Behavioral Impacts of Flexible Working Hours

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This paper presents new results on the behavioral responses to flexitime, a system of flexible working hours. Flexitime is of particular interest as a transportation systems management strategy that has potentially significant impacts on work schedules, travel behavior, traffic congestion, and energy consumption. Although it has generally been established that flexitime has been beneficial to both employers and workers, very little evidence on individuals' activity and travel responses exists. Consequently, this study, based on a flexitime experiment at a large government research and development facility, was designed to permit a rigorous assessment of these behavioral impacts and their implications for transportation planning. Significant changes in work scheduling were observed with a majority of workers who shifted their average work arrival times by more than 15 min. Individuals also exhibited considerable daily variation in their work schedules. These findings suggest that workers derive significant benefits from the opportunity to vary work schedules. Preliminary econometric models indicate that work-scheduling responses to flexitime are strongly influenced by socioeconomic and life-cycle characteristics, savings in travel time, and activity patterns. Flexitime also had a large impact on the journey to work. Approximately 9 percent of the workers changed modes in response to flexitime; for those who shifted mode, there were small net changes in favor of ridesharing and public transport. A majority of workers experienced savings in travel time due to flexitime. These savings are estimated to have caused a 5.8 percent saving in fuel consumption for vehicles driven to work. These findings suggest that flexitime may be an important strategy for reducing energy consumption.

This paper presents new results on the behavioral responses to flexitime, a system of flexible working hours under which workers are permitted to select their daily schedules within certain predefined limits. Flexitime has been implemented by an increasing number of firms and institutions in Europe and the United States and is of particular interest as a transportation systems management stragegy that has potentially significant, but largely unknown, impacts on traffic congestion and energy consumption. By removing a constraint on the choice of work schedules, flexitime permits individuals to vary their activity patterns and travel behavior with benefits that result from more satisfactory activity and travel choices. The timing and mode of work trips are among the principal travel choices that may be modified in response to flexitime. Assessment of these impacts is essential to an understanding of the aggregate policy consequences of flexible working hours. Consequently, this study, which makes use of an extensive data base assembled in order to evaluate a flexitime experiment at a large government research and development facility, was designed to permit a rigorous assessment of these behavioral impacts and their implications for transportation planning.

PREVIOUS RESEARCH

Although it has generally been established that flexitime has typically been beneficial to both employers and workers (1,2), there is some controversy among urban transportation analysts about whether flexible-work-hour programs are consistent with the goals of reducing congestion, energy consumption, and air pollution through increased use of carpools and transit (2). Currently, very little and somewhat conflicting empirical evidence on individuals' activity and travel responses exists (3). A study of flexitime at a suburban employment site in Reading, England (1), found few changes in activities and travel behavior, although many workers chose earlier work schedules. Their travel behavior responses, however, may have been severely constrained by short journeys to work and the absence of attractive alternative travel options. Similarly, a study of variable working hours in Ottawa (4) found no basis for concluding that flexitime has any impacts on mode split but noted increased dispersion of work schedules. In contrast, a shift toward carpools was noted in a demonstration program in Toronto (5) and a shift toward carpools and public transit in an experiment in Sacramento (2). However, the Ottawa, Toronto, and Sacramento studies were confounded by gasoline shortages and changes in transit service (3), which is one reason why further research is needed to establish and explain the impacts on mode split of flexitime. Although it seems clear that, when given the choice, individuals will choose to shift their work schedules, virtually no analysis has been made of how their responses vary with sociodemographic characteristics, travel options, or activity patterns.

Another important question concerns the stability of decisions about work schedules (3). The hypothesis that individuals will exhibit considerable variability in their daily work schedules when freed from fixed hours of work is suggested by a prospective attitudinal study by Tannir and Hartgen (6) that found that favorable views toward flexitime were motivated largely by an individual's desire for increased flexibility in activity schedules. Because of its implications for transport planning, this hypothesis also needs to be examined empirically.

DESCRIPTION OF THE FLEXITIME EXPERIMENT

The basis for this study is a flexitime experiment conducted at the U.S. Department of Transportation's Transportation Systems Center (TSC) in Cambridge, Massachusetts. More than 600 persons are employed at this facility, which is located in a dense and congested area of the Boston region that enjoys high accessibility by all modes of urban transport.

The flexible program of work hours adopted has a midday core from 9:30 a.m. to 3:30 p.m., during which employees are required to be present except for their lunch period. Employees may arrive between 7:00 and 9:30 a.m., and may leave after they have worked 8 h. Employees are not permitted to work through lunch in order to leave 0.5 h earlier. The program allows employees to opt for a lunch longer than 0.5 h as long as they work 8 h between 7:00 a.m. and 6:00 p.m.

Study Approach

The major impacts on individuals anticipated in response to flexitime included changes in work schedules, travel behavior, nonwork activity patterns, and attitudes. These changes, which are studied in this paper, reveal improvements in individuals' satisfaction with their travel and activity choices and, thus, are important indicators of the benefits of flexitime realized by workers.

The data for the analysis in this paper come from two sources: (a) a survey administered to all employees and (b) arrival and departure time data for a sample of 300 TSC employees for approximately 100 days. An excellent response rate in excess of 75 percent was achieved--479 individuals returned the survey instrument. Since not all respondents answered every question, the sample size for some results based on the survey is smaller.

For this study, only arrival and departure times for those days the employee was at TSC for a full workday (i.e., not on leave or travel for any part of the workday) were used. Part-time employees were also excluded from the analysis. Only normal workdays were used for the analysis of work scheduling under flexitime so that the effects of flexitime would not be confused with other factors, such as attendance at outside meetings or the use of leave.

Impacts on Work Schedules

The average arrival and departure times of the staff are examined below along with measures of the variability of individual schedules. Significant benefits from the ability to vary work schedules can be inferred from the data.

The distribution of mean work arrival times is presented in Figure 1. The distribution approximates a normal curve and has a mean of 7:55 a.m. and a standard deviation of 32 min. The fact that the distribution is approximately symmetrical means that, although a majority of employees' average work schedules are close to an 8:00 a.m.-4:30 p.m. day, the remainder are fairly evenly distributed between early and late flexers. The shift in the mean of the distribution makes it clear that many TSC staff have chosen work schedules that are significantly different from those prior to flexitime. Approximately 56 percent arrive at or before 8:00 a.m. Another 14 percent arrive at or after 8:30 a.m. These findings suggest that there are large differences in staff preferences for the choice among alternative work schedules.

In contrast to many other programs of flexible working hours, the experiment at TSC permitted staff to vary their working hours from day to day without prior notice. Analysis of the data on arrival and departure times indicates that many individuals exhibited considerable variation in their daily work schedules rather than merely shifting to a different but relatively fixed work pattern. The table below indicates the percentage of individuals' arrival times that deviated from their average arrival times by more than 10 min.

Percentage of Arrival Times That Deviated from the Individual's Average Arrival Time by More Than 10 min	Percentage of TSC Staff
0-25	21
25-50	26
50-75	29
75-100	24

More than half of the workers deviated from their mean work arrival times by more than 10 min more than half of the time. This wide variability in individuals' arrival time behavior suggests that this aspect of the opportunity for flexible working hours also affords them significant benefits.

In the survey, staff were asked to indicate factors that influenced their work schedule decisions. Almost three-quarters of the respondents reported the scheduling of after-work activities as a factor in determining their work schedules. The desire to avoid congestion also affected work schedule and travel choices. More than two-thirds of the respondents indicated that it was a factor in their work schedule decision; about one-third of the survey respondents indicated it was the most important determinant. Other determinants of work hours, each mentioned by about one-quarter of the respondents, included before-work activities, work-related reasons, schedules of other household members, family meal schedules, sleep patterns, and carpool arrangements.

Obviously a wide variety of factors may be significant determinants of work scheduling decisions observed here through the choice of a work arrival time. In addition to the motives noted above, work schedule decisions are hypothesized to be a function of the socioeconomic characteristics of the individual, the travel options available, and nonwork activity patterns. Socioeconomic characteristics, particularly life-cycle, are thought to be important determinants of individual's work schedules under flexitime. Children's schedules may also influence parent's choices of arrival time at work and, particularly if the children are on a fixed schedule, result in their parents' arrival times being relatively consistent.

Travel options and mode choice are also thought to enter into the work scheduling decision. For example, carpoolers are apt to be relatively consistent in their work arrival times and the variability of arrival times of transit users are dependent to some degree on the reliability of the transit system.

Another determinant of an individual's arrival time at work is probably nonwork activities. These can include a desire to participate in a sports activity, to shop, or to enjoy entertainment and recreation both in and out of the home.

Arrival Time Modeling

Since many factors influence an individual's decision about work arrival time, multivariate analysis is necessary to determine the relative importance and significance of each. To test the hypotheses that socioeconomic characteristics, travel options, and patterns of nonwork activities are significant determinants of an individual's arrival time at work, a preliminary, exploratory model of individuals' mean arrival times was developed. A linear regression model was selected for this initial analysis, although the use of more-sophisticated econometric techniques is anticipated for further work on this data set.

The independent variables used in the model are described in Table 1. The socioeconomic and life-cycle characteristics include dummy variables for workers of different ages; the number of children in various age groupings; the number of full-time workers in the household; the ratio of the number of automobiles to the number of licensed drivers in the household; and the worker's grade (GS) level, which is a proxy for occupation and income.

The travel variables used in this preliminary analysis were dummy variables for mode choice and travel time. For the model we assume that decisions about mode choice typically precede decisions about work schedules although, of course, the characteristics of alternative work schedules enter decisions about mode choice. (Consequently, some individuals will change both mode and work schedules at the same time in response to flexitime.) One way that travel options enter the work-schedule model is in their effect on mode choice. Savings in travel time from alternative work schedules enter the model through dummy variables whose coefficients reflect the deviation from peak-period arrivals for individuals who cited the desire to avoid congestion as a primary motive in making decisions about work schedules. Two separate dummy variables are needed to reflect shifts to both earlier and later work schedules. Travel time to work is also included in the model in order to test for the effects of location and journey duration.

To capture the effects of nonwork activity patterns, variables were constructed based on the reported primary importance to the individual of after-work activities and schedules of other household members in influencing their decisions about work scheduling. As above, two dummy variables were used to measure the effect of schedules of other household members as the major determinants of the individual's work schedule.

Figure 1. Distribution of employees' mean arrival times.

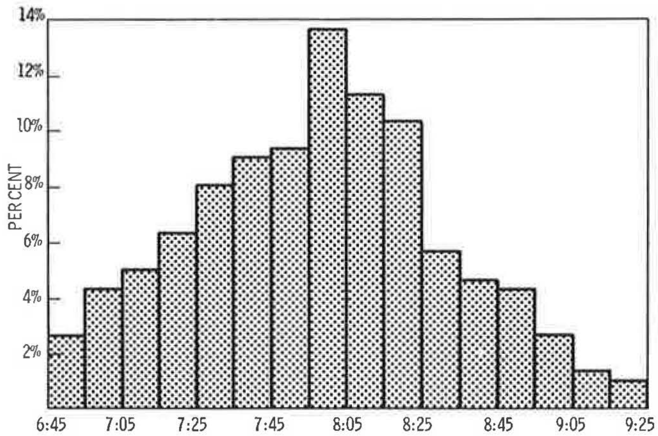

Table 1. Model variables.

Variable	Description
Travel	
TRANSIT	1 if transit user, 0 otherwise
CARPOOL	1 if carpooler, 0 otherwise
TTIME	Travel time in hours
BCONG	1 if avoiding congestion is most important factor determining work schedule and mean arrival time is before 8:15 a.m., 0 otherwise
ACONG	1 if avoiding congestion is most important factor and mean arrival time is after 8:15 a.m., 0 otherwise
Socioeconomic and life-cycle	
GS	GS salary level
A3039	1 if between 30 and 39 years old, 0 otherwise
A4049	1 if between 40 and 49 years old, 0 otherwise
A50	1 if 50 or older, 0 otherwise
CU5	Number of children under 5
C513	Number of children 5-13 years old
C1418	Number of children 14-18 years old
FWKR	Number of full-time workers in household
OTHH	Number of others in household not counted as children or full-time workers
AUTODR	Automobiles in household per licensed driver
Self-reported determinants of work scheduling	
AFT	1 if after-work activities were ranked as most important factor in determining work schedule, 0 otherwise
BSCHED	1 if schedules of other household members most important and mean arrival time is before 8:15 a.m., 0 otherwise
ASCHED	1 if schedules of other household members most important and mean arrival time is after 8:15 a.m., 0 otherwise

The results of estimation of two versions of the disaggregate work-arrival-time model are shown in Table 2. Model 1 does not include the dummy variables that represent the factors cited by individuals as the primary determinants of work schedules. These are included in model 2. The results from these models are quite encouraging in that almost all the coefficients have the correct sign, and many of the factors hypothesized to influence decisions about work schedules were statistically significantly different from zero. (For models such as these that have a large number of degrees of freedom, t-statistics that have absolute values in excess of 1.65 imply significance at the 90 percent confidence level.) The degree of explanation achieved was acceptable, especially for a disaggregate model.

The coefficients for both model 1 and model 2 are quite similar and convey important findings with respect to work schedule behavior under flexitime. Specifically, the models indicate that sociodemographic characteristics are important determinants of flexitime impacts, which suggests that these impacts may vary considerably from place to place as a function of the distribution of the characteristics of workers and their households.

Mean arrival times are later for individuals who have longer travel time, higher salaries, and use transit. Mean work arrival times are earlier for those who have higher numbers of children and other members of the household. The models also indicate that older individuals have earlier arrival times than others. Interestingly, workers who have children under five years old choose earlier schedules than those who have older children. This perhaps reflects the earlier schedules of young children and their parents' desire to spend time with them. Participation in a carpool and the number of automobiles per driver were not significant in either version of the model.

With fuller specification of model 2, the explanatory power of the model, as measured by R^2, was substantially increased. The coefficients of the congestion variables are significantly different from zero, and their magnitudes suggest that relatively large shifts are made in some individuals' mean arrival times to avoid congestion. Similarly, schedules of other household members, particularly for those who have late arrival times, are significant determinants of work scheduling.

Models were also developed with the same specifications in an attempt to account for the variability of individual work schedules. These models, which have the standard deviation of individual work arrival times as the dependent variable, are presented in Table 3.

The explanatory power of these models is not as great as that of the model for mean arrival time. However, the signs of the significant coefficients are in the direction expected. The models indicate that carpooling decreases variability in arrival times. Variability in work schedules decreases with age; in fact, the magnitudes of the coefficients suggest that persons 50 years old or older are much more consistent in work schedules than are other employees. The coefficient of the number of children under five years old is negative, significant, and relatively large, which is possibly a reflection of the constraints young children impose on schedule variability. The model indicates

Table 2. Models of individual's mean arrival time.

	Model 1		Model 2	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	7.615	41.385	7.884	47.632
TRANSIT	0.112	1.133	0.123	1.402
CARPOOL	-0.045	-0.607	0.043	0.662
TTIME	0.164	1.232	0.131	1.150
GS	0.047	3.793	0.027	2.476
A3039	0.075	0.716	0.059	0.652
A4049	-0.141	-1.303	-0.122	-1.305
A50	-0.457	-3.888	-0.351	-3.447
CU5	-0.244	-3.434	-0.168	-2.769
C513	-0.081	-1.931	-0.057	-1.605
C1418	-0.059	-1.579	-0.062	-1.929
FWKR	-0.035	-0.739	-0.152	-1.290
OTHH	-0.049	-1.218	-0.045	-1.314
AUTODR	0.025	0.266	0.008	0.104
BCONG			-0.376	-5.659
ACONG			0.655	5.777
AFT			-0.072	-0.919
BSCHED			-0.127	-1.061
ASCHED			0.451	3.479
R^2	0.1809		0.4236	

Table 3. Models of the standard deviation of an individual's mean arrival time.

	Model 1		Model 2	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	0.462	4.424	0.5392	4.984
TRANSIT	-0.013	-0.233	0.017	0.299
CARPOOL	-0.054	-1.250	-0.019	-0.438
TTIME	0.0127	0.166	-0.009	-0.128
GS	0.0235	3.291	0.019	2.625
A3039	-0.038	-0.627	-0.039	-0.658
A4049	-0.092	-1.489	-0.085	-1.382
A50	-0.209	-3.101	-0.191	-2.874
CU5	-0.148	-3.633	-0.135	-3.398
C513	0.019	0.808	0.260	1.118
C1418	-0.036	-1.705	-0.036	-1.702
FWKR	-0.022	-0.793	-0.029	-1.114
OTHH	0.009	0.373	0.006	0.246
AUTODR	0.017	0.321	0.008	0.163
BCONG			-0.077	-1.769
ACONG			0.287	3.811
AFT			-0.016	-0.304
BSCHED			-0.083	-1.064
ASCHED			-0.038	-0.448
R^2	0.124 97		0.1991	

that other factors that reduce the variability of work arrival include the number of full-time workers and the number of older children. Earlier arrival times are planned either to avoid congestion or because of the schedules of other household members.

The variables significant in increasing variability in work schedules are GS level and later arrival times to avoid congestion. The number of children 5-13 years of age also contributes to variability in work arrival time. This may be due to parents' accommodating the busy extracurricular schedules of many preteens.

Before we examine the impacts on travel and activity choice suggested in the above discussion of individuals' decisions about work schedules, we first consider some of their aggregate consequences on work schedule patterns at TSC. These aggregate data are relevant to forming a management perspective on flexitime and also offer some additional insights into individual decision making.

Figure 2 illustrates the mean arrival time at TSC for each day in the sample. Note that, for most days, the average arrival time of employees at TSC is a little earlier than 8:00 a.m. The daily average arrival time is relatively consistent; almost all the average arrival times fall within a 15-min interval.

The graph of average daily arrival times suggests that there is a trend to later arrival in the fall and earlier arrival in the spring. This trend is correlated with and may be due, at least in part, to seasonal variation in the hours of daylight.

In addition to the seasonal trend, there also appears to be a day-of-the-week trend in work schedules. As illustrated in Figure 3, the average daily arrival times for Mondays are later than for Fridays. This difference, statistically significant at the 98 percent confidence level, suggests that work schedules are modified in order to extend the duration of the weekend.

IMPACTS ON TRAVEL TO WORK

Results from the survey show that flexitime has had a very significant impact on employee travel to work; it is estimated that 9 percent of TSC workers shifted modes to work due to flexitime. The percentage of respondents who drove dropped from 42.4 to 39.5 percent, and carpool participation increased from 35.4 to 37.4 percent. Transit patronage also increased slightly, from 21.5 to 22.5 percent. Those who switched modes due to flexitime had a significantly higher average GS level than those who did not and they were predominantly female.

Survey evidence also suggests that flexitime may have had an impact on automobile ownership. About 6 percent of the respondents indicated that flexitime had influenced the number of motor vehicles operated by their household. For most of these households, flexitime enabled them to decrease the number of vehicles operated.

As indicated in Table 4, many TSC employees reported savings in travel time due to flexitime. More than 60 percent of the automobile drivers and carpoolers who had not changed modes reported savings in travel time due to flexitime. All of those who switched to driving alone and carpooling reported savings in travel time; this suggests that savings in travel time were a major influence on these mode shifts.

A very small percentage of TSC staff who drive to work alone or carpool reported an increase in travel time to work. Of course, travel time increases due to flexitime are freely chosen and thus presumably offset by other benefits to each traveler. Some transit users (30 percent) also reported savings in travel time. Interestingly, more than 40 percent of those who switched to transit as a result of flexitime reported an increase in travel time.

The shift to temporally dispersed work schedules also implies further significant impacts on travel from flexitime. Since many TSC employees are traveling to work outside the peak commuting times, they have reduced their contribution to peak-period congestion on the highway and transit networks. In addition, those who are now driving during periods of less congestion are using less energy because they travel at more fuel-efficient speeds and with less stop-and-go driving.

For the range of urban driving speeds [up to 60 km/h (35 mph)], an increase in speed generally improves fuel efficiency. A rough calculation of energy savings was made by using the travel time savings reported in the survey and by using data developed at the Oak Ridge National Laboratory (7) on energy efficiency by speed, which takes account of the vehicle fleet mix and the range of urban driving conditions. For those who reported

Figure 2. Average arrival time of staff for sample days.

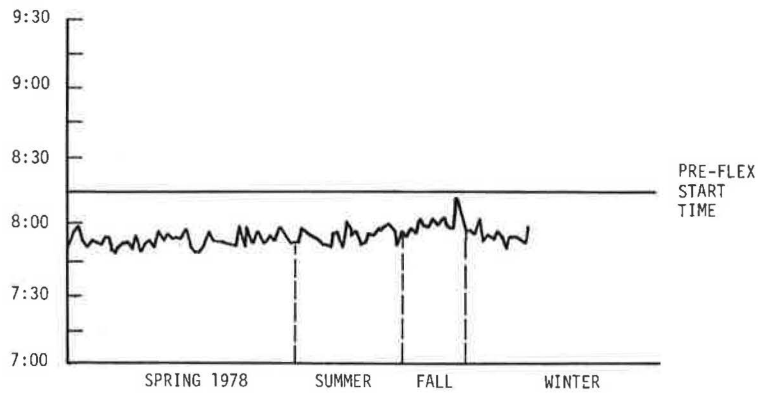

Figure 3. Average daily arrival time by day of the week.

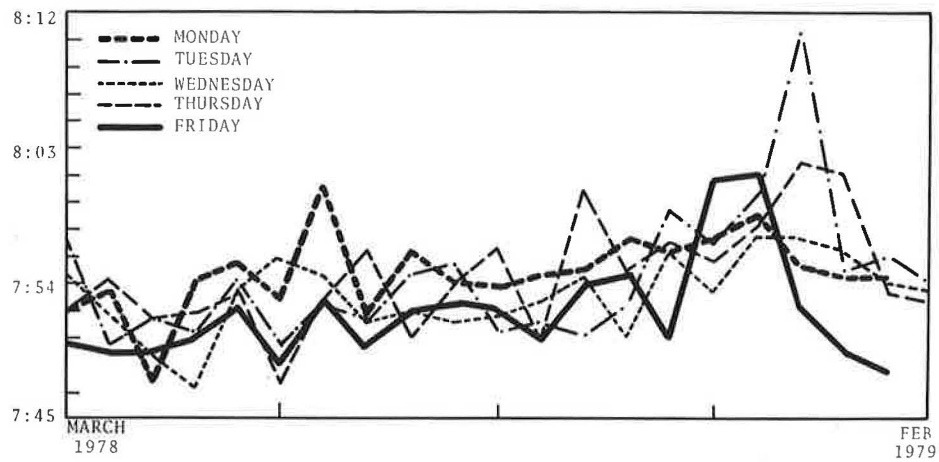

Table 4. Savings in travel time by mode.

Effect of Flexitime on Average Travel to Work	Drive Alone (%)	Carpool (%)	Transit (%)
For those who did not change modes			
Increase it	2	2	3
No effect	34	28	65
Decrease it[a]	63	68	30
Do not know	1	2	2
For those who changed modes due to flexitime			
Increase it			44
No effect			
Decrease it[b]	100	100	56
Do not know			

[a]For those who decreased their travel time, the average decrease was 13.7 min for those who drive alone, 10.74 min for those who carpool, and 11.37 min for those who use transit.
[b]For those who decreased their travel time, the average decrease was 18.23 min for those who drive alone, 13.0 min for those who carpool, and 11.4 min for those who use transit.

improvements in travel time, fuel efficiency improved by 11.7 percent [from 6.3 km/L (14.9 miles/gal) to 7.0 km/L (16.6 miles/gal)], and fuel consumption was reduced by 9 percent [from 3.8 L/trip to 3.4 L/trip (1 gal/trip-0.9 gal/trip)]. This implies a 7.6 percent overall improvement in fuel efficiency for vehicles driven to TSC and an overall 5.8 percent savings in fuel.

SCHEDULING AND ACTIVITY CHANGES

The survey results indicate that, consistent with prior expectations, employees have taken advantage of flexitime to make their personal schedules more convenient and to increase their participation in nonwork activities. More than 75 percent of the employees reported that flexitime enabled them to spend more time with their families and to increase participation in nonwork activities. Only 29 percent reported that flexitime had little or no effect on increasing the amount of time they were able to spend with their families.

Apparently flexitime's impacts on decisions about activity patterns have also resulted in significant decreases in the use of sick leave and short-term annual leave. Thirty-six percent and 50 percent of employees reported reductions in these leave categories, respectively. In addition to the benefits to staff from the ability to substitute varied work schedules for leave, benefits also accrue to the government from the reduced use of sick leave.

Attitudes Toward Flexitime

Flexitime is extremely popular with employees. Approximately 95 percent of the respondents like flexitime and would like to see it continued; this feeling is shared by supervisors and nonsupervisors.

Flexitime has also improved employee job satisfaction. Sixty-five percent of the employees who responded report that flexitime has increased their job satisfaction; only 1 percent reported that their job satisfaction had decreased due to flexitime. Reasons given for the improvement in their job satisfaction due to flexitime included that it is convenient, it is more professional, it allows them more responsibility and independence, the work environment is more relaxed, and it is evidence of management's concern for employees. More than 20 percent of the respondents indicated that they would like additional flexibility in work schedules.

Organizational Impacts

Perhaps the biggest benefit of flexitime to TSC is its positive effect on morale; more than 85 percent of the respondents felt that morale had improved as a result of flexitime. In addition, results from the survey suggest that flexitime has improved productivity. This assessment revealed no significant work-related problems due to flexitime. Only 15 percent of the respondents indicated on the survey that they had experienced any work-related difficulties due to flexitime. The most-often-cited problems were difficulty in scheduling meetings (cited by 5 percent of the respondents) and difficulty in interacting with co-workers (6 percent).

Flexitime is as popular with supervisors as it is with their staff. Supervisors share the assessment that flexitime has improved morale and that it has increased productivity. However, larger percentages of supervisors than of staff reported work-related difficulties due to flexitime. Many had difficulty in interacting with co-workers (25 percent) and scheduling meetings (20 percent). Flexitime has virtually eliminated the problem of tardiness. This has reduced the burden on supervisors to discipline tardy employees and is inferred to have increased the number of hours worked by previously tardy employees. Furthermore, flexitime has reduced the number of work hours missed due to inclement weather because travel delays are made up at the end of the day.

An unanticipated impact of flexitime is reflected in the fact that more than one-fourth of the professional staff indicated that they voluntarily increased the average numbers of hours they work in response to flexitime; the average increase was reported to be about 30 min. Reasons stated for the increase included the desire to finish a task and a reluctance to leave while project co-workers remain. Only 3 percent of the respondents felt that flexitime led to a reduction in the number of hours they worked. Among the reasons given were bus schedules and clock watching.

The costs of flexitime have been minor. It was expected that overhead would increase by a small amount due to the need to keep the building open for a longer period of time each day. However, due to revised operating procedures, any costs that accrued from flexitime were offset, and the cost of facilities operation during the flexitime experiment remained about constant.

FUTURE WORK

This analysis has indicated that flexitime has potentially large and socially beneficial impacts on individuals' activity and travel choices. Further research, therefore, seems warranted to investigate the applicability of flexitime to a wide variety of different (nongovernmental) work settings; to explore the potential of flexitime programs to achieve energy conservation in the large, severely congested urban areas; and to corroborate the empirical findings on behavioral impacts obtained in this study. Improvements in modeling individual responses to flexitime are also warranted because of the models' usefulness in understanding and predicting behavior in other settings. In particular, model forms that reflect the underlying choice structure more appropriately should be investigated; variables that describe the travel options available to workers should be incorporated; and daily arrival times ought to be modeled with seasonal and day-of-the-week effects included.

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REFERENCES

1. M. Shapcott and P. Steadman. A Study of the Introduction of Flexible Working Hours in Reading. Report to the Civil Service Department (G.B.), Jan. 1977.
2. D.W. Jones, Jr., T. Nakamoto, and M.P. Cilliers. Flexible Work Hours: Implications for Travel Behavior and Transport Investment Policy. Institute of Transportation Studies, Univ. of California, Berkeley, Dec. 1977.
3. P.P. Jovanis and A.D. May. Flexitime Travel Choice: A Literature Review and Framework for Analysis. Institute for Transportation Studies, Univ. of California, Berkeley, 1979.
4. R. Safavian and K.G. McLean. Variable Work Hours: Who Benefits? Traffic Engineering, March 1975.
5. A.M. Greenberg and D.M. Wright. Staggered Hours Final Evaluation, Queens Park Demonstration, Ontario. Ontario Ministry of Transportation and Communications, Downsview, 1975.
6. A.A. Tannir and D.T. Hartgen. Who Favors Work-Schedule Changes and Why. TRB, Transportation Research Record 677, 1978, pp. 53-58.
7. A.B. Rose; Oak Ridge National Laboratory. Energy Intensity and Related Parameters of Selected Transportation Modes: Passenger Movements. U.S. Department of Energy, Jan. 1979.
8. A.A. Tannir and D.T. Hartgen. Traffic Impacts of Work-Schedule Changes in Medium-Sized Urban Areas. TRB, Transportation Research Record 677, 1978, pp. 58-61.

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