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**INCENTIVE MANAGEMENT TRAINING:
USE OF BEHAVIORAL PRINCIPLES FOR PRODUCTIVITY ENHANCEMENT.**

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Managers and supervisors from six Management Information offices were (1) given training in the theory and practice of incentive management, and (2) provided with a measurement system that contained both performance and diagnostic information. Following the training, the trainees implemented incentive management programs within their own key entry operations sections. This report summarizes the effects of these implementations as they relate to well-established behavioral principles.		

FOREWORD

This research and development was conducted in support of FY79 Exploratory Development Task Area ZF55.521.018 (Organizational Management), Work Unit 03.02 (Expectancy Theory of Work Motivation) under the sponsorship of the Deputy Chief of Naval Operations for Manpower, Personnel, and Training (OP-01). Additional support was provided under a task order from the Long Beach Naval Shipyard.

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An earlier version of this report was presented at the 21st Annual Conference of the Military Testing Association held in San Diego, California, 15-19 October 1979.

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SUMMARY

Problem

Navy managers have long expressed the need for methods to motivate their subordinates. A number of successful programs in the private sector have used the technique of incentive management to boost productivity at the individual level. This method has not been used in public sector organizations because it was felt that the existing incentive awards program was not suited to the requirements of incentive management.

Objective

The objectives of this effort were to develop an incentive management program within existing federal guidelines and to test and evaluate this program in government organizations. This report focuses on the behavioral principles involved in the development of the program, and how their application influenced the productive output of the workers involved.

Approach

A performance measurement system for key (keypunch) entry operators was developed. A monetary incentive program based upon (1) the measurement system, (2) supervisory training in incentive management, and (3) a unique application of the special achievement award (Federal Personnel Manual, Ch. 451) was developed as a training package. Training in incentive management was provided to the managers and supervisors of eight management information offices. Following the training, the managers and supervisors were required to implement the program within their organizations and provide data to the research team. A minimum of 6 months of data were collected. At that time, members of the research team visited each office and collected interview information to determine the extent to which the program had been implemented as required by the training objectives.

Findings

Six offices had implemented the program and had provided sufficient data for evaluation. In all but one, there were significant and cost effective gains in productivity, ranging from 11 to 55 percent. The lack of a productivity increase in one organization, and the variation in the others, was closely related to the extent to which the behavioral principles were applied.

Conclusions

Increases in worker motivation that result in higher output can be achieved through incentive management methods. Furthermore, the absolute amount of success with such methods depends upon the stringency by which certain basic principles are applied. Finally, the existing incentive awards system, with minor modifications, can be used to achieve the goal of increased worker productivity.

Recommendations

It is recommended that OP-14:

1. Develop supervisory training courses in incentive management and implement such courses for all civilian supervisors.
2. Use existing performance standards in the practice of incentive management, and develop new methods for measuring job performance.
3. Use objectively measured work output as the primary factor in determining incentive awards, performance appraisal, and advancement.

CONTENTS

	Page
INTRODUCTION	1
Problem	1
Purpose	1
APPROACH	1
The Measurement System	1
Task Studies and Performance Standards	1
Performance Measurement	2
Determination of Rewards	3
The Management System	3
General Implementation of the PCRS	5
RESULTS	6
Performance at Pilot (A) and Replication (B) sites	6
Site A	6
Site B	6
Evaluation of Sites A and B.	8
Performance at Remaining Sites	9
Sites C and D.	10
Sites E and F	12
CONCLUSIONS	13
RECOMMENDATIONS	15
REFERENCES	16
DISTRIBUTION LIST	17

LIST OF FIGURES

	Page
1. Pre- and postimplementation production statistics for pilot (A) site	7
2. Pre- and postimplementation production statistics for the replication (B) site	8
3. Pre- and postimplementation production statistics for site C	10
4. Pre- and postimplementation production statistics for site D	11
5. Pre- and postimplementation production statistics for site E	12
6. Pre- and postimplementation production statistics for site F	13

INTRODUCTION

Problem

The behavioral approach to personnel management has received increased attention in both research and applications during the past decade (Luthans & Kreitner, 1975; Miller, 1978). The success of feedback, reward, and other incentive management techniques can often be attributed to the effective application of known behavioral principles. Such strict application of the principles associated with feedback (specificity, timeliness, frequency, etc.) and rewards (contingency, equity, timeliness, etc.) are not typical of management practices. In fact, the salience of these principles was determined in controlled laboratory settings designed to examine learning behavior (Marx, 1969). The management community, however, has "virtually ignored the findings of empirical psychology, which has been built on the same technological methods that have produced the greatest gains in productivity in the material area" (Miller, 1978, p. 2).

Managers have been reluctant to use incentive management for at least two reasons. First, the effective application of the principles requires valid performance measurement that reflects work output. Highly complex jobs (i.e., those having many and assorted separate tasks), as well as highly cognitive jobs, represent a significant (although not impossible) challenge to such measurement. Second, the behavioral principles have such a common-sensical nature that they are seldom strictly and consistently applied in the practice of management. This paradox can easily be observed in the day-to-day interactions between supervisors and their subordinates and is often associated with difficulties encountered in the annual performance appraisal (Lefton & Buzzotta, 1977).

Purpose

The purposes of this effort were (1) to develop an incentive management program within existing federal guidelines that provides monetary rewards for Navy civilian employees and (2) to test and evaluate the program in government organizations. This report focuses on the behavioral principles involved in the development. A more general discussion of the details of the project has been presented in Shumate, Dockstader, and Nebeker (1978). The test and evaluation of the program were facilitated by the training of managers and supervisors in the principles of incentive management.

APPROACH

The Measurement System

In its most elementary form, an incentive management system must contain (1) stated goals or objectives, (2) a clear method for determining whether the goals and objectives have been met, and (3) a system for giving rewards to ensure that they relate to performance. In the system described here, these conditions were met by the use of performance standards, performance measurement, and a unique application of the superior achievement award (Federal Personnel Manual, Chapter 451).

Task Studies and Performance Standards

The job studied for the development of the incentive management system was that of the data entry operator or "key puncher." Data entry operators participating in this research used electronic key-to-disc data entry terminals. The information on the disc is

later transferred to tape. This tape contains all of the information pertinent to the task being performed, including operator identification and stroke rate in both the write and verify modes.

When the information is transferred from disc to tape, it updates an historical file on the particular task being performed. Consequently, historical information, for as long as a year, is available for each task and for several different operators performing each task. This results in an historical record of the performance. In the organization where the incentive management system was developed, hereafter referred to as the pilot site, these historical records were used to establish the standard or expected performance rate for each key entry task. For information on standard development in subsequent applications, see Nebeker and Nocella (1979).

Performance Measurement

The notion of accountability is fundamental to the successful application of incentive management. Such accountability is typically achieved by the development of a thorough performance measurement system. In order to achieve this, management must perform task and work flow analyses of the job being performed and determine the exact role of each human operator in the system. Once the task/role alignments have been established, measures of each task need to be established. Every effort should be made to develop measures that are (1) psychologically meaningful to the human operators and (2) sensitive to changes in the effort expended on the task. From the management standpoint, it is important to be able to relate these kinds of measures to all of the task-related activities performed by the person on the job. The extent to which significant portions of the job are not measured can very often determine the success or failure of an incentive management scheme.

The job of key entry at the journeyman level includes four tasks that require accountability: (1) entering data, (2) verifying data previously entered, (3) performing both of these operations on card punch devices, and (4) preparing work to be entered. In the program described here, the first two operations were automatically recorded by the key entry terminal. Both stroke count and elapsed time were thus measured by the devices used. Entering and verifying data on cards were measured in a similar fashion, although, for some locations, only the time spent doing these operations was recorded. Preparatory and set-up time was not strictly measured. Rather, a constant amount of time was allowed during each shift for these activities. This time, plus personal time allowed for breaks, interruptions due to scheduled system maintenance, and time required for shift changes, amounted to approximately 1.2 hours. Thus, an operator was expected to be "on line" and in production for 6.8 hours per each 8-hour shift.¹ Exceptions to this "standard day" were recorded by the supervisor for each operator. The exceptions allowed were any that were beyond the personal control of the operator, such as system failures, being called away from the terminal to perform other tasks, running out of work, etc.

¹At some locations, control of the work flow was such that only 6.5 hours were required as the "standard day." This most often occurred on the second shift, as operators were frequently required to stop ongoing work to break for a meal.

Determination of Rewards

From the above, it can be seen that the data entry operator's work is measured in terms of stroke rate and time. Specifically, keystroke standards were established in terms of keystroke per hour (KSHR), primarily because this measure of performance was readily available and met the previously mentioned criteria of meaningfulness and sensitivity. In addition, production time, the 6.8-hour "standard day," represented an additional production goal that was to be met by each operator. The combination of keystroke rate and production time defines productivity in terms of total strokes (keystrokes/hour x time = total keystrokes). This measure is more meaningful to the department supervisors and managers than KSHR, since it is the best measure of the volume of work through the operations section of the department.

Indices of these three measures were developed to aid in the administration of rewards. Both keystroke rate (KSHR) and productive time were expressed as percent of their respective standards. Total productivity, or the effects of both speed and time, is the multiplicative combination of the indices (i.e., productivity = keystroke rate x productive time).

The rationale developed for the determination of reward is as follows: When the worker's efforts exceed production standards, the excess output results in a cost savings to the organization.² Under the provisions of most monetary incentive programs, the resultant cost savings are shared with the employee, usually at the rate of 30-70 percent. In the federal government, such cost savings are shared at a much lower rate--recommended to be at 10 percent or less. Determination of cost savings and descriptive examples can be found in Bretton, Dockstader, Nebeker, and Shumate (1978). Savings is ultimately based upon productive performance and the cost per key entry hour. The amount of the reward determined under this program has an upper limit potential of approximately 30 percent of base salary. In the extreme, this means that a key entry operator working at 200 percent of standard for a year could earn approximately an additional \$2850 (cf., Shumate et al., 1978).

The Management System

The administration of the program required the creation of a new organizational structure, which, in combination with the measurement system, is referred to as the performance contingent reward system (PCRS). An incentive management coordinator (IMC) was selected from the organization and trained specifically to administer the program. This administration was considerably simplified by the development of a management report that included the input from the performance recorded by the machines, the standard applied to the jobs, and the bonus determined from productivity. This report reflected details of performance by task and by operator. As an integral part of the system, the IMC was required to present a copy of this report to each operator on the day that it was produced.

As shown in Table 1, operators can determine from this report how their stroke rate compares with the rate standards (shown under the TOT EFF column), and how the amount of time they spend compares with the standard day (shown under PROD). The PROD EFF column reflects total productivity (RATE x TIME or, in the case presented here, TOT EFF

²Implicit in the notion of the standard is that it represents the output that can be expected from an average, fully qualified operator, working at a normal pace.

Table 1

Daily Production Report for Performance and Incentive Earnings

OPERATOR	OAL1008		KEY PROCESsing				OPERATOR				ANALYSIS				790910				WONDAY	PAGE	I	INCENTIVE EARNINGS			
	RECORDS	W	V	W	V	STROKES	C	HOURS	W	V	KS/HOUR	W	V	% EFF	TOT	EFF	PROD	IBM					CMC	LV	AD
001	1729	516	40337	17113	57450	61	5.04	1.86	7990	9156	110	103	108	97	100	100	104							.54	
002							4.06	AD																	
002	639	17	16764	652	17416	3	3.20	.04	5237	15902	89	129	90	97	33	17	50	87							
012	1276	674	34679	18633	53312	77	4.67	2.13	7422	8715	72	75	73	100	100		73								
013							4.33	AD																	
013	185	177	8400	6225	14625	21	2.06	.86	4061	7221	60	65	62	90	46	54	55								
019							1.16	AD																	
019	1345	3470	37765	89173	126938	348	1.91	4.87	19589	18291	239	183	199	102	98	2	202							11.07	
020							8.00	SL							100										
021	896	1765	30288	45021	75309	239	2.61	4.22	11564	10658	118	103	109	101	100		110							1.06	
024	876	684	56148	15454	71602	34	5.21	1.31	10776	11796	123	96	117	96	100		112							1.34	
025							8.00	AD								100									
025	2188	630	36819	23081	59900	124	3.95	3.32	9309	6935	138	77	110	102	100		112							1.37	
030	1176	1050	35642	33600	69242	195	3.28	3.52	10866	9545	103	80	91	100	100		21								
032							8.00	AD								100									
036	1296	1232	39086	34818	73904	121	3.77	3.20	10356	10863	117	103	111	103	100		114							1.53	
039							8.00	SL							100										
040	1457	535	41729	27967	69696	169	4.42	3.05	9438	9160	124	98	113	105	100		118							2.04	
045	1263	1976	20041	57607	77848	157	1.63	4.85	12287	11863	159	122	131	95	100		124							2.74	
055							8.00	SL							100										
059	2086	1	56162	106	56268	10	6.59	.01	8511	6235	97	47	97	97	100		94							2.54	
061	732	1086	25344	45662	71006	147	2.90	4.34	8724	10513	111	127	121	102	100		123								
071	1348	705	42921	19642	62563	152	5.01	1.61	8560	12184	95	132	104	97	100		100							.15	
072							4.45	AD																	
072	628	598	9712	7647	17359	13	2.67	1.11	3637	6852	96	104	98	112*	40	5	55	109						.48	
075							1.00	AL																	
075	1165	927	20626	26946	47572	145	2.66	3.80	7736	7083	110	89	97	104	88	12	100							.07	
086							8.00	SL							100										
091							8.00	AL							100										
094							4.00	SL																	
094	524		22436		22436		3.68		6086		78	78	104	50	50		81								
097	571	1840	20635	62119	82754	244	2.21	4.73	9328	13119	130	152	147	98	100		144							4.77	
TOTAL	22480	18683	595534	531456	1127000	2260	67.54	48.90	8816	10666	110	114	111	100	2	64	21	111							29.70

x PROD). Finally, the last column provides the dollar amount of the reward, if any. On the day this particular report was run (not at the pilot site), a total of \$29.70 in rewards were earned--\$11.07 by a single person.

Besides the feedback function, the IMC was primarily responsible for setting rate standards on new jobs and processing the payments of the rewards in a timely fashion. The principal points of interface for the latter task were (1) the operator, (2) the incentive awards officer, and (3) the comptroller's office. An IMC may work only with a first line supervisor and by corresponding with the incentive awards officer to process the award payment. This simple structure, which is supposed to exist for every supervisor working in the federal government, is very often hamstrung by several layers of reviewing and approving authority. Every effort was made to keep the PCRS as simple and automatic as possible in order to avoid the debilitating effects of time lag on incentive motivation.

General Implementation of the PCRS

During 1977, the PCRS was tested and evaluated at the pilot site (Shumate et al., 1978), and a replication was performed at a second site, both with similar highly favorable results. As a result, the Director of the Industrial Activities' Management Information Systems Division of the Naval Sea Systems Command requested that the Navy Personnel Research and Development Center implement the PCRS at the remaining six naval shipyards. Time and monetary constraints dictated that the implementation task include three major steps: (1) development of the measurement and management systems, (2) conduct of management training, and (3) program evaluation. Task 1 was the responsibility of the field installations; and tasks 2 and 3, of NAVPERSRANDCEN.

Copies of the production reports and a description of the general management system were supplied to each of the field installations. The NAVPERSRANDCEN research staff prepared a 2-day workshop on incentive management, and developed an evaluation plan for the project. Training for the IMCs, some supervisors, managers, and incentive awards personnel was given during the first week of August 1978. Approximately one-half of the training time was spent describing the effects of the various parameters of feedback and reward upon work motivation. Of the remaining time, half was spent developing the parallels between theory and management for the data entry job, and the other half was dedicated to problem solving (both with the use of the diagnostic properties of the production report, and with the practical concerns of implementation within the organization).

The IMCs were then tasked to implement the system by the beginning of the fiscal year, to run the program for 60-90 days in order to establish baselines, and, finally, to introduce the program to the key entry operators at the beginning of the year. Key elements and evaluation criteria for the program were emphasized:

1. Feedback should be timely and provided on an individual basis.
2. Feedback should be informative (i.e., the operators should be aware of the meaning of all of the statistics and indices on the production reports). This would include how the reward was derived.
3. Rate and time standards should be adequately set in order to produce an incentive effect.

4. The mechanism for processing the monetary reward must be established prior to introduction of the program so that payments can be made without delay (bimonthly payments with a provision for a minimum payment of \$25 was recommended).

5. Negative sanctions for low performance should be minimized.

Unfortunately, these key elements could not be varied systematically and thus dealt with in a strictly experimental fashion. Feedback with and without a standard was examined in the pilot site (Dockstader, Nebeker, & Shumate, 1977), but time constraints and other practical concerns required that the PCRS be implemented as a complete package for the remainder of the sites. Thus, the evaluation plan allowed only for monitoring performance rates, auditing standards, and holding follow-up meetings with the IMCs. These meetings assessed the relative effectiveness of the implementation vis a vis the five key elements listed above.

RESULTS

Performance at Pilot (A) and Replication (B) Sites

The dependent variables used to analyze key entry job performance were keystroke rate and productive time. As previously indicated, the measures of these variables are indices, expressed as percentages, which are comparisons of these variables with their respective standards. Thus, the data to be presented here will be expressed in terms of percent of the standard. The only exceptions to this are data for the pilot (A) and the replication (B) sites. At these locations, the performance baselines had been established in terms of keystrokes per hour (KSHR) because of the absence of standards during the baseline period.

Site A

Figure 1 provides pre- and postimplementation keystroke rates, productive time, and total productivity (i.e., the product of speed and time) for the pilot (A) site. As shown, the average overall keystroke rate for the 3 months prior to implementation was approximately 8000 KSHR. (Data for a period of 1 year prior to this time indicates that this baseline is slightly higher than had previously been the case (Shumate et al., 1978).) The post-implementation data are averages of the monthly data and reported here in quarter-years. The slight increase during the 1st quarter has been shown to be cost effective for the organization (Bretton et al., 1978), and the linear increase during the first 6 quarters represent, at its highest point, a 40 percent increase in keystroke rate. It can also be seen that productive time increased from 80 percent to 110 percent during the first 2 quarters, and then leveled off until the end of the 6th quarter where it began to increase again in response to the decrease in keystroke rate. These changes in rate and time reflect turnover within the key entry section--three high performing operators left the section for jobs elsewhere. Their work was picked up (at the cost of time) by other, slower operators. Productivity appears to have leveled off during the 5th to 10th quarters at about 115 percent, or an increase of about 140 percent over the first quarter.

Site B

As indicated previously, several months following implementation at the pilot site, it was decided to test the effectiveness of the PCRS at a second location. The primary purpose was for a validity test, as a considerable amount of feedback and work flow changes had preceded the implementation at the pilot site and may have accounted for

the changes in performance there (Shumate et al., 1978). In order to logically eliminate such "Hawthorne effects," we attempted to design the most conservative test for the replication. This was achieved by selecting a second organization that had a well established record of high productivity.

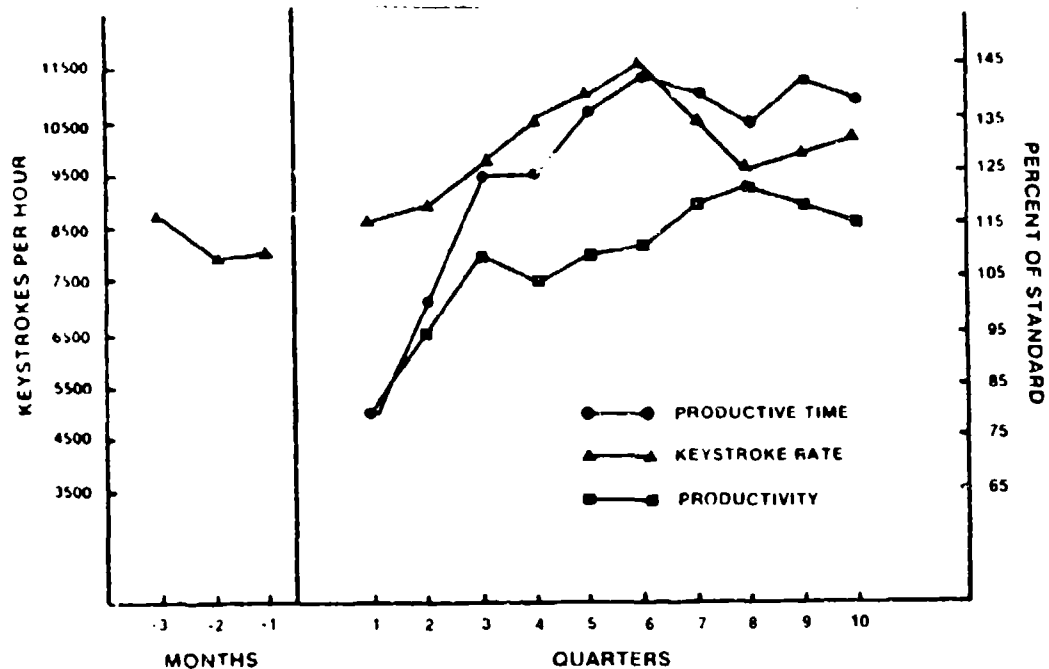


Figure 1. Pre- and postimplementation production statistics for the pilot (A) site.

Site B was such an organization and had, in fact, an existing incentive management program. The fundamental differences between that existing program and the PCRS had to do with the amount and frequency of the monetary award, and also the work standards. At site B, work standards were expressed in terms of keystrokes per day, rather than hourly, and there was a single standard for the day shift and a single higher standard for the second shift--the difference being a reflection of the different kinds of work performed and the length of the shift.³ The reward was a lump sum of \$150 awarded once a year for performance that consistently exceeded the standard. This program had been quite successful and had been operating for a considerable time prior to our entrance into the organization.

The supervisor in charge of the existing program was quick to appreciate the differences between his approach and that of the PCRS, but was somewhat skeptical that higher performance rates were possible from his operators. As a progressive manager, however, he was eager to try an experimental program that could have further positive effects on the productivity of his organization. Thus, each job was separately standardized and changes were made in his existing production reports to accommodate the new indices and the determination of rewards. The time standard was not adjusted, however, because the highly efficient work flow system allowed for a 7.1 hour "on line" day.

³In the development of the programs at the other sites, separate standards were developed for each key entry task.

Figure 2 displays the effects upon keystroke rate. Again, the preimplementation baseline is stable and representative of performance for the previous year--the overall average being about 8750 KSHR. The change following introduction of the PCRS was immediate and has been a relatively stable increase of about 1000 KSHR, an 11 percent increase in productivity.

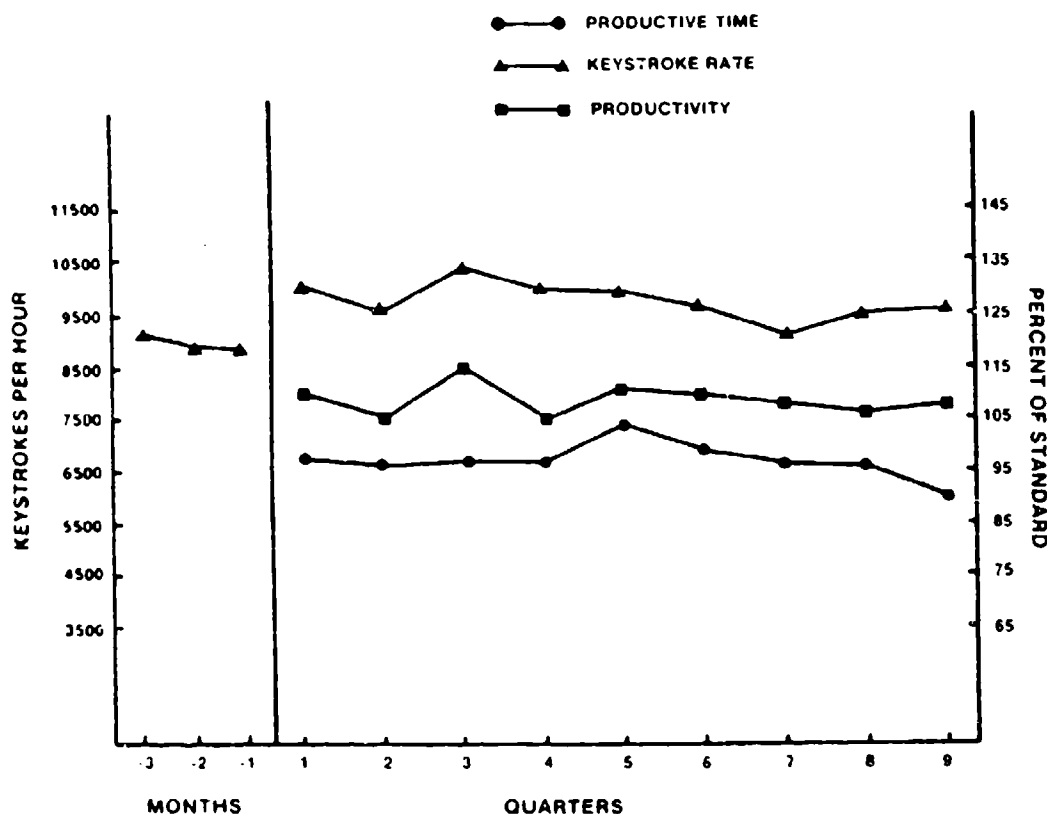


Figure 2. Pre- and postimplementation production statistics for the replication (B) site.

Evaluation of Sites A and B

Comprehensive statistical and cost/benefits have been performed on the program developed at site A (Bretton et al., 1978; Dockstader, Nebeker, & Shumate, 1978; Shumate et al., 1978). The need for such an analysis at site B is questionable, however, because of (1) the stability of the increase and (2) the fact that the acceptance of the program by site B management did not require such a detailed argument.

A visual examination of Figures 1 and 2 does suggest questions of both practical and theoretical interest. For instance, although performance in terms of KSHR suggests a high similarity between the two locations, the productivity measures indicate that site A is much more productive than is site B. This is not the case. Rather, the difference in productivity is an artifact due to the different time standards at the two locations--site A having a much smaller (and easily attainable) standard day while site B has the high 7.1 value referred to earlier. Therefore, in the equation--productivity = rate x time--there is a greater overall chance that site A's time figure will exceed 100 percent than is the case for site B, thus making the productivity measure higher.

The theoretical implications of this difference as it relates to work motivation are obvious. First, other things being equal, lower standards allow for higher amounts of monetary reward. Second, lower standards will result in some reward for more persons (i.e., persons of lower ability will be able to earn some reward due to the time they spend working rather than being strictly dependent upon the rate of their work). Some managers could view this as a bad feature of this program. From the standpoint of incentive management, however, it makes much more sense to be able to appeal to the majority of the work force rather than to just the minority of high performers; a shortcoming of existing incentive awards policy. Motivational theory as well as rational insight would predict that unless a goal (i.e., performance level) is perceived to be attainable, the working individual will not strive to reach it. In the example of the key entry task, if the workers cannot achieve the high stroke rates or cannot be in the production mode for 7 hours per day, no amount of money could be great enough to have lasting effects on their performance.

The multiplicative interaction of rate and time in this task can appear somewhat paradoxical to the operator who is capable of high speed. Typically, prior to the advent of this program, operators who were regarded as high performers were those who were capable of high speed. When examining the production reports, however, it was found that some slower operators produce as many or more keystrokes in a given day, week, or month as the high-speed operator because of the amount of time the slower operator spends "on line." This more productive operator may not, in fact, earn any monetary reward when the time standard is as high as 7.1 hours. The effects of this unfortunate inequity is that the slower but more productive operators will not receive any reward. As a result, they will perceive themselves as being incapable of earning the reward and will thus not be motivated to attempt higher rates of performance. In addition, the high-speed operator can be frustrated by a high time standard and see high performance rates as not resulting in much payoff. Although it is impossible to determine exactly how much influence this frustration has on the other operators, it was a factor in the way that the program was perceived at site A (Dockstader et al., 1978).

The salience of these two standards and their interactive nature became more obvious in the performance of the remaining sites. As for the other four important criteria for evaluation, referred to on page 5, sites A and B received considerable development related to those criteria from the researchers as well as local management. The remaining sites, however, got this information only through the incentive management workshop. The remainder of this paper will address these criteria as they apply to the general implementation of the PCRS at the other sites.

Performance at Remaining Sites

Only four of the six sites represented at the incentive management workshop provided data for evaluation. Site visits were made to three of the four locations in order to audit their standards and assess the effective implementation of the five criteria referred to above.

Before proceeding with this discussion, two caveats are provided. First, no location developed an adequate baseline for the purpose of an unequivocal statistical analysis. The baselines range from less than 1 month to as many as 4; in each case, however, they were contaminated by prior knowledge on the part of the participant operators. On the surface, this appears to have had little effect on the outcomes and, in any case, it would provide conclusions of a conservative nature (i.e., such contamination usually elevates baselines rather than lowering them).

The second potentially contaminating event that can be expected to have significant effects on performance is the threat of reduction-in-force (RIF). At the time that most of the sites had implemented the PCRS, headquarters announced that there was going to be a large scale RIF in key entry.

Sites C and D

In the four remaining sites, baseline data were available for all three indices. That is, "keystroke rate" here is really an index of keystroke rate compared to the rate standards. These statistics for sites C and D are presented in Figure 3 and 4, which provide a dramatic example of the interactive effects of rate and time in the determination of productivity. In Figure 3, productive time increased slightly, but remains relatively constant during the 8 months following implementation. Keystroke rate has increased linearly and has been the driving parameter for total productivity, as can be seen by the close parallel. Figure 4 represents the opposite extreme. In this location, productive time has remained relatively constant, while the variations in productivity have been directly related to changes in keystroke rate.

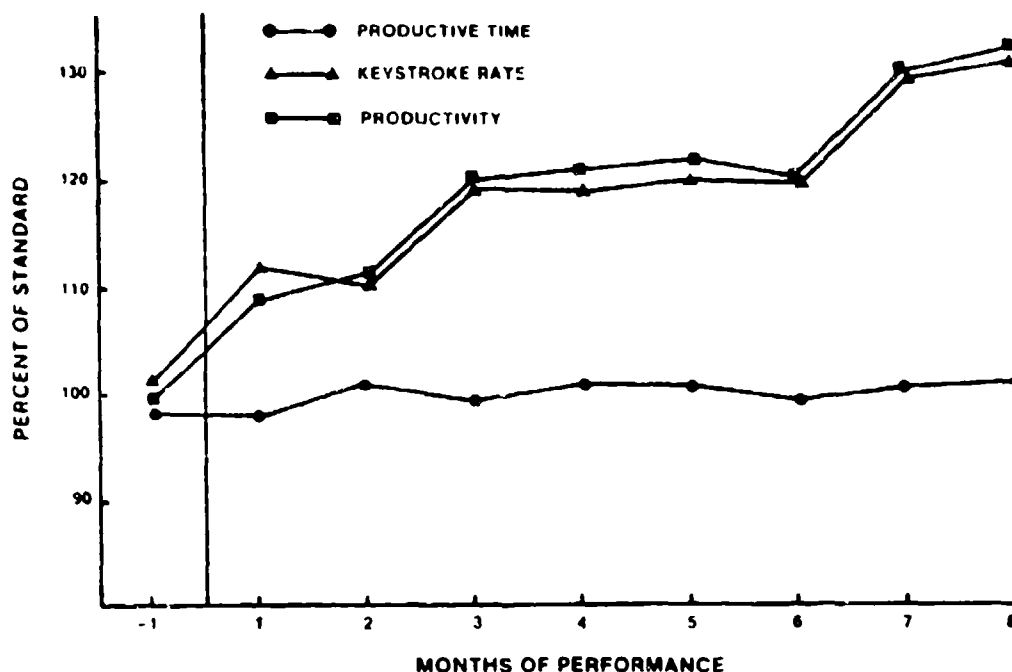


Figure 3. Pre- and postimplementation production statistics for site C.

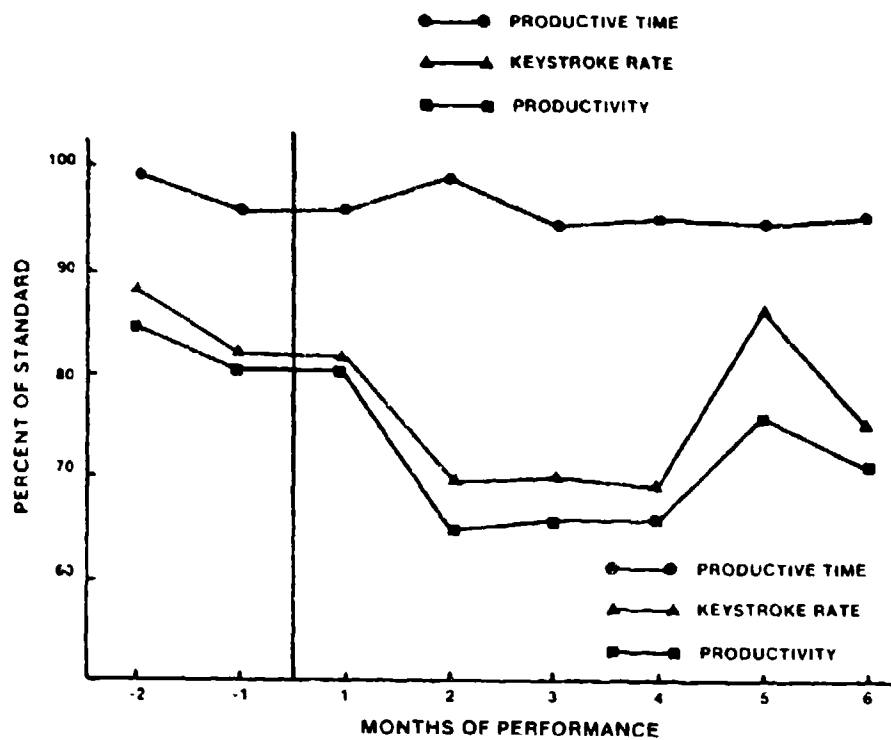


Figure 4. Pre- and postimplementation production statistics for site D.

Also accounting for the differences between these two sites is a case of opposites. Of the five criteria, there was only agreement on one part of one of them--the rate standards had been correctly set according to the rules developed by Nebeker and Nocella (1979). At site D, regular feedback was not given; it was only provided when an operator had made a reward. As a partial result of this, not a single operator interviewed understood the relationship between the time and rate standards, or how the reward was derived from them. At site C, on the other hand, at least half of the operators and both shift supervisors understood and could verbalize this relationship. The rate standard at site D was set at 7.0, compared to 6.5 at site C. It is obvious from production reports that there are operators in that organization who are capable of beating the rate standards, but the debilitating effect of the time standard precludes monetary rewards for all but the very fastest. At site C, payments were made promptly as a part of the bi-monthly paycheck and were paid in full each month. At site D, only two checks--for performance 2 or 3 months earlier--had been processed, 6 full months following introduction of the program.

One final factor picked up from interviews of site D operators concerned a conflict related to productive time. Although the operators were informed (by memo) that they should attempt to increase their productive time, several reported that they were afraid to do so, since they might lose their jobs if they ran out of work. Thus, any attempts at increasing productive time was at the cost of decreasing keystroke rate. This obvious bind was not designed into the PCRS, as running out of work was provided as a legitimate reason for reducing the work time standard. Running out of work also provides impetus

for management to reexamine the work flow system and the supervisor's role in the distribution of work. It is, after all, not the case that there isn't enough work to be done. Rather, the flow of work is interrupted to the extent that it has a negative effect upon productive time--unless such time is otherwise accounted for.

The announcement of the forthcoming RIF was made at month 2 for sites C and D. The effect, if any, was transient--although this might account for the large decrease in keystroke rate at month 2 for site D. In interviews with the operators, at all of the locations visited, there was an awareness of the impending reduction, but few considered it a serious immediate problem.

Sites E and F

Production statistics for sites E and F are presented in Figures 5 and 6. At the time of this writing, site E had not been audited so little can be said beyond a description of the statistics presented in Figure 5. Productivity increases have not been stable, but are, at a minimum, 15 percent. Again, as has been the case with most of the sites, the gain primarily resulted from increases in keystroke rate rather than in productive time.

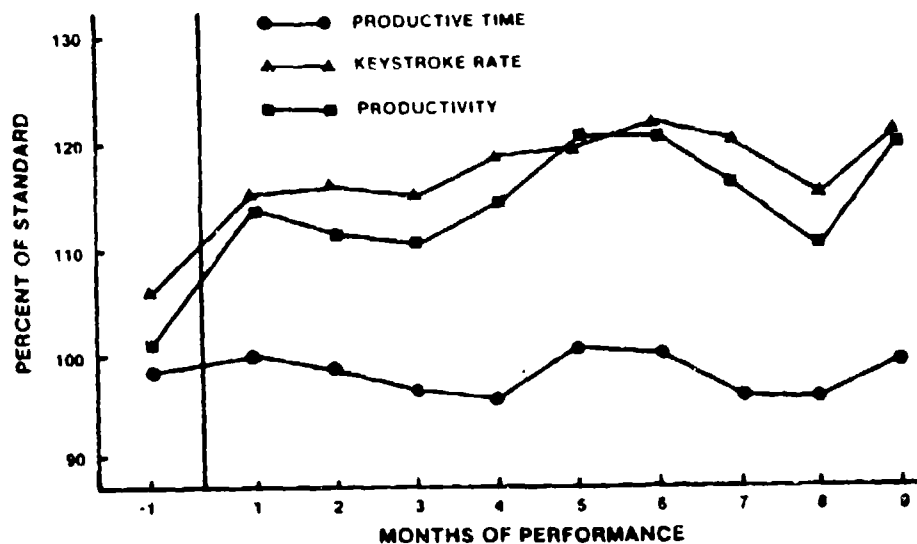


Figure 5. Pre- and postimplementation production statistics for site E.

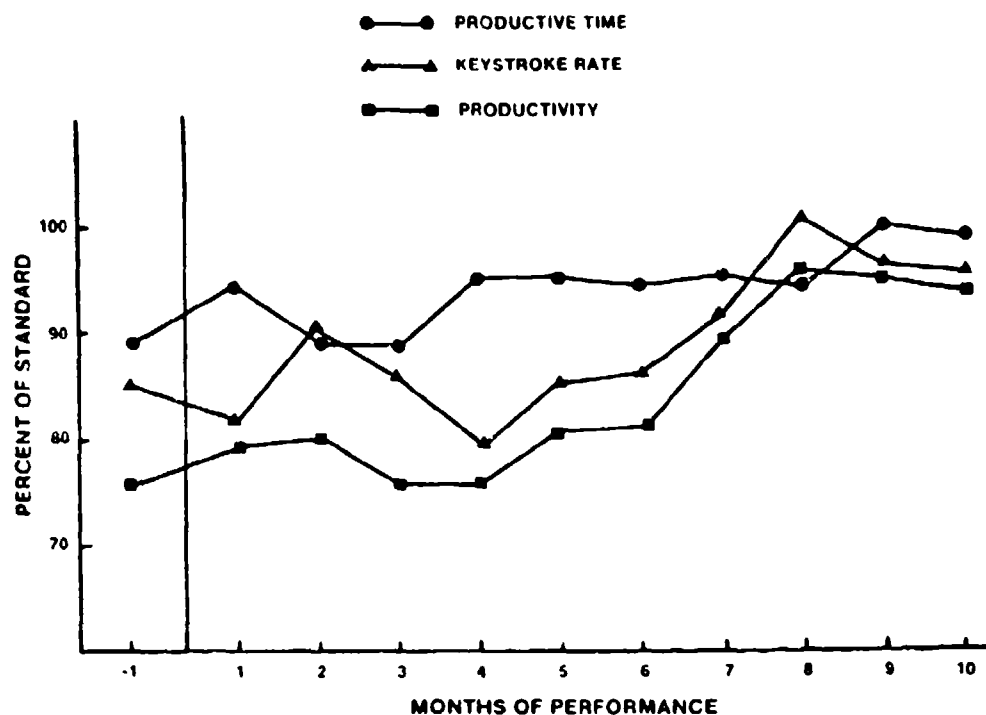


Figure 6. Pre- and postimplementation production statistics for site F.

Productivity at site F increased following implementation of the PCRS, and the depression at the 3rd and 4th month are interpreted as a reflection of the intention to RIF. Since then, there has been a slow but steady increase in productivity that appears to have leveled off at 95 percent--a 20 percent increase over the baseline figure. The audit conducted at this site revealed that daily feedback had been provided. The operators generally understood the production statistics and realized that both rate and time were the determinants of productivity and, in turn, rewards. This location, however, had the highest time standard (7.1 hours), and the operators expressed considerable frustration concerning this figure. An examination of the performance rates of individual operators indicated that 50 percent of them could have been earning some monetary reward if this value was set at the recommended 6.8 hours. As it was, only 25 percent were earning any money and only one was making a significant amount.

CONCLUSIONS

Six key entry sections were examined regarding the effects of the PCRS on productivity. In all but one section, there were significant gains in productivity ranging from 11 to 40 percent. In the single location that showed no effects (in fact, net losses), it was found that the time standard was too high for operators to achieve and that several other features of the PCRS were not being practiced; notably, the lack of performance feedback and the lack of timely payment of rewards.

The greatest changes in productivity were found in those organizations that had the lowest time standards (i.e., 6.5 hours). It has been reasoned that, other things being equal, this results in (1) greater magnitudes of reward for a given stroke rate and (2) more persons becoming eligible for rewards because it is easier to meet the smaller time requirement. The latter reason is considered the most important, because it allows incentives to reach operators who are in the middle of the performance range and will thus include the majority of workers.

It has been observed by the authors during the course of this research program that management has been generally reluctant to accept the lower time standard. The reluctance appears to be one that is philosophically based on notions of a work ethic rooted in "a fair day's work," which they equate with 8 hours. Although this idea is firmly associated with compensation, many managers are apparently unable to divorce it from incentive pay. Paradoxically, some have attempted, without success, to establish work flow and supervisory practices that would allow for more time "in production" and, instead of acknowledging the fact that they cannot raise the value to their goal, they set the figure in a way that punishes the worker. The real paradox is that all of the evidence concerning the effects of monetary incentives indicates that the performance resulting from higher bonuses is proportionately greater than that resulting from smaller ones. This is to say that the net effect in terms of cost savings is greater with the more generous programs--a finding rather conclusively demonstrated at sites A and C.

A basic intention of the design of the PCRS was that negative consequences would not be associated with substandard performance, and that high performance would yield rewards. Implementation of this program, however, does have a punishment contingency. Specifically, the money earned for high performance is a net amount resulting from the summing of both substandard and suprandard performance. Thus, if a person has more substandard performance during a particular time period than suprandard, he or she would lose the money earned for the period of high performance. Thus, the withdrawal of a positive reward results in a punishment. In the organizations with high time standards, this is exaggerated and is a known and very aggravating fact because of the difficulty of achieving the high time standard within the constraints of the production system. This problem could be partially alleviated if the production report that presents the net earnings was run more frequently. Most "borderline" operators readily acknowledge that it was easier for them to conceive of performing consistently above standard rates for a day or a week--but a month was too much to make the effort-payoff ratio worthwhile. This is a potentially positive gain in productivity that is stifled to some extent by a punishment consequence.

Ultimately, the cost savings derived from increased individual output come from a reduction in the number of man-hours required to perform a fixed amount of work. Thus, unless organizations have a very large backlog or are in a growth period, savings come from the reduction of personnel. In a key entry task, this was easily accommodated because of the large amount of turnover in this job. The pilot site found it easy to absorb the loss of almost one-third of the key entry personnel because of the increased output of the remaining employees. The implications of this kind of program for other jobs is straightforward: mechanisms currently exist with civil service for continuing monetary rewards for high performance. This fact is very important in the light of anticipated ceiling point reductions and the large number of retirements from federal service being predicted during the 1980s. Effective performance-related reward systems like the PCRS are required to meet the difficulties associated with these large changes in the available manpower.

RECOMMENDATIONS

It is recommended that OP-14:

1. Develop supervisory training courses in incentive management and implement such programs for all civilian supervisors. This approach to management is not only simple and easily taught, but also is totally consistent with major provisions of the Civil Service Reform Act.

2. Use existing performance standards in the incentive management framework, and develop new methods for measuring job performance. The psychological principles that underlie the successful application of incentive management do not require particular kinds of work measurement (i.e., only industrial engineering approaches). Performance on the job can be measured in many ways and used for managing people, but there is a tendency to avoid measurement unless it is performed in the very traditional ways.

3. Use objectively measured work output as the primary factor in the determination of performance awards. In the interests of productivity enhancement, performance should be defined as productive output, and incentive awards should be established on this basis.

4. Use objectively measured work output as the primary factor determining favorable performance appraisal. If measured work were the primary input, much of the vagueness and ambiguity associated with the performance appraisal process could be substantially reduced and productivity enhanced.

5. Use objectively measured productivity as the primary factor in the selection of individuals for promotion, pay grade increases, and other forms of advancement. It has long been recognized that the best predictor of future performance is past performance. Performance per se, however, is rarely used as the primary qualification for advancement. The long-term goals of productivity enhancement through incentive management demand a change in this practice.

The latter two recommendations were not based on results obtained in the present research. Rather, they represent an extension of the principles evaluated here and are considered by the authors as an integral aspect of incentive management.

REFERENCES

- Bretton, G., Dockstader, S., Nebeker, D., & Shumate, E. Preliminary cost effectiveness analysis, projections, and implementability issues of a performance contingent incentive system (NPRDC Tech. Rep. 78-13). San Diego: Navy Personnel Research and Development Center, February 1978. (AD-A059 830)
- Dockstader, S., Nebeker, D., & Shumate, E. The effects of feedback and an implied standard on work performance (NPRDC Tech. Rep. 77-45). San Diego: Navy Personnel Research and Development Center, September 1977. (AD-A045 430)
- Dockstader, S., Nebeker, D., & Shumate, E. Performance contingent rewards and productivity: A one-year summary of a prototype incentive management system (NPRDC Special Rep. 78-7). San Diego: Navy Personnel Research and Development Center, April 1978.
- Lefton, R., & Buzzotta, V. Effective motivation through performance appraisal. New York: Wiley, 1977.
- Luthans, F., & Kreitner, R. Organizational behavior modification. Glenview, IL: Scott, Foresman, & Company, 1975.
- Marx, M. Learning: processes. London: Collier-MacMillan Ltd., 1969.
- Miller, L. Behavior management: The new science of managing people at work. New York: Wiley, 1978.
- Nebeker, D., & Nocella, J. Keyprocessing performance: A method for determining operator performance standards (NPRDC Special Rep. 79-22). San Diego: Navy Personnel Research and Development Center, June 1979.
- Shumate, E., Dockstader, S., & Nebeker, D. Performance contingent reward system: A field study on worker productivity (NPRDC Tech. Rep. 78-20). San Diego: Navy Personnel Research and Development Center, May 1978. (AD-A055 796)

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