Increasing worker productivity through incentives

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INCREASING WORKER PRODUCTIVITY
THROUGH INCENTIVES

By

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degree of
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Date
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CHAPTER I
INTRODUCTION

The problem of increasing worker productivity has been one of long standing. Many studies have centered around this problem and many ways have been devised to combat it. Some of these ways are: (1) the introduction of rest breaks or pauses, (2) the formation of working groups, (3) better lighting conditions, (4) closer supervision, and (5) the introduction of wage incentive programs. Why do we want to increase the productivity of workers? Rensis Likert believes that the main reason for increasing worker productivity is that top management wants to increase company sales and company profits in the short run. He questions whether it is a good practice to put so much pressure on the workers in the short run to increase productivity. The above reasons are not the only reasons for increasing productivity. Consider, for example, the following situation:

The ABC Widget Company recently faced a problem of setting a standard of output per employee. The company's operation consists mainly of assembling widgets and distributing them through retail outlets. The company is in a

\[\text{1}\text{Rensis Likert, Measuring Organizational Performance,} \in \text{Management of Human Resources, eds. Paul Pigors, Charles A. Myers, and F.T. Malm, p. 27.}\]
highly competitive environment and must maintain tight
schedules along with high productivity to maintain its
share of the market. The worker's job on the assembly
line is repetitive and monotonous in nature, and consists
of taking three individual parts from bins and assembling
them into a finished product. To assist in analyzing
employee performance, the company conducted an experiment
on productivity. Results of this experiment were used to
set a standard of output per worker on the assembly line.
Employees are currently paid a substantial weekly salary
to maintain this high level of output.

The company is now faced with a problem which if
not treated immediately will result in loss of sales and
diminishing market share. Research over the past six
months shows that employee output has fluctuated. However,
total output for the group on the assembly line has been
high enough to meet demand for the product. During this
period supervisors have not been worried about these
fluctuations. However, the situation is critical now.
Output has leveled off at a point below standard. Unless
productivity can be increased, the ABC Widget Company
faces a substantial decline in sales and market share in
the future.

Top management is principally worried about the
pending loss of sales and market share. However, in the
long run if the problem is not corrected, the workers also
would be affected (most probably in the form of layoffs). This situation may be common to most small parts manufacturing concerns who enjoy a comfortable share of the market.

ABC Widget Company has developed the following suggestion for solution to their problem. The company is considering introducing one of two new incentive programs for their employees to raise productivity. These are: (1) a group type bonus system, and (2) a piece-rate or individual incentive program. Either system would basically consist of setting a standard of output per worker or group and then substantially rewarding the individual or group for greater than standard output performance.

PURPOSE

The purpose of this study was to show experimentally how a company can choose between alternative pay incentive plans directed at increasing productivity. The text of this study was concerned with the use of only two incentives (group bonus plans and piece-rate plans) as a means to raise productivity of workers. An experiment based on the above information was part of this study.
CHAPTER II

INCREASING WORKER PRODUCTIVITY

Past Research

Several researchers have addressed the problem of increasing productivity through incentives. S. Wyatt et al. conducted an experiment in a factory in 1934 to test the effects that incentives have in a repetitive, monotonous working environment.\(^1\) The experiment on incentives lasted thirty-six weeks. During this period, different incentives were introduced to the working group at varying times.

The first period consisted of nine weeks during which time the workers received a straight weekly salary. At the end of the ninth work week a competitive bonus system was introduced. This system of wages remained in effect for fifteen weeks when the third and final system was instituted. This system was a flat piece-rate and lasted another twelve weeks. It was found that at the introduction

of both the bonus and piece-rate systems outputs increased significantly and leveled off at these rates. Wyatt concluded that a straight weekly salary was insufficient incentive to increase productivity. He stated further that some type of bonus system, whether it be group or individually oriented, would-be necessary to increase the outputs of workers.

Further experiments were conducted by Roethlisberger and Dickson between 1927 and 1932 at the Hawthorne Works of the Western Electric Company in Chicago. An experiment involving relay assembly workers was conducted to determine the effects of wage incentives on the performance of workers. In this experiment, five workers were placed in a special group in the relay assembly room and were paid separately from the rest of the workers. This special group went through a test period consisting of three phases and approximately twenty-one work weeks. The experimenters used the first phase of their experiment which lasted five weeks to set a base from which output changes could be measured.

During the second phase, which lasted nine weeks, the group was introduced to a new, more substantial method of payment. A substantial increase in output was noted during this phase. Output increased from 8.3% to 17.4%

---

among the group with a group average output increase of 12.6%. The final phase of the experiment restored the old method of payment and lasted seven weeks. During this period, output within the group fell below that which was observed in both the base period and the experimental period. Roethlisberger and Dickson concluded that output had in fact increased with the change in incentive plans. However, due to the shortness of the experimental period and the lack of comparable data from several months prior to the experimental period, the amount of increased output attributed to just the change in incentive systems was not measurable.

Victor Vroom's theory of work motivation along with supporting evidence from other experiments showed "a higher level of performance by subjects who were told that their earnings were contingent on the effectiveness of their performance."¹ In Vroom's Work and Motivation a statement is made that "most surveys of companies' experience with wage incentive plans indicate that substantial increases in productivity have followed their installation."²

Another experiment conducted by Roethlisberger and

---


Dalton in a Bank Wiring Observation Room at the Hawthorne Works showed that wage incentive plans encourage restriction of output.\(^1\) During this experiment nine workers were introduced to a group type piece-rate system. This system of payment encouraged workers to produce at a higher output not only for their own personal gain but also for the benefit of the group as a whole. Output during this study remained constant. After questioning the workers, it was found that the workers' felt if output increased that management would increase the standard of output per worker to this new level. Based on this belief, they maintained output at a constant rate and restricted the outputs of other workers within the group rather than have management set these new higher standards. With but few examples, it generally has been shown in past research that productivity increases with the introduction of incentive programs.

**Objective**

Past experimentation has not been based on an either-or type situation. Most experiments have used one particular incentive system as a means of raising productivity. In this study an experiment was designed to determine which of two incentive plans would increase productivity more for the ABC Widget Company. The different incentives considered in this

\(^1\)Dickson and Roethlisberger, *Management and the Worker*, pp. 409-447.
experiment were: (1) a group bonus incentive system, and (2) a piece-rate or individual incentive system. Considering the problem that the ABC Widget Company has with output, it is to their benefit to find out which incentive system would likely increase productivity the most. The company would then be in a position to institute this new incentive system in order to realize increases in productivity necessary to maintain its share of the market.
CHAPTER III

METHODOLOGY

Terminology

Several terms were used in this experiment which require further explanation. These are: (1) worker productivity, (2) piece-rate system, and (3) standard of output.

Worker productivity as defined by Egner is "output per time period."¹ In this experiment, the time period under consideration was twenty minutes. In the case of output, a sheet completed by each worker was considered one unit of output. The total number of output sheets completed by each worker during this specified time period was considered the worker's productivity for that time period.

Piece-rate system is defined as a system of work paid for at a fixed rate per piece of work done. In this experiment, the piece-rate system did not take effect until after the standard of output set by the company was met by individual workers.

Standard of output is defined as some established measurement of quantity. In this experiment, the standard of output per worker set by the company was twelve in a twenty minute time period.

**General Description**

The experiment included two groups of workers. Both groups were asked to produce the same amount of output. Each group received an initial briefing stressing these points: (1) the required output was established by a prior experiment and the company and its workers had agreed on this standard, (2) the workers would receive a good salary for completion of the required output, and (3) a bonus would be given (group or individual) for output above standard performance. Each worker within his group worked individually to attain the desired output.

**Physical Description**

This experiment was patterned after the actual assembly job in the ABC Widget Company situation. The experiment started with the participants seated at their work stations (desks). At their disposal were output sheets with instructions, scissors, and paste. The participants left their work stations, picked-up a set of forms from each bin (box), returned to their work station, cut out the forms, formed the squares, pasted the squares on the output sheet, and finally numbered and placed the time on each output. Each
sheet that was completed was considered as one unit of output. A sample of the output sheet with instructions is shown in Figure 1. Each individual continued to work until the twenty minute time limit had expired. The total number of sheets completed during this specific time period was his productivity. This sequence was performed twice by each group, the first time to familiarize the participants with the experiment, and the second time to institute the incentive programs.

**Standard of Output**

The standard of output was twelve units for each group. This standard was established by the researcher after some trial runs of the experiment. It was felt that this standard would be sufficient to meet the objectives of the experiment.

**Incentives**

In the experiment two different incentive systems were used. Following is a description of each system. The group bonus system was an incentive system based on total output of one test group in the experiment. The participants worked individually. If the group as a whole exceeded the standard, each member of the group received a percentage of his base salary no matter what the individual produced. The system is outlined below:
<table>
<thead>
<tr>
<th>UNITS OF OUTPUT (GROUP)</th>
<th>WAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>180-194</td>
<td>STRAIGHT SALARY</td>
</tr>
<tr>
<td>195-209</td>
<td>SALARY + 5% OF BASE SALARY</td>
</tr>
<tr>
<td>210-224</td>
<td>SALARY + 10% OF BASE SALARY</td>
</tr>
<tr>
<td>225-239</td>
<td>SALARY + 15% OF BASE SALARY</td>
</tr>
<tr>
<td>240 &amp; OVER</td>
<td>SALARY + 20% OF BASE SALARY</td>
</tr>
</tbody>
</table>

The above was based on twelve units of output per worker and fifteen workers per group with 180 units being the standard output per group. Again individuals within the group were not penalized for not meeting the standard if the group as a whole produced 180 or more units of output.

The individual or piece-rate system was based on the individual's performance to standard output. Based on a standard output of twelve units per worker, the worker received his straight salary if he produced exactly twelve units. Anything over twelve units entitled the worker to his salary plus 5% for each unit over standard output.

**Location**

A classroom at the AFIT building was used as the location for the experiment. Work stations were arranged into three rows with five stations in each row. The stations were so situated that each participant had an equal amount of space to move around. A scaled drawing of the classroom is shown in Figure 2. The experimenter was situated in front of the classroom for purposes of observation and timing. The sets of forms were strategically located in three bins (boxes) in the classroom.
Participants

The participants of this experiment were officers all of whom were in the AFIT MBA Program at Malmstrom Air Force Base. Thirty participants were assigned to the two groups, fifteen to each. One group used the group bonus system and the other the individual or piece-rate system.

Schedule of Events

A schedule of the important events prior to and during the performance of this experiment has been included in the Appendix of this study.
OUTPUT

INSTRUCTIONS

1. TAKE ONE SET OF FORMS FROM EACH BIN (BOX)
2. RETURN TO YOUR WORK STATION
3. CUT OUT FORMS
4. MAKE A SQUARE WITH EACH SET OF FORMS
5. PASTE EACH SQUARE OVER THE APPROPRIATE DIAGRAM
6. NUMBER EACH OUTPUT IN APPROPRIATE SPACE
7. PLACE TIME IN APPROPRIATE SPACE
8. PLACE IN OUTPUT FILE
9. CONTINUE PROCEDURE

OUTPUT NUMBER ____ TIME ____

I. 

II. 

III. 

FIGURE 1. OUTPUT
FIGURE 2. CLASSROOM
Questionnaire

The participants were given a questionnaire at the end of the twenty minute test period. The purposes of the questionnaire were twofold: (1) to find out how participants ranked the importance of incentives in this job, and (2) to find out how much bias was involved in the experiment. A sample questionnaire follows. Items in question one were rotated to reduce possible position bias.
QUESTIONNAIRE

1. Based on the job you have just performed, rank the items from 1 to 6 based on the importance you place on each item for meeting the company standard of output.
   a. more rest periods
   b. better lighting
   c. rotation of jobs (within the factory)
   d. larger salaries
   e. longer vacations
   f. closer supervision

   1. ____ (most important)
   2. ____
   3. ____
   4. ____
   5. ____

   6. ____ (least important)

2. Was there any pressure put on you by the experimenter or the initial briefing to perform the task more quickly?
   Yes ____ No ____

3. Was this task easy or difficult to perform? _________

4. What do you feel the purpose of this experiment was?

_________________________________________________________________________________________

_________________________________________________________________________________________

FIGURE 3. QUESTIONNAIRE
CHAPTER IV

RESULTS

Analysis of Productivity

Group A, tested under the group incentive system, and Group B, tested under the individual or piece-rate incentive system, both were assigned twelve units as a standard of output to meet or exceed. Means were computed for both groups and analyzed using covariance analysis. A summary of the analysis is presented in Table 1 and 2.

TABLE 1

COMPLETED OUTPUT

<table>
<thead>
<tr>
<th>Participant</th>
<th>Group A 15 min</th>
<th>Group A 20 min</th>
<th>Group B 15 min</th>
<th>Group B 20 min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>interval</td>
<td>interval</td>
<td>interval</td>
<td>interval</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>19</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>18</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>18</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>18</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>17</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>16</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>16</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>15</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>15</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>15</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>11</td>
<td>7</td>
<td>15</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>14</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>13</td>
<td>8</td>
<td>12</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>14</td>
<td>7</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>6</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Output Number Mean
116 15 7.7
230 15 15.3
93 13 7.2
189 13 14.5
TABLE 2
SUMMARY TABLE AND F-VALUE CALCULATION

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F-Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatments</td>
<td>.51</td>
<td>1</td>
<td>.51</td>
<td>.33*</td>
</tr>
<tr>
<td>Error</td>
<td>39.11</td>
<td>25</td>
<td>1.56</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>39.62</td>
<td>26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Not significant

Outputs in Table 1 were analyzed using covariance analysis. Results are presented in Table 2. Since it was not possible to pair individuals according to ability in each group, two observations were made of each individual's level of productivity, the first to use as a concomitant variable to adjust the test results for differences in ability of individuals. An F-statistic was calculated to see if the null hypothesis of no difference between incentive plans should be accepted or rejected. For rejection of the hypothesis on which this study was based, an F-value of 4.24 with 1 degree of freedom in the numerator and 25 degrees of freedom in the denominator and .05 confidence level was desired. The results in Table 2 show an F-ratio of .33. This figure proved to be insignificant and the null hypothesis was accepted. The means of the two groups were not statistically different.

Analysis of Questionnaire

The first question (see Figure 3) was asked to determine how much emphasis participants in the experiment place on larger salaries as a means for them to attain the company standard of output. The participants were asked to rank six items from the most important item to the least important item. The responses for fifteen (15) participants in Group A and thirteen (13) in Group B are summarized in Table 3 below.¹

<table>
<thead>
<tr>
<th>ITEM</th>
<th>GROUP A (15) (Average Ranking)</th>
<th>GROUP B (13) (Average Ranking)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More Rest Periods</td>
<td>2.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Better lighting</td>
<td>4.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Rotation of Jobs</td>
<td>3.1</td>
<td>2.4</td>
</tr>
<tr>
<td>Larger Salaries</td>
<td>1.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Longer Vacations</td>
<td>3.2</td>
<td>3.8</td>
</tr>
<tr>
<td>Closer Supervision</td>
<td>5.8</td>
<td>5.2</td>
</tr>
</tbody>
</table>

NOTE: 1=Most Important 6=Least Important

The results are similar in both groups. Group A ranked larger salaries as most important with more rest

¹Two participants failed to show up for Group B experimentation.
periods second. Group B ranked rotation of jobs (within the factory) as most important with larger salaries a close second. The results presented in Table 3 show that the participants in both groups do in fact place a great emphasis on larger salaries as a means for them to meet or exceed the company standard of output.

The second question attempted to determine whether there was bias introduced in the form of pressure placed on the participants by the experimenter. The responses in all but a few cases were negative. Further discussion with the participants that responded positively to this question indicated that the pressure came from the group they were in rather than from the experimenter. Therefore, the experiment was judged free of bias in the form of pressure put on the participants by the experimenter.

The final question's purpose was to determine if anyone knew what the purpose of the experiment was. If any participants had known the purpose, they would have introduced some participant bias and their outputs would have been thrown out. The responses to this question indicated that no one really grasped the purpose of the experiment. Therefore, there was no participant bias involved in the experiment.

In conclusion, the experiment was successful with respect to the desired simulation. Experimenter and participant biases were not present in the experiment. Larger salaries do in fact seem to play an important part in meeting the company standard of output.
Observations of Experimenter

Observation of both groups during both parts of the experiment revealed some very interesting and very contrasting characteristics. During the first test period of the experiment, Group A participants walked around to the different bins and really didn't notice one another. There was a lot of talking, laughing and joking around by the participants. It took from one to seven minutes for participants to discover the fastest way to cut out the forms (folding the form and then cutting). Finally, the group did not develop any specific traffic pattern to the bins to cut down the problem of congestion.

In the second test period of the experiment, when the group incentive system was introduced, Group A continued to talk. This talking was used as a tool to find out where each individual stood within the group and also to encourage the slower individuals in the group to work faster. Group A also developed a circular traffic pattern to the bins. It seemed as if the group as a whole was trying to keep the congestion problem to a minimum. The participants hurried constantly, but it seemed as if they were trying to help each other to meet a higher standard to get a bigger bonus.

Group B did exactly the same things in their first test period as Group A. They walked around to the bins and didn't notice each other. There also was a lot of talking, laughing and joking. It took some of them a little bit
longer to realize the fastest way to cut out the forms. The last participant discovered it at approximately the ten minute mark. They also didn't have any particular traffic pattern developed to combat congestion.

During the second test period of the experiment, when the individual or piece-rate incentive system was introduced, Group B developed some rather contrasting characteristics from those of Group A. There was a minimum of talking with each participant constantly hurrying and trying to avoid others. The group didn't develop any specific traffic pattern to combat the problem of congestion at the bins. As a matter of fact, there was some pushing and shoving by the participants at the bins. It seemed as if the group had developed an "everyone for himself" attitude.

When these observations were tied to the answers received in the questionnaires, they related very well. Both groups rated larger salaries as important in meeting company standard of output. When both groups were told what their respective incentive systems and rewards were, they worked hurriedly toward their bonuses, but in very different ways. Group A participants worked together as a group while Group B participants worked individually.
CHAPTER V

CONCLUSIONS, WEAKNESSES, POSSIBILITIES
FOR FUTURE RESEARCH

The purpose of this study was to show how a company can choose experimentally between alternative pay incentive plans directed at increasing productivity. There were two main assumptions in this study. First, officers (AFIT students in particular) would react the same way as the worker population. Second, the test periods in the experiment (fifteen minutes and twenty minutes) would be enough time to perform the simulated task.

Conclusions

Analysis of outputs showed that the means of both groups were not statistically different. The average output of Group A was 15.3 units in a twenty (20) minute period and in Group B was 14.5 units in the same period. Although these outputs are above the standard of twelve and substantially above the output of the initial test periods, the analysis of the outputs shows that the learning process was not completed during the initial test periods. Even though the observations of the experimenter pointed to the group incentive plan as being the better of the two plans, it was
not possible after the analysis to choose between the plans on the basis of statistical analysis of results.

No conclusive results can be deduced from the experiment performed in this study. However, several ways to improve this experiment will be discussed in the section on possibilities for future research.

Weaknesses

Some of the weaknesses that were brought out in this study involved: (1) the participants in the experiment, (2) the test periods in the experiment, (3) the specific reward systems, and (4) the standard of output set for the experiment.

One of the principal assumptions made during this study was that officers (AFIT students) would perform the same as the worker population. This is not necessarily true; in fact, it is a very relevant weakness. The experiment in this study was designed to be easy and therefore no skills were required of the participants. However, students and, more important, officers do not react the same way as a common laborer. There is a lack of common experience involved.

Another assumption made was that the test periods in the experiment (fifteen and twenty minutes) would be long enough to perform the simulated task. As was pointed out in the conclusion section, the learning process was not completed during the initial test period (fifteen minutes). It was impossible to set apart the learning from the increases
brought on by the introduction of the incentive plans. Different results could have occurred if the initial test periods for both groups had been lengthened to get the required learning out of the way. This was a definite weakness of this study.

The specific reward systems involved could also have been a weakness in this study. The specific increases in output during the second test period (twenty minutes) cannot be tied explicitly to the reward systems introduced during the experiment. As of now it can't be seen whether the reward systems were sufficient enough to simulate a worker receiving his straight salary plus some bonus. The reward systems and more specifically the bonus systems involved in this experiment might have to be revised in further studies.

Finally, the standard of output set for the experiment was low. This was a weakness that could be corrected in further studies of this nature.

**Possibilities for Future Research**

Several suggestions can be made for future research of this nature. First, individuals in the two groups should be paired or matched to assure an equal amount of talent. A pre-test can be performed to rank all the participants involved in the experiment. Then random assignments can be made of equal performers, one to each group, until all the
individuals are assigned. In this way greater use is made of the information from the experiment.

Second, the test periods should be lengthened. The main reason to lengthen the test periods is to remove the learning process from the experiment so that increases in productivity due to the introduction of the incentive systems can best be measured.

Finally, the best way to overcome the weakness involving the participants would be to perform the experiment in a real live factory environment. The participants would be familiar with their jobs and there would be no learning involved. The weakness of the reward system would also be overcome since the workers would already be receiving a weekly check. The setting of low standards would be combated since there would, more than likely, be data available on past performance by the factory workers.
CHAPTER VI

SUMMARY

In Chapter I the problem of increasing worker productivity was introduced. The hypothetical situation with ABC Widget Company was introduced and the stage was set for the introduction of the bonus systems which were to be directed at raising worker productivity. The purpose of this study was also discussed.

Past research was discussed in Chapter II. Several past experiments dealing with increasing worker productivity were introduced. The objective of this study was set forth as that of designing an experiment to determine which incentive plan (group or individual) would increase productivity more.

In Chapter III the methodology of the study was presented. Two groups performed an easy task in two different test periods. The first period lasting fifteen (15) minutes and the second period lasting twenty (20) minutes. Each group was given the same standard of output to produce. The first period was used to familiarize the participants with their job. The second period was used to introduce and test the effect of the two incentive systems.

Analysis of covariance showed no significant difference between the incentive plans. The means of both

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groups were not significantly different. Questionnaire analysis showed that both groups placed a good deal of emphasis on larger salaries as a means of meeting the company standard of output. The desired simulation occurred and none of the participants knew the purpose of the experiment.

No conclusive results could be drawn from the experiment. Weaknesses in the study included: (1) the participants in the experiment, (2) the test periods in the experiment, (3) the specific reward systems and (4) the standard of output set for the experiment. Several suggestions were offered to combat the problems that might take place during future research in the area of increasing worker productivity through incentives.
APPENDIX

APRIL 2ND, 3RD & 5TH

On the above dates, Dr. Bowlen, Dr. Foran, Dr. Neu, Dr. Guy, and Dr. Steele read a letter to their classes the contents of which follow:

Dear Students:

I will be performing an experiment (which is part of my professional paper) on Friday the 12th of April. The experiment will take place at two different times, 1:00 and 3:00 respectively, in room 123 of the AFIT building and will last approximately one hour. If you are interested in participating, I would appreciate you putting your name and phone number on this sheet of paper. Your professor will assign you to one of the two groups prior to the end of the class. There will be a substantial reward given to the outstanding performer in each group.

Each of the letters had either an A or B written in the upper right hand corner. The professors used this letter to assign the students to a group. If the letter had an A written in the corner, the first student to sign up was assigned to the 1:00 section and the next was assigned to the 3:00 section and so
The reverse was true of a letter with a B in the corner. Sometime between the 5th of April and the day of the experiment, I contacted each participant and reminded him of the time and place of the experiment.

APRIL 12TH

The experiment was run on this day. The two groups were tested at 1:00 and 3:00 respectively. Each group was tested twice. The first fifteen minute period was used to familiarize the participants with their job. The second period which lasted twenty minutes was used to test the participants under the incentive systems. Group A was the group tested under the group incentive system and Group B was tested under the piece-rate system. Following were the briefings given to each group.

BACKGROUND BRIEFING (PART 1)

BOTH GROUPS

You are a semi-skilled worker and are employed by the ABC Widget Company. You work on an assembly line and your job consists of assembling three individual parts into a finished product called a widget.

Last year the company conducted an experiment, the purpose of which was to establish an output per employee on the assembly line. This experiment yielded an average output
of twelve units per employee in a twenty minute period. The company negotiated with the employees and the above output was accepted as a standard for assembly line workers.

Currently, the standard for workers on the assembly line is not being met. Output has fallen below standard and ABC Widget is being faced with lost sales and diminishing share of its market. The company has decided to perform another experiment to see if the problem of output per worker on the assembly line can be corrected. You have been personally selected to participate in this experiment.

The experiment will consist of two parts, one lasting fifteen minutes the other twenty minutes. The first part will be used to familiarize you with the experiment which is similar to your job at ABC Widget Company. Now for your instructions.

INSTRUCTIONS

BOTH GROUPS

You will notice that there are three bins or boxes strategically located in the room. There are sets of forms in each box. When instructed you will proceed and take one set of forms from each box. You will then return to your work station and cut out the forms in the fastest way you know how. When you have cut out all the forms, make a square with them and paste each square over the appropriate form on your output sheet. Only a dab of paste is needed for each
form. When you have completed the above, number the output and place the time in the appropriate space (I'll be keeping the time remaining on the blackboard). Continue this procedure until the fifteen minute period is over.

I have provided you with the first three sets of forms at your work stations to avoid the initial congestion problem.

Are there any questions?

BACKGROUND BRIEFING (PART 2)

GROUP A

ABC Widget is considering a group bonus plan for the employees on the assembly line. You are currently paid a good salary for meeting a standard of output set by the company and agreed to by the workers. This standard is twelve units for a twenty minute period. The new bonus plan will be based on the standard of output for this group with the average of 180 units or 12 units per worker. Standard performance by the group (180-194 units) will result in the group receiving their straight salary. Above standard performance by the group (more than 194 units) will result in a group bonus. The group will receive for an output between 195 and 209 units, a base salary plus 5% of the base. For an output of 210 to 224 units, the group will receive base salary plus 10% of the base. For an output of 225 to 239 units, the group will receive base salary plus 15% of the base. For output of 240 and over, the group will
receive base salary plus 20% of the base.

**GROUP B**

ABC Widget is considering an individual bonus plan for the employees on the assembly line. You are currently paid a good salary for meeting a standard of output set by the company and agreed to by the workers. This standard is twelve units for a twenty minute period. The new bonus plan will be based on the standard of output for each worker which is twelve units. Standard performance (12 units) by the individual will result in the worker receiving his straight salary. Above standard performance (more than 12 units) by individuals will result in an individual bonus. Individuals will receive their base salary plus 5% of the base for each additional unit produced over the standard.

**INSTRUCTIONS (PART 2)**

**GROUP A**

You will be performing the same task as you did in the first part of this experiment. The instructions which I read to you at the beginning of this experiment still apply. Remember that the standard of output for individuals within the group is twelve units and that the group average output is 180 to 194 units in the twenty minute period.

Now for the reward. If the group produces 195 to 209 units, each individual in the group will receive fifty cents. If the group produces 210 to 224 units,
each individual in the group will receive seventy-five cents. If the group produces 225 to 239 units, each individual in the group will receive one dollar. Production of 240 units or over will result in each individual receiving one dollar and twenty-five cents.

Remember, work the fastest way you know how.

Are there any questions?

GROUP B

You will be performing the same task as you did in the first part of this experiment. The instructions which I read to you at the beginning of this experiment still apply. Remember that the standard of output for each individual is twelve units in the twenty minute period.

Now for the reward. There will be four prizes given. First prize is $2.00 and it goes to the individual who produces the greatest output above twelve units. Second prize is $1.50 and goes to the individual who produces the second greatest output above twelve units. Third prize is $1.00 and it goes to the individual who produces the third greatest output above twelve units. Finally, fourth prize is $.50 and it goes to the individual who produces the fourth greatest output above twelve units.

Remember, work the fastest way you know how.

Are there any questions?
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BOOKS


OTHER SOURCES
