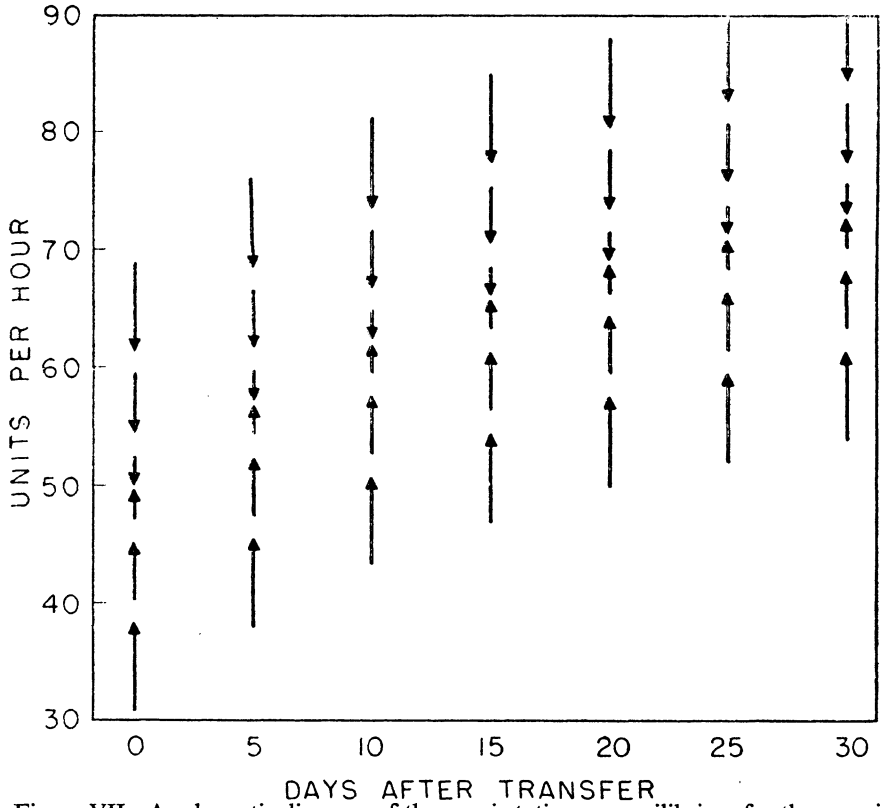

Figure VII. A schematic diagram of the quasi-stationary equilibrium for the experimental groups after transfer.

over the period of thirty days. During this time the point of equilibrium, which starts at 50 units per hour, gradually rises until it reaches a level of over 70 units per hour after thirty days. Yet here again the equilibrium level has the character of a "central force field" where at any point in the total field the resultant of the upward and the downward forces is in the direction of the equilibrium level.

To understand how the difference between the experimental and the control treatments produced the differences in force fields represented in Figures VI and VII, it is not sufficient to consider only the resultant forces. We must also look at the component forces for each resultant force.

There are three main component forces influencing production in a downward direction: (1) the difficulty of the job (see p. 517); (2) a force corresponding to avoidance of strain; (3) a force corresponding to a group standard to restrict production to a given level. The resultant force upward in the direction of greater production is composed of three additional component forces; (1) the force corresponding to the goal of standard production (see p. 516); (2) a force corresponding to pressures induced by the management through supervision; (3) a force corresponding to a group standard of competition. Let us examine each of these six component forces.

1. *Job Difficulty.* For all operators the difficulty of the job is one of the forces downward on production. The difficulty of the job, of course, is relative to the skill of the operator. The given job may be very difficult for an unskilled operator but relatively easy for a highly skilled one. In the case of a transfer a new element of difficulty enters. For some time the new job is much more difficult, for the operator is unskilled at that particular job. In addition to the difficulty experienced by any learner, the transfer often encounters the added difficulty of proactive inhibition. Where the new job is similar to the old job there will be a period of interference between the two similar but different skills required. For this reason a very efficient operator whose skills have become almost unconscious may suffer just as great a drop as a much less efficient operator (see Figure II). Except for group 4, the difficulty of these easy jobs does not explain the differential recovery rates because both the initial difficulty and the amount of change were equated for these groups. The two operators in group 4 probably dropped further and recovered more slowly than any of the other three groups under total participation because of the greater difficulty of the job.

2. *Strain Avoidance.* The force toward lower production corresponding to the difficulty of the job (or the lack of skill of the person) has the character of a restraining force—that is, it acts to prevent locomotion rather than as a driving force causing locomotion. However, in all production there is a closely related driving force towards lower production, namely "strain avoidance." We assume that working too hard and working too fast is an unpleasant strain; and corresponding to this negative valence there is a driving force in the opposite direction, namely towards taking it easy or working slower. The higher the level of production the greater will be the strain and, other things being equal, the stronger will be the downward force of strain avoidance. Likewise, the greater the difficulty of the job the stronger will be the force corresponding to strain avoidance. But the greater the operator's skill the smaller will be the strain

and the strength of the force of strain avoidance. Therefore:

(4) The strength of the force of strain avoidance =

$$\frac{\textit{job difficulty x production level}}{\textit{skill of operator}}$$

The differential recovery rates of the control group in both experiments and the three experimental groups in Experiment I cannot be explained by strain avoidance because job difficulty, production level, and operator skill were matched at the time immediately following transfer. Later, however, when the experimental treatments had produced a much higher level of production, these groups were subjected to an increased downward force of strain avoidance which was stronger than in the control group in Experiment I. Evidently other forces were strong enough to overcome this force of strain avoidance.

3. *The Goal of Standard Production.* In considering the negative attitudes toward transfer and the resistance to being transferred, there are several important aspects of the complex goal of reaching and maintaining a level of 60 units per hour. For an operator producing below standard, this goal is attractive because it means success, high status in the eyes of her fellow employees, better pay, and job security (see p. 516). On the other hand, there is a strong force against remaining below standard because this lower level means failure, low status, low pay, and the danger of being fired. Thus it is clear that the upward force corresponding to the goal of standard production will indeed be strong for the transfer who has dropped below standard.

It is equally clear why any operator, who accepts the stereotype about transfer, shows such strong resistance to being changed. She sees herself as becoming a failure and losing status, pay, and perhaps the job itself. The result is a lowered level of aspiration and a weakened force toward the goal of standard production.

Just such a weakening of the force toward 60 units per hour seems to have occurred in the control group in Experiment I. The participation treatments, on the other hand, seem to have involved the operators in designing the new job and setting the new piece rates in such a way that they did not lose hope of regaining the goal of standard production. Thus the participation resulted in a stronger force toward higher production. However, this force alone can hardly account for the large differences in recovery rate between the control group and the experimental groups; certainly it does not explain why the latter increased to a level so high above standard.

4. *Management Pressure.* On all operators below standard the management exerts a pressure for higher production. This pressure is no harsh and autocratic treatment involving threats. Rather it takes the form of persuasion and encouragement by the supervisors. They attempt to induce the low rating operator to improve her performance and to attain standard production.

Such an attempt to induce a psychological force on another person may have several results. In the first place the person may ignore the attempt of the inducing agent, in which case there is no induced force acting on the person. On the other hand, the attempt may succeed so that an induced force on the person exists. Other things being equal, whenever there is an induced force acting on a person, the person will locomote in the direction of the force. An induced force, which depends on the power field of an inducing agent—some other individual or group—will

cease to exist when the inducing power field is withdrawn. In this report it is different from an " own " force which stems from a person's own needs and goals.

The reaction of a person to an effective induced force will vary depending, among other things, on the person's relation to the inducing agent. A force induced by a friend may be accepted in such a way that it acts more like an own force. An effective force induced by an enemy may be resisted and rejected so that the person complies unwillingly and shows signs of conflict and tension. Thus in addition to what might be called a " neutral " induced force, we also distinguish an *accepted* induced force and a *rejected* induced force. Naturally the acceptance and the rejection of an induced force can vary in degree from zero (i.e., a neutral induced force) to very strong acceptance or rejection. To account for the difference in character between the acceptance and the rejection of an induced force, we make the following assumptions:

(5) The acceptance of an induced force sets up additional own forces in the same direction.

(6) The rejection of an induced force sets up additional own forces in the opposite direction.

The grievances, aggression, and tension in the control group in Experiment I indicate that they rejected the force toward higher production induced by the management. The group accepted the stereotype that transfer is a calamity, but the control procedure did not convince them that the change was necessary and they viewed the new job and the new piece rates set by management as arbitrary and unreasonable.

The experimental groups, on the contrary, participated in designing the changes and setting the piece rates so that they spoke of the new job as " our job " and the new piece rates as " our rates". Thus they accepted the new situation and accepted the management induced force toward higher production.

From the acceptance by the experimental groups and the rejection by the control group of the management induced forces, we may derive (by (5) and (6) above) that the former had additional own forces toward higher production whereas the latter had additional own forces toward lower production. This difference helps to explain the better recovery rate of the experimental groups.

5. *Group Standards.* Probably the most important force affecting the recovery under the control procedure was a group standard, set by the group, restricting the level of production to 50 units per hour. Evidently this explicit agreement to restrict production is related to the group's rejection of the change and of the new job as arbitrary and unreasonable. Perhaps they had faint hopes of demonstrating that standard production could not be attained and thereby obtain a more favorable piece rate. In any case there was a definite group phenomenon which affected all the members of the group. We have already noted the striking example of the presser whose production was restricted in the group situation to about half the level she attained as an individual (see p. 519). In the control group, too, we would expect the group to induce strong forces on the members. The more a member deviates above the standard the stronger would be the group-induced force to conform to the standard, for such deviations both negate any possibility of management's increasing the piece rate and at the same time expose the other members to

increased pressure from management. Thus individual differences in levels of production should be sharply curtailed in the control group after transfer.

An analysis was made for all groups of the individual differences within the group in levels of production. In Experiment I the 40 days before change were compared with the 30 days after change; in Experiment II the 10 days before change were compared to the 17 days after change. As a measure of variability, the standard deviation was calculated each day for each group. The average daily standard deviations *before* and *after* change were as follows:

Group	*Variability*		
Experiment I	Before Change		After Change
Control group	9.8	.....	1.9
Experimental 1	9.7	.....	3.8
Experimental 2	10.3	.....	2.7
Experimental 3	9.9	.....	2.4
Experiment II			
Control group	12.7	.....	2.9

There is indeed a marked decrease in individual differences within the control group after their first transfer. In fact the restriction of production resulted in a lower variability than in any other group. Thus we may conclude that the group standard at 50 units per hour set up strong group-induced forces which were important components in the central force field shown in Figure VI. It is now evident that for the control group the quasi-stationary equilibrium after transfer has a steep gradient around the equilibrium level of 50 units per hour—the strength of the forces increase rapidly above and below this level. It is also clear that the group standard to restrict production is a major reason for the lack of recovery in the control group.

The table of variability also shows that the experimental treatments markedly reduced variability in the other four groups after transfer. In experimental group 1 (participation by representation) this smallest reduction of variability was produced by a group standard of individual competition. Competition among members of the group was reported by the supervisor soon after transfer. This competition was a force toward higher production which resulted in good recovery to standard and continued progress beyond standard.

Experimental groups 2 and 3 showed a greater reduction in variability following transfer. These two groups under total participation were transferred on the same day. Group competition developed between the two groups. This group competition, which evidently resulted in stronger forces on the members than did the individual competition, was an effective group standard. The standard gradually moved to higher and higher levels of production with the result that the groups not only reached but far exceeded their previous levels of production.

Turnover and Aggression

Returning now to our preliminary theory of frustration, we can see several revisions. The difficulty of the job and its relation to skill and strain avoidance has been clarified in proposition (4). It is now clear that the driving force toward 60 is a complex affair; it is

partly a negative driving force corresponding to the negative valence of low pay, low status, failure, and job insecurity. Turnover results not only from the frustration produced by the conflict of these two forces, but also as a direct attempt to escape from the region of these negative valences. For the members of the control group, the group standard to restrict production prevented escape by increasing production, so that quitting their jobs was the only remaining escape. In the participation groups, on the contrary, both the group standards and the additional own forces resulting from the acceptance of management-induced forces combined to make increasing production the distinguished path of escape from this region of negative valence.

In considering turnover as a form of escape from the field, it is not enough to look only at the psychological present; one must also consider the psychological future. The employee's decision to quit the job is rarely made exclusively on the basis of a momentary frustration or an undesirable present situation; she usually quits when she also sees the future as equally hopeless. The operator transferred by the usual factory procedure (including the control group) has in fact a realistic view of the probability of continued failure because, as we have already noted, 62 per cent. of transfers do in fact fail to recover to standard production. Thus the higher rate of quitting for transfers as compared to non-transfers results from a more pessimistic view of the future.

The control procedure had the effect for the members of setting up management as a hostile power field. They rejected the forces induced by this hostile power field, and group standards to restrict production developed within the group in opposition to management. In this conflict between the power field of management and the power field of the group, the control group attempted to reduce the strength of the hostile power field relative to the strength of their own power field. This change was accomplished in three ways: (1) the group increased its own power by developing a more cohesive and well-disciplined group, (2) they secured " allies " by getting the backing of the union in filing a formal grievance about the new piece rate, (3) they attacked the hostile power field directly in the form of aggression against the supervisor, the time study engineer, and the higher management. Thus the aggression was derived not only from individual frustration but also from the conflict between two groups. Furthermore, this situation of group conflict both helped to define management as the frustrating agent and gave the members strength to express any aggressive impulses produced by frustration.

CONCLUSIONS

It is possible for management to modify greatly or to remove completely group resistance to changes in methods of work and the ensuing piece rates. This change can be accomplished by the use of group meetings in which management effectively communicates the need for change and stimulates group participation in planning the changes.

For Harwood's management, and presumably for managements of other industries using an incentive system, this experiment has important implications in the field of labor relations. A majority of all grievances presented at Harwood have always stemmed from a change situation. By preventing or

greatly modifying group resistance to change, this concomitant to change may well be greatly reduced. The reduction of such costly phenomena as turnover and slow relearning rates presents another distinct advantage.

Harwood's management has long felt that action research such as the present experiment is the only key to better labor-management relations. It is only by discovering the basic principles and applying them to the true causes of conflict that an intelligent, effective effort can be made to correct the undesirable effects of the conflict.

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