

# Alternate Work Schedules, Productivity, Leave Usage, and Employee Attitudes: A Field Study

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*Alternate work schedules reduced leave usage significantly during a nine month intervention time period in a government agency. The effects of the change on individual productivity were mixed. Employee satisfaction with work schedules increased significantly, while other traditional satisfaction variables were not significantly affected by the work schedule intervention.*

**I**n the past 15 years alternate work schedules (AWS), especially flexitime, have become widely used in business and government in the United States. Although these interventions have been reported by the academic community (Nollen and Martin, 1978; Golembiewski 1978, 1980) and the business community (Fields, 1974; Cottrell and Walker, 1980), there have been relatively few longitudinal studies.

Kim and Campagna (1981) and Orpen (1981) have conducted empirical studies on flexible work hours which report generally positive effects. Orpen (1981) employed a pretest and posttest design and utilized random assignment to control and experimental groups. Satisfaction, performance (ratings) and productivity (output) were tested and the independent variable was working hours. The research design of Or-

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pen's study was carefully developed and well documented. The sample of 64 clerical workers is somewhat limited, but the time frame of six months provides a reasonable degree of program maturation. The Kim and Campagna study was also well designed and contained pre-post data, control and experimental groups, and hard data comparisons. The Kim and Campagna and Orpen studies are among the few which have utilized rigorous research designs. Golembiewski and Proehl (1978) provided an extensive review of 32 empirical studies in the public sector and reported only two which utilized statistical treatment to test the data.

Studies by several researchers (Craddock, Lewis and Rose, 1981; Latona, 1981; Orpen, 1981; McGrath, 1980) found that employee satisfaction increased after the implementation of an AWS program. In a recent study, however, Dunham and Pierce (1983) found that while employee satisfaction with work schedules increased under AWS, other employee satisfaction factors were largely unchanged. Pierce and Newstrom (1980) offer an elaboration of the Dawis, England and Lofquist (1968) work adjustment model to explain how and why working hours may impact employee attitudes and behaviors. The work adjustment model provides a conceptual theory to test individual responses to work schedule changes. Pierce and Newstrom offer thirteen testable propositions. Although the research design of the present study does not propose to test any of the specific propositions, partial responses may be inferred for several of the Pierce and Newstrom propositions (i.e., absenteeism, discretionary time/employee job satisfaction, body rhythms/performance, and non-task-based stress/performance).

The specific questions under investigation in the present study are: (1) Do alternate work schedules affect individual productivity?; (2) Do alternate work schedules affect sick leave and/or annual leave usage? If so, in what way?; and (3) Do alternate work schedules affect employee satisfaction?

## BACKGROUND OF THE STUDY

The study took place in an office of a federal government agency, located in the midwest, which is responsible for providing support in accounting, loan payment collection, computer services, office services, and management and financial reports to the agency's national, state, and nationwide network of 2,230 district and county offices. The workforce of the agency was unionized and management was willing to explore alternatives to the traditional "eight to five" work schedule. Agency management was highly process oriented and utilized a representative task force to study alternate work schedules and to provide recommendations to the agency management. The task force surveyed, by means of questionnaires, all employees in the local office and presented management with a report of its recommendations.

Compressed work (CW) and modified flexitour (MFT) schedules were recommended to agency management by the representative task force. The agency management endorsed the task force recommendations and, after negotiation with the union, implemented both CW and MFT. Approximately half of the work force elected the MFT

program while the other half chose the CW schedule. Employees were permitted to move from one schedule to another.

Under the CW program, commonly referred to as 5/4-9, employees work eight nine-hour days and one eight-hour day every 14 calendar days. This program was implemented on a Monday-Friday schedule. Therefore, every 10 working days, employees worked nine days, 80 hours. The starting and stopping times were fixed and specified by the union contract. MFT permitted employees to select a starting time (between 6:30 a.m. and 9 a.m.), a lunch time (30 minutes between 11 a.m. and 1 p.m.), and a quitting time (between 3 p.m. and 6 p.m.). After supervisor-subordinate agreement to an arrival time under the MFT, employees were committed to adhere to that schedule until an "open season," which occurred on a monthly basis, permitting employees to modify their starting time. A 15 minute plus/minus starting time variation was allowed to the selected start time. Further, supervisors could authorize employees to deviate from the nine-to-three core times so long as eight hours were completed within the same working day.

The agency had a well developed computerized work measurement system (WMS). The WMS contained data on the number of units processed, the time to process the units, and the average processing time. Annual and sick leave data were collected daily. The WMS permitted analysis of leave taken according to its interval, (e.g., less than two hours, two to four hours, etc.).

## METHOD

### *Study Design*

This study used a pretest/posttest design. Overall, the longitudinal frame covered 18 months of productivity time and leave usage time and 16 months between measures of satisfaction. The pretest (a traditional eight to five, five days a week schedule) included nine months of data for both productivity measures and leave usage measures and the administration of a satisfaction questionnaire one month prior to the AWS intervention. Another nine months of data on productivity and leave usage and a second satisfaction survey 15 months after the AWS intervention constituted posttest (AWS time schedules). These time periods allowed for maturation of the effects of the work schedule change.

In the posttest, employees could move between CW and MFT. Thus, the findings of this study are the products of the CW and MFT programs and are reported as the alternate work schedule (AWS) results. Control groups were not used due to limitations imposed by the union contract.

### *Dependent Variables*

*Productivity.* Initially eight tasks were analyzed to compare differences between pre and post periods. In order for a task to be included as a measure, the following

criteria had to be satisfied: (a) The technology and duties were required not to have changed significantly over the eighteen month time period; and (2) The supervisors must have indicated that they were confident that employees reported the data in a valid, reliable and consistent manner.

Two of the eight tasks did not satisfy the conditions and were excluded from the study. A description of the work covered in the resulting six tasks is presented in Appendix A. Since employees usually work on several tasks in each work day, time spent and units of production were reported for each of the six tasks. Average time to process work was calculated units for each task for each nine month period.

*Leave Usage.* The agency provided two types of leave: (1) Sick leave where employees accumulated four hours of sick leave per two week period. No limit was placed on the total amount of sick leave which may have been accumulated; and (2) Annual leave where employees with less than three years, three to 15 years, and more than 15 years of service accrued four, six, and eight hours of annual leave respectively per two week period. Employees were not permitted to carry forward more than 240 hours of annual leave from one year to the next.

Both sick and annual leave were analyzed relative to percentage of total hours paid to ascertain if significant differences in leave usage rates were present between the two test periods. A second level of analysis of leave usage was conducted in order to determine if AWS caused the patterns of partial-day absences to change for both sick and annual leave. AWS effects on various intervals of partial-day leave usage were also studied. Specifically, this study measured whether the relative proportion of identified interval lengths changed after the introduction of AWS.

*Employee Satisfaction.* One month prior to the implementation of the AWS, a satisfaction questionnaire developed by the United States Office of Personnel Management (OPM) was administered to 650 employees. Fourteen questions pertaining to satisfaction were added. This same instrument was administered to 843 employees 15 months after the AWS program was implemented. Fifteen months were allowed to elapse in order to minimize a possible "Hawthorne Effect," which could have occurred with the introduction of a new and attractive employee option. Thus, the study contains satisfaction data from two questionnaires covering a 16 month time period.

### **Sample**

The sample for the productivity data averaged 75 employees per month. Only individuals performing one of the six selected tasks were included in the sample for the productivity data.

All full-time employees were included in the sample to evaluate the impact of AWS on sick and annual leave usage. The workforce grew from a monthly average of 663 to 806 employees from the pretest to the posttest period. Annual and sick leave data were collected for nine months in both the pretest and posttest periods.

The pretest satisfaction survey was administered through inter-office mail to 650 employees and 485 usable responses were collected. In the posttest, 515 employee responses were available from the 843 questionnaires distributed.

**TABLE I**

**Mean Production Efficiency by Task**

Tasks	Mean Processing Time, Pretest	Mean Processing Time, Posttest	t-Statistic
Task 1	5.30	6.10	6.50*
Task 2	5.84	5.57	1.53
Task 3	5.26	4.01	1.06*
Task 4	4.06	3.66	3.27*
Task 5	1.18	1.22	0.84
Task 6	1.49	1.50	0.11

\*p<.05

**TABLE II**

**Leave Usage As a Percentage of Total Hours Worked**

	Pretest Data n = 663	Posttest Data n = 806	t-Statistic
Sick Leave	4.09	3.06	5.07**
Annual Leave	5.76	5.04	2.80*

\*p<.01

\*\*p<.001

**RESULTS**

A two-tailed t-test was applied to the production data for the six tasks in the pretest and posttest periods. Table I provides the results of the analysis. Means for unit processing time, or production efficiency, are provided. One task, Task 1, showed a significant increase in average processing time in the posttest compared with the pretest period. Two tasks, Task 3 and Task 4, showed a significant decrease in average processing time.

The percentages of sick leave and annual leave to total hours worked were compared in the pretest and posttest periods. Table II provides the results of the two-tailed t tests. There was a significant reduction in both sick and annual leave rates in the posttest period. A second level of analysis of leave usage was undertaken to determine if significant differences resulted in the manner by which intervals of partial-day leave usage were taken. Table III presents the results of annual and sick leave usage by time interval. With the exception of one time interval, 2.25 - 4.0 hours of sick leave, no significant difference exists in the way.

**TABLE III**  
**Leave Usage by Time Interval**

Time Interval (in hours)	Sick Leave			Annual Leave		
	Pretest	Posttest	t-statistic	Pretest	Posttest	t-statistic
.25-1.0	3.94	5.16	-2.17	13.81	14.49	-0.76
1.25-2.0	7.79	8.26	-0.59	9.12	8.32	1.32
2.25-4.0	19.32	17.52	2.61*	13.58	13.19	0.05
4.25-9.0	68.95	69.05	-0.06	63.49	63.92	-0.28

\*p<.05

Job satisfaction data from the two OPM questionnaires were compared using chi-square analysis. Tables IV and IVA provide the results from responses to selective questions during the pretest and posttest periods.

No significant differences were found in the pretest and posttest results to the questions in Table IV. Only one significant difference appeared from the analysis of the question in Table IVA, that being a significantly greater degree of employee satisfaction with their work schedules after implementation of the AWS.

## DISCUSSION AND CONCLUSIONS

### *Productivity*

The analysis of average individual processing efficiency, defined as productivity in this study, yielded mixed results. Of the six tasks observed, processing time increased in three and decreased in three tasks. Two tasks showed significant declines, while one task increased significantly in average processing time. Since a consistent pattern pertaining to average individual processing time did not emerge, it is concluded that the AWS did not adversely impact individual efficiency. In the aggregate, the alteration of workweek schedules did not enhance or detract from an individual's ability to process units in the federal agency. It is important to recognize that total office productivity was not the reference point. Rather, aggregated individual task productivity was analyzed, with the conscious effort made to select tasks which represented more than one type of the work of the office.

### *Leave Usage*

Under the AWS, both sick and annual leave usage rates declined significantly: the decline in sick leave was significant at the .001 level, while annual leave reductions

**TABLE IV**

**Employee Responses to Selected Questions From Job Satisfaction Questionnaires\***

<b>Key Questions</b>	<b>Pretest</b>	<b>Posttest</b>
<b>"Is your pay fair for the job you do?"</b>		
Yes	209 (43%)	201 (41%)
Uncertain	66 (14%)	81 (10%)
No	210 (43%)	211 (43%)
<b>"Are you satisfied with your opportunities for promotion?"</b>		
Yes	131 (27%)	138 (28%)
Uncertain	62 (13%)	75 (15%)
No	292 (60%)	281 (57%)
<b>"Are you given credit when you do a job well?"</b>		
Yes	197 (41%)	203 (41%)
Uncertain	91 (19%)	85 (17%)
No	197 (41%)	202 (41%)
<b>"Do people you work with generally do a good job?"</b>		
Yes	364 (75%)	391 (79%)
Uncertain	91 (19%)	69 (14%)
No	30 ( 6%)	35 ( 7%)

\*Chi-square analysis showed no significant differences for any of the above questions,  $p < .05$ .

were significant at the .01 level. It is not possible to determine with absolute certainty that the decreases in leave usage were due to the introduction of the AWS; however, there appear to be no other identifiable factors which would have caused a significant decrease in leave usage patterns. There was an increase in the workforce size after the AWS implementation of 18.8% during the nine month test period. This compares to a workforce increase of 11.1% during the pretest period. The differences in workforce growth rates may account for some of the differences noted; however, it is believed that the degree of impact is negligible because: (a) approximately 25% of the new employees transferred to this agency from another federal agency (leave is also transferred); and (b) new employees without prior federal work experience begin to accrue leave the second pay period. The percentage of leave used relative to hours worked dropped 12% for annual leave and 25% for sick leave.

While employee output per work hour neither improved nor declined significantly, it should not be concluded that the AWS program did not alter agency-wide productivity. After AWS, more time was spent on the job and no significant differences in

TABLE IVA

Employee Responses to Selected Questions from Job Satisfaction Questionnaires

Questions	Very Highly Satisfied	Highly Satisfied	Average Satisfaction	Below Avg. Satisfaction	Very Dissatisfied
<b>"My degree of satisfaction with my current work schedule."*</b>					
Pretest	52 (11%)	108 (23%)	251 (52%)	49 (10%)	17 ( 4%)
Posttest	144 (29%)	132 (27%)	163 (33%)	44 ( 9%)	12 ( 2%)
<b>"My degree of satisfaction with the work I am doing."</b>					
Pretest	34 ( 7%)	112 (23%)	213 (44%)	85 (17%)	44 ( 9%)
Posttest	48 (10%)	116 (24%)	194 (38%)	95 (19%)	38 ( 9%)
<b>"My feelings of the general working conditions."</b>					
Pretest	15 ( 3%)	58 (12%)	218 (45%)	131 (27%)	63 (13%)
Posttest	28 ( 6%)	78 (16%)	204 (41%)	115 (23%)	69 (14%)
<b>"My feelings of the specific working conditions at my job site."</b>					
Pretest	24 ( 5%)	87 (18%)	223 (46%)	102 (21%)	49 (10%)
Posttest	41 ( 8%)	96 (19%)	230 (47%)	90 (18%)	37 ( 8%)
<b>"My relationship with my supervisor."</b>					
Pretest	88 (21%)	163 (34%)	169 (35%)	40 ( 8%)	12 ( 2%)
Posttest	120 (24%)	153 (31%)	165 (34%)	39 ( 8%)	16 ( 3%)
<b>"My relationships with my co-workers."</b>					
Pretest	107 (22%)	204 (42%)	155 (32%)	15 ( 3%)	5 ( 1%)
Posttest	123 (25%)	211 (43%)	142 (29%)	11 ( 2%)	4 ( 1%)
<b>"My feelings of general job satisfaction."</b>					
Pretest	34 ( 7%)	112 (23%)	194 (40%)	102 (21%)	44 ( 9%)
Posttest	28 ( 6%)	112 (23%)	208 (42%)	102 (21%)	41 ( 8%)
<b>"My feelings about management's interest in improving the general welfare of the full workforce."</b>					
Pretest	19 ( 4%)	44 ( 9%)	175 (36%)	142 (29%)	107 (22%)
Posttest	17 ( 3%)	58 (12%)	175 (36%)	134 (27%)	108 (22%)

\*p<.001

**TABLE V**

**Analysis of Leave Hours and Costs**

	Pretest	Posttest	Difference
Annual Leave Hours	98,662	86,500	12,162
Annual Leave Cost	\$775,483	\$679,890	\$95,593
Sick Leave Hours	70,056	52,242	17,814
Sick Leave Cost	\$550,646	\$410,628	\$140,018
Total Leave Hours	168,718	138,472	29,976
Total Leave Cost	\$1,326,123	\$1,090,512	\$235,611

average processing rates were noted. It is concluded that the government achieved more work per salary dollar paid under the AWS program than prior to the change intervention. Table V, Analysis of Leave Costs, provides a constructed summary of hours and salary dollars saved in the post period relative to the pretest period.

The organization "saved" 29,976 hours of leave, or 14.4 staff years, due to the decreased usage rate after the change intervention. It is assumed that these hours were productive hours because no significant differences were found overall in average processing time on the selected tasks studied. The average hourly employee salary was \$7.86 per hour, which equates to a savings of \$235,611.

The data provided in Table III reveal that the patterns (intervals) of leave usage in the pretest and posttest were nearly identical. It had been expected that short-interval leave usage (one-half day or less) would decline in use; this was not the case. Although significant changes resulted in leave usage rates, the manner in which employees used leave did not change significantly.

**Employee Satisfaction**

The employee satisfaction questionnaires obtained employee responses to questions pertaining to issues such as pay, promotion, supervision, co-workers, working conditions, and work schedules. In all but one area, responses indicated that employees were not more satisfied in the posttest period than in the pretest period. The only area that yielded a significant difference between the two periods was the one which dealt with degree of satisfaction with work schedule. To that question, employee responses revealed that a significant difference existed at the .001 level. The 16 month time period between the two surveys would appear to allow ample time for any initial bias effect to be removed.

Several case studies reported in the literature provided testimony to increased satisfaction after AWS had been introduced. Many of the studies do not employ statistical testing, others rely only on subjective interpretations, while some other reports may have a Hawthorne bias. It seems logical that employee satisfaction with

work schedules would be altered with actual changes in those schedules. These findings support the Dunham and Pierce (1983) results. We do not believe that employee perceptions about pay, working conditions, co-workers, and the like should be significantly different based on changes in work schedules. The employees' responses in this survey support this contention.

This longitudinal study of AWS in a government agency yielded three major findings: (1) Individual productivity was not affected by AWS; (2) AWS had a significant positive effect of reducing employee use of annual and sick leave. Since employees worked more hours, aggregate agency productivity was affected positively; and (3) Employee satisfaction with work, pay, working conditions, supervision and other traditional satisfaction-related issues were not affected by the AWS program. Satisfaction toward work schedule was altered significantly in this study in a positive manner.

Individual productivity, measured by average time to process work units, was not increased. Substantial leave usage reductions, however, were found in this study. Leave usage reductions, in concert with unchanged individual processing times, led to improved productivity in the federal agency. Employee satisfaction with work schedules was substantially improved in this study but this satisfaction increase did not result in enhanced satisfaction in other employment-related variables under investigation. In this study the union, the employees, supervisors, and agency management were favorably impressed with the results of the AWS change intervention.

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## APPENDIX A

*Task 1, Loan Costs and Extra Journal Vouchers.* The work associated with this task consists of reviewing vouchers for accuracy, coding them, preparing journal vouchers, and other related clerical procedures. Work is randomly distributed among employees except for new employees, who receive less complex items. New employees generally learn how to do this work independently in about three weeks but receive the easier work until they become proficient. Employees spend an average of about six hours per day on this task. There is always a backlog of this work and the workload fluctuates on a cyclical basis.

*Task 2, Open Market Purchases.* This job requires review of vouchers for accuracy and completeness. Voucher files are researched and the vouchers themselves are coded with correct information. Correspondence must be proposed to vendors and field offices (usually form letters).

*Task 3, 1A and 1B, Obligations.* This work involves examination of loan documents which have been rejected from the computer in order to determine the cause for the rejections. Corrections are then made and information reentered to the system. There are approximately 40 different items on the loan document which could be incorrectly noted or omitted to cause rejection. The task is completed by preparation of form letters which are sent to the field notifying them of additional information needs and action taken. The 1A and 1B obligation work is considered to be "foundation" work for much of the other loan servicing activity in the central office. New employees are taught this task first, and work it exclusively. It takes at least three months for new employees to become sufficiently skilled in this task before learning other tasks.

*Task 4, 1F Closing Discrepancies.* The work of this task is necessary in order to accomplish loan closings. While the steps involved are nearly identical to those described in Task 3, 1F Closings involve much more detail and require considerably more research. This work is given only to experienced employees who are familiar with all aspects of loan research and re-entry.

*Task 5, Filling Requisitions, Regular Stock.* This is a task performed in a supply warehouse by blue collar employees. It involves checking dates of the requests and taking it to appropriate bins, where items are loaded on a cart. The address label is prepared for mailing the package to the correct location.

*Task 6, Filling Requisitions, Emergency Stock.* This task is similar to Task 5. It is performed when requisitions for materials or supplies are needed on an emergency basis which exceed the amount projected and authorized in the planning phase.