STAGGERED WORK-HOUR PROJECT IN LOWER MANHATTAN

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On April 1, 1970, about 50,000 employees of some 50 public and private organizations in lower Manhattan voluntarily changed their work hours in a closely monitored program to determine whether such work schedule changes would help relieve peak-hour transportation congestion. This is one of the most concentrated central business districts in the world, occupying a little more than 1 square mile and having a daytime employee population of about 450,000 men and women, of whom some 65 percent began work at 9:00 a.m. and quit at 5:00 p.m. before the project started. The principal thrust of the project was to determine whether such peaks can be reduced. Beginning in January 1969, the Port Authority undertook a staggered work-hour experiment involving some 3,000 members of its own staff. The major findings were that a system of staggered work hours was feasible for continuing on a permanent basis and was fully accepted by most employees. Moreover, the project resulted in perceived improvements in commuting for many employees and in better elevator service. The project began on April 1, 1970, and has had significant effects in relieving peak-hour congestion on some of the transportation facilities serving lower Manhattan.

•THE ENTIRE Port of New York Authority managerial and clerical work force, some 2,400 persons working in Port Authority headquarters offices at 111 Eighth Avenue at 15th Street in Manhattan, participated in early 1969 in a 4-month project designed to indicate whether a system of staggered work hours would be feasible for this and other business organizations in Manhattan.

The principal objective of the study was to determine whether modest readjustments of work hours by major employers in Manhattan would help to alleviate the surge of traffic that now occurs during a brief time within the morning and afternoon peak hours on the Port Authority Trans-Hudson (PATH) system and other downtown public transportation systems. As operators of PATH, the Port Authority has a vital interest in improving the pattern of passenger flow, particularly because commuter traffic on the interstate rail line is now marked by severe morning and evening peaking.

Improvements that result from a feasible system of staggered work hours would not be limited to PATH, however. They would, undoubtedly, have an effect at the major city subway and commuter railroad stations and also at elevator banks of the tall office buildings where most downtown workers are employed.

PORT AUTHORITY PROJECT

The decision to have its own staff engage in the experiment was made after research indicated that few cities or organizations had issued documented studies on the effects of the staggered work-hour programs they may have tried. There have been a number of theoretical studies on staggered work hours—including a landmark study done by Lawrence Cohen in New York entitled Work Staggering for Traffic Relief and published

Sponsored by Committee on Passenger and Freight Transportation Characteristics and presented at the 50th Annual Meeting.

in 1968—but very little data could be found detailing the actual effects of staggered work hours on the companies or cities who tried it.

After determining to try the experiment, the Authority was then faced with the question of what work schedules should be included. For experiment's sake, it would have been desirable to try a very wide range of schedule alternatives such as 15 min, 30 min, 60 min, and 90 min before and after the normal work schedule. It was feared, however, that very large schedule changes might unduly disrupt the agency's work and result in employee morale problems. The Authority, therefore, settled on splitting the headquarters work force roughly into thirds on three different schedules: one was the normal 8:45 a.m. to 4:45 p.m.; one was 30 min earlier from 8:15 a.m. to 4:15 p.m.; and one was 30 min later from 9:15 a.m. to 5:15 p.m. This decision was made as a result of two considerations:

1. Thirty minutes on each side of the regular schedule was the point at which employees had begun to express severe reservations in the sociological studies reported in Work Staggering for Traffic Relief.
2. Given the intensive peak-hour problem in New York during which an extremely high percentage of the employees start at 9:00 a.m. and quit at 5:00 p.m., a schedule change of as much as 30 min on each side of 9:00 a.m., if found feasible, could substantially relieve the extremes of the peak-hour problem.

In implementing the schedule changes, the Authority felt that greater acceptance of the program could be achieved if the individual department directors had some voice in determining the schedules their units would work. The department directors' views were, therefore, solicited and, as it turned out, a sizable number preferred the early schedule, some wanted to retain the normal Port Authority 8:45 a.m. to 4:45 p.m. schedule, and some opted for the later schedule. The numbers of staff on each schedule worked out voluntarily to be 929 for the 8:15 a.m. to 4:15 p.m. schedule, 795 for the 8:45 a.m. to 4:45 p.m. schedule, and 705 for the 9:15 a.m. to 5:15 p.m. schedule.

In some departments, all staff went on one of the new schedules; in others, the directors split their units internally with some groups working the early schedule and other groups working the normal or late schedule. In addition, three Port Authority units volunteered during the experiment to work all three schedules. These units, which worked 1 month on the early, 1 month on the normal, and 1 month on the late schedule, provided valuable comparative data on the effects of each of the three schedules. Every effort, moreover, was made during the experiment to avoid personal hardships that arose from the schedule changes. Supervisors were encouraged to make alternative arrangements if their employees were encountering severe problems in coming in earlier or later.

The employees who participated in the experiment lived in many different locations in the region, a pattern of residence dispersal similar to that of many New York-based firms. Almost 50 percent of the employees who participated live in the five boroughs of New York City; 34 percent west of the Hudson River in New Jersey and Rockland County, New York; 13 percent on Long Island; and the remainder in Westchester, Connecticut, and upstate New York.

In tracing the effects of staggered work hours on the organization and its employees, Port Authority analysts and systems engineers recorded and analyzed data in three main areas:

1. Attitudes of employees and supervisors on the effects of the various schedules both at work and at home;
2. Effects of the various schedules on building service systems and on unit efficiency; and
3. Records maintained by employees of average commuting time and indicators of commuting comfort and convenience.

An important criterion of the feasibility of staggered work hours is the willingness of a firm's employees to come in and leave work on schedules differing from their normal one. Theoretical studies on staggered work hours indicated in general that employees are quite flexible on this point and would readily accept schedule changes of up

to 30 min earlier or later if an organization decided to change. In the Port Authority research, we had the great advantage of being able to change the hours of a large group of employees and then to ask them to give their reactions.

The first aim of the attitude study was to determine the influence of staggered work hours on people's attitudes, opinions, and subjective assessments concerning work efficiency both from their own perspective and from that of those persons responsible for evaluating their work performance. Of interest here was whether different scheduling arrangements influenced the way people viewed their own effectiveness at work and whether their differing schedules affected the way in which supervisors viewed their performance.

The second aim of the study was designed to measure and catalog the effects of the experiment at home and included such areas as whether the changed hours affected the involvement of people in various community activities in the evening and whether mealtime schedules were adversely affected.

In the attitude study, questionnaires were sent to approximately 50 percent of the employees, drawn at random, who participated in the experiment. Of these, a total of 809 persons returned the questionnaires within a specific 2-week time period. This return rate of about 70 percent is unusually high for a study of this type, and, as far as could be determined, those returning the questionnaires did not differ in any significant way from those not returning them. We, therefore, felt it valid to generalize from the findings of the sample to the complete universe of Port Authority personnel.

The general findings of this study were that a system of internal staggering of work hours can work for the Port Authority on a permanent basis and will be accepted by most people despite problems for some groups involved. About 70 percent of the employees who were sampled had a favorable overall reaction to the experiment, and an even larger majority of persons indicated that they would be willing to recommend a staggered work-hour schedule to their friends in other organizations. The results of the staff's assessment of the reaction of personnel to the staggered work hours experiment is given as follows:

Reaction	Percent
Strongly favorable	29.8
Somewhat favorable	39.1
Somewhat unfavorable	21.7
Strongly unfavorable	9.4
Total	100.0

The foregoing data are based on answers to the question, "Now that the staggered work-hour experiment has been in effect for several weeks, what is your overall reaction to it (whether or not you are on a new schedule)?"

The New School for Social Research, which conducted the employee attitude study, reported a great deal of variation among Port Authority staff on the degree of satisfaction with their assigned schedules. In almost every respect, both at work and at home, those on the earlier 8:15 a.m. to 4:15 p.m. schedule showed the greatest satisfaction with the schedule changes. As compared to their own experience on the normal 8:45 a.m. to 4:45 p.m. schedule, the earlier group was more satisfied with their commuting experience, was not particularly disturbed about meal planning or other effects at home, and even felt they were more efficient in their jobs. In fact, some 35 percent of the individuals reported more overall satisfaction with their jobs under the early schedule than under the original schedule. It should be remembered that the experiment took place during the dark winter months of the year, and it could be expected that a liking for the earlier schedule would be even greater during the spring and summer.

Staff opinion on the 9:15 a.m. to 5:15 p.m. schedule was also strong but in the opposite direction. Those on the later schedule reported problems with transportation and with arrangements at home and feelings of decreased efficiency at work when compared to the normal 8:45 a.m. to 4:45 p.m. schedule.

This dissatisfaction with the 9:15 a.m. schedule also was prevalent when the points of view of supervisors alone were considered. Almost 85 percent of the supervisors on the 8:15 a.m. schedule saw it as convenient, whereas only 35 percent of the supervisors on the 9:15 a.m. schedule saw it as a convenient schedule. In terms of unit efficiency on the various schedules, more than half of the supervisors on both the 8:15 and 9:15 a.m. schedules reported "no change" in efficiency. However, some variation among supervisors on questions of increased or decreased unit efficiency yielded the following information:

	Percent of Supervisors by Schedule		
Changes in Efficiency	8:15	9:15	8:45
Increased	20.8	6.1	—
Decreased	15.2	37.4	—

The foregoing data are based on answers to the question, "Compared to the old schedule, is there increased efficiency, decreased efficiency, or no change in the efficency of your unit?" The results here are also in the direction of other categories; that is, the earlier schedule appears to have fewer negative effects than the later one.

This attitude pattern is again confirmed in a vivid fashion in one of the final parts of the questionnaire that asked Port Authority employees to indicate whether they would be willing to work certain schedules permanently. As can be seen in the following data, almost 83 percent of those on the 8:15 a.m. schedule would be willing to work this experimental schedule permanently. In fact, they indicated a greater preference for this schedule than the one they had been following for years—the 8:45 a.m. to 4:45 p.m. schedule.

	Percent of Employees by Experiment Schedule		
Proposed Schedule	8:15	8:45	9:15
8:00	59.5	37.7	28.4
8:15	82.8	50.8	47.4
8:30	78.6	71.6	66.0
8:45	67.3	91.1	90.3
9:00	21.1	44.3	54.9
9:15	14.7	23.4	32.0

The foregoing data are the percentage of employees who answered "very willing" and "somewhat willing" to the question, "Whether or not you would look favorably on being permanently assigned to various schedules, how willing would you be to accept each of the following schedules as permanent?"

Almost 50 percent of those employees on the 8:45 a.m. and 9:15 a.m. schedule would also be willing to work the early schedule permanently, even though they had not been working it during the experiment. No similar amount of high regard for the 9:15 a.m. schedule was evidenced by those who worked it. More than 90 percent of the 9:15 a.m. group expressed a preference for the normal 8:45 a.m. schedule, and almost as many would be willing to start at 8:00 a.m. (28.4 percent) on a permanent basis as would be willing to continue starting at 9:15 a.m. permanently.

Despite the fact that there was considerable discontent (especially among those working the 9:15 a.m. schedule) with the staggered work hours experiment among some Port Authority personnel, the great majority of persons indicated that they would be willing to recommend staggered working hours to people outside the Port Authority. Evidently, even though some individuals were personally dissatisfied with their own schedule of work hours, they saw enough merit in the concept itself to recommend it to their friends in other organizations. Moreover, the sociological study showed definitively that modest

adjustments can be made in work hours, particularly to earlier time periods, without any serious disruption of organizational efficiency and with the enthusiastic cooperation of people. Even when work schedules in time periods later than the normal schedule were considered, the study indicated that negative responses would be reduced considerably if it were possible to make schedule assignments on the basis of individual preference. That is, a certain number of individuals prefer later schedules, and they will be far more positive in their reaction if they are assigned to them.

Effects of Staggered Work Hours on Unit Efficiency and Building Systems

The previous section of the paper dealt with employee views and opinions on the effects of staggered work hours at work and at home. These views and feelings are key ingredients in evaluating the feasibility of introducing new schedules in urban centers, because employee cooperation and willingness are essential to the success of any program.

During the Port Authority experiment, we were also interested in recording as much nonsubjective data as possible to assess the effects of the program. We felt that these objective or quantitative studies would complement the findings of the attitudinal survey to give a more complete picture of what happens to an organization on staggered work-hour schedules. Our studies in this area included examinations of elevator operations, cafeteria operations, and measures of employee productivity or efficiency.

Because building elevator systems are essentially vertical transit operations, elevators, particularly in high-rise office structures, are subject to the same peaking problems in the morning and evening as other transit systems. Staggering the arrival and departure times of the occupants of a building should, therefore, relieve crowding and congestion in the elevator lobbies in the morning and make it easier and faster to get an elevator at night. Both these improvements occurred in the Port Authority Building during the staggered work-hour experiment, and, moreover, it was found that elevator travel within the building during lunch hours was also faster. For example, passenger counts in the building's main lobby prior to the experiment indicated that some 900 persons entered the lobby in the peak 10-min period from 8:40 to 8:50 a.m., the height of the morning rush hour. During the experiment, the maximum number of persons entering the main lobby during any 10-min period in the morning was 550, a reduction of about 39 percent in the peak flow.

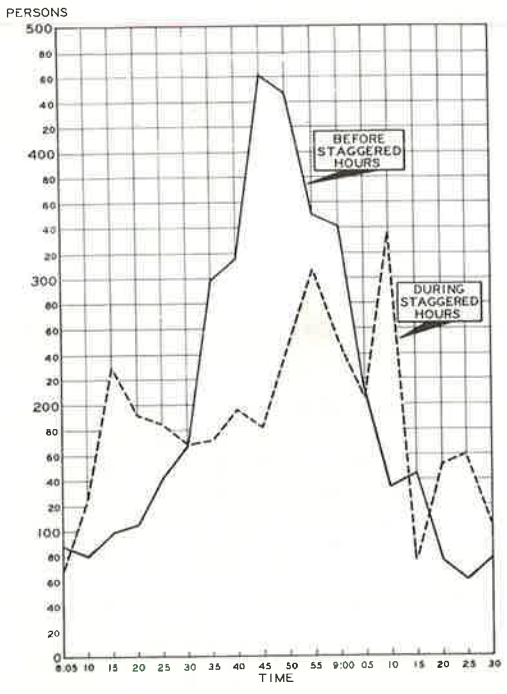

Figure 1. Arrival time and number of persons entering Port Authority Building lobby.

Figure 1 shows the arrival pattern of persons entering the main lobby of the Port Authority Building in the morning hours both before and during the experiment. The peak 15-min congestion has been reduced considerably, which has made elevator travel more comfortable for all building occupants.

Employee Efficiency and Productivity—Port Authority employees who participated in the staggered work-hour experiment were engaged principally in administrative, managerial, or professional activities. Few of the groups worked in areas where the product of their efforts could be recorded as so many units per hour or units per day. Rather, they were professional groups engaged in activities such as facility

management, engineering design, centralized purchasing, public affairs work, accounting and budgeting, and long-range planning. These and many other "headquarters" types of activities are, of course, vital to an organization but are not easily amenable to precise studies of efficiency under various work schedules.

In attempting to gather data on efficiency and productivity, the experiment coordinators, therefore, adopted a three-pronged approach:

1. In units in which the output was quantifiable, precise records of unit output were kept before and during the experiment.
2. A control group of some 100 persons in three different units kept precise logs of their starting and quitting times on all three schedules during the experiment. Furthermore, the average length of an employee's luncheon stay in the Port Authority cafeteria was calculated both before and during the experiment.
3. In the attitudinal studies, as reported earlier, supervisors and employees were asked to give their opinions on any changes in efficiency that may have resulted from the schedule changes.

Productivity Measures in Service Units—In certain service units of the Port Authority, the industrial engineers were able to develop and analyze precise production records of employees engaged in various clerical and technical tasks, such as transcribing, typing, and developing photographic print. Production logs were maintained both before and during the experiment for these activities.

In the central typing pool, the work force was split into three groups, and records of the daily and hourly production of each group were kept. Analysis indicated that the total output of the groups was not generally affected by the different schedules. There were production variations among the three groups on the different work schedules, however, particularly at the beginning and end of the work day. For example, the output of the 9:15 a.m. group during the ½-hour period at the start and the end of the work day was relatively low as a direct result of staggered hours. This occurred because the 9:15 a.m. group arrived at work just ½ hour before the customary coffee break and did not really get into full production before the break. At the end of the day, the group on the latest schedule observed employees on the two earlier shifts leave for their homes, and this resulted in another productivity decline. All of these minor declines would probably have been averted if all of the employees were working one shift either earlier or later. The disturbance caused by groups coming and leaving on the different shifts caused production to fall off temporarily, although these declines were not of major proportions.

In the photographic print laboratory, the technicians were divided into two groups during the experiment with one group working the 8:45 a.m. to 4:45 p.m. schedule and the other the 9:15 a.m. to 5:15 p.m. schedule. Analysis indicated that the productivity of the group in producing color prints increased by about 50 percent during the experiment, but productivity declined on print enlargements and reductions. These production variations were attributed more to personnel changes during the experiment than to the effects of two-shift scheduling. The supervisors did indicate, however, that the staggered scheduling did result in more efficient equipment utilization.

Measures of Punctuality—A control group of 100 persons was selected to record their precise starting and quitting times on the various schedules; a hypothesis was made that professional employees were producing when at their desks and were not producing when not at their desks. That is, production was assumed to be linear in relationship to time at the desk. For some occupations, this relationship may not be appropriate, but it was felt that it did apply to most Port Authority professional positions.

The results of these analyses showed that the length of the workday was about the same on the early, normal, and late schedules. Among the three schedules, there was a good deal of variation as to whether employees were "late" or "early" for work, but the differences were balanced out at the end of the day. That is, employees on the 8:15 a.m. to 4:15 p.m. shift came in, on the average, a little later than 8:15, but left a little later than 4:15 too. Those on the 9:15 a.m. to 5:15 p.m. shift, on the other hand, came in a little earlier and left a little earlier. In essence, then, no matter which schedule Port Authority employees were on, they worked the same number of hours.

The other factor involved in computing the average length of the workday is the duration of the lunch period. This was measured both before and during the staggered work-hour experiment. Observations here revealed that the average lunch duration during the normal 8:45 a.m. to 4:45 p.m. schedule was 35 min, but this declined to 30 min during the experiment. Although some very slight gain in efficiency might result from the 5-min difference, the bulk of the difference was probably due to differing weather conditions when the surveys were made. During the week that the 30-min time was observed, the weather was exceptionally pleasant, and people were more than likely leaving the cafeteria sooner to catch a breath of air outside. We, therefore, concluded that the duration of the lunch period was not materially affected by staggered work hours.

Supervisory Attitudes on Efficiency—As reported in the section on employee attitudes toward staggered work hours, the majority of Port Authority supervisors felt that the new schedules did not affect the efficiency of their units. Where changes in efficiency were noted, supervisors on the 8:15 a.m. to 4:15 p.m. schedule generally reported gains in efficiency while those on the later schedule reported losses of efficiency.

There were also undoubtedly certain losses of efficiency resulting from communications problems during the experiment. Port Authority employees were asked about problems of "getting in touch with others" and reported as follows:

	Percent of Employees by Schedule		
Opinion on Communicating	8:15	8:45	9:15
Much easier now	2.0	0.0	3.0
Somewhat easier now	5.7	1.4	1.9
Same as before	56.7	63.5	41.3
Somewhat more difficult now	31.2	31.6	45.1
Much more difficult now	4.4	3.5	8.7

The foregoing data are based on answers to the question, "Compared to the old schedule, how do you feel the new schedule affects getting in touch with people at work?"

More than 50 percent of those on the 9:15 a.m. schedule and 35 percent of those on the 8:15 and 8:45 a.m. schedules reported increased communications problems during the staggered work-hour experiment. It would have been surprising if such problems had not occurred. For years, the entire Port Authority headquarters group had been on one schedule, and during the experiment the various units were on three different schedules. It would take a certain amount of time for individuals to become accustomed to these changes, and the experimental period of 4 months was not long enough for this to occur. Moreover, in weighing the impact of temporarily impaired communications, supervisors and employees evidently did not feel that it was a major deterrent to their effectiveness on the job. In a question addressed directly to effectiveness, for example, supervisors and employees responded as follows:

	Percent of Employees by Schedule		
Opinion of Own Effectiveness	8:15	8:45	9:15
Much more	9.7	0.8	2.3
Somewhat more	19.7	5.3	6.2
No change	60.5	85.4	63.8
Somewhat less	9.4	8.1	25.4
Much less	0.7	0.4	2.3

The foregoing data are based on answers to the question, "In your opinion, how effective has the new schedule made you?"

The trend of earlier questions is continued, for only on the 9:15 a.m. schedule does a significant percentage of employees, 28 percent, report a reduction in overall effec-

tiveness as a result of the schedule changes. Likewise, as in earlier questions, some 30 percent of those on the 8:15 a.m. schedule reported increased effectiveness.

Therefore, with the possible exception of the 9:15 a.m. schedule, it can be inferred that, although communications difficulties appear to be an inevitable by-product of internal staggering, their impact could be expected to lessen over time as people become adjusted to changed schedules, and, in addition, they are not so severe that they curtail overall effectiveness. Furthermore, of course, these internal communications problems would probably not have occurred at all if the entire work force had shifted to one schedule, either earlier or later.

Travel Time and Ease of Commuting During Staggered Work Hours

Although there were considerable variations in travel time to and from work among Port Authority employees residing in various counties, the overall effect of staggered work hours on average commuting time for all employees did not vary by as much as 5 min from the shift with the least time to and from work to that with the most. This was a surprising result of an analysis involving the cooperative efforts of more than 1,000 employees.

A general assumption was made prior to the travel time surveys that those individuals on the two different schedules—8:15 and 9:15 a.m.—would have some difficulties in making their connections on the travel modes they use to and from work. The staff for years had become accustomed to an 8:45 a.m. starting time and a 4:45 p.m. quitting time and had made their commuting arrangements accordingly. The fact that their average commuting time was about the same on all three schedules indicates that Port Authority employees were able to make adjustments in their commuting habits without any great time losses.

For locations east of the Hudson River, it was the last of the three schedules in the experiment—9:15 a.m. to 5:15 p.m.—during which Port Authority employees generally recorded the longest travel times to and from work. West of the Hudson River, none of the schedules emerged with what could be considered a significant advantage over the other two in terms of travel time. The most noteworthy finding of the surveys on commuting time, therefore, was the relatively minor differences in average travel time on the various schedules.

In addition to recording their commuting time on the three schedules, Port Authority employees were surveyed to determine their attitudes toward various commuting conditions they encountered on their trips to and from work. Employees rated their modes of transportation as to frequency, dependability, convenience, cost, ability to make connections, and comfort. The results of this survey were also somewhat surprising in that there was so little variation in the ratings among the three schedules.

These findings on specific commuting conditions on the three schedules vary a good deal, however, from the general attitudes toward commuting discerned in the study done by the New School for Social Research. In the New School study, employees were asked how satisfied they were in commuting on either the early or late schedule as compared to the normal 8:45 a.m. to 4:45 p.m. schedule. They reported as follows:

	Percent of Employees by Schedule	
Commuting Satisfaction	8:15	9:15
More satisfied now	57.0	14.6
Less satisfied now	15.8	63.0
Equally satisfied	27.2	22.4

The foregoing data are based on answers to the question, "Comparing your commuting experience on the 8:45 a.m. to 4:45 p.m. schedule with your commuting experience now, how are you satisfied?" The answers to this question indicated emphatically that employees were dissatisfied with commuting on the 9:15 a.m. to 5:15 p.m. schedule and very favorably disposed toward their trips to and from work on the 8:15 a.m. schedule.

It was expected that the data on commuting time and commuting conditions would pinpoint as emphatically the sources of these differing responses, but this did not occur. Although, as mentioned, there were some variations in the various counties in travel time and commuting conditions on the three schedules, there was nothing to indicate that one schedule was four times more advantageous than another.

What can be inferred from these findings on commuting is that attitudes of individuals, whether founded on fact or presumption of fact, are most powerful forces in shaping their outlook. Port Authority employees indicated that they were not at all pleased with the 9:15 a.m. schedule in a number of areas, and this generally unfavorable attitude affected their responses on the transportation questions in the sociological survey. On the other hand, employees were pleased with the 8:15 a.m. schedule, and they responded accordingly with favorable remarks when asked about commuting on this schedule.

At the close of the formal experiment in May 1969, many Port Authority units opted of their own volition to remain on the staggered work-hour schedules they had been following during the experiment, and they continue to remain on them to this day. As far as can be determined at this time, these units remain very well satisfied with these schedules in terms of both office efficiency and employee morale. Of the original experimental population of some 2,400 employees, about 40 percent are still on staggered work-hour schedules.

DOWNTOWN LOWER MANHATTAN PROJECT

On the basis of the findings of its own internal experiment, the Port Authority suggested to the Downtown-Lower Manhattan Association (DLMA) that a project be undertaken to determine whether staggered work hours would have benefits on a scale as broad as the entire lower Manhattan business community.

At its annual meeting on February 4, 1969, the DLMA agreed on a cooperative project with the Port Authority to determine the work-hour scheduling practices of firms in lower Manhattan and the extent to which they would be willing to stagger their hours. The DLMA had advanced for many years the concept of staggered work hours as a possible means of relieving peak-hour congestion on transportation facilities in lower Manhattan. In fact, in a prior report issued in 1961 entitled A Study of Travel Patterns, DLMA recommended that its members actively explore the feasibility of staggered work hours. Since that time, it was understood that some lower Manhattan firms had adopted revised starting and quitting schedules, but the magnitude of the changes was not known. It was against this background that a survey of present work schedules was undertaken as the first step in the project.

The survey began on February 19, 1969, when the president of DLMA transmitted a two-page questionnaire to all of the member firms of the Association. The questionnaire elicited information from each member firm on the total number of employees, the work schedules followed by the firm, and the place of residence of employees.

Some 113 firms, representing about 136,000 employees, responded to the survey. This constituted roughly 70 percent of DLMA's membership and included almost all of the major downtown employers.

The results of the survey on work schedules showed that the staggered work-hour system had not been adopted to any considerable extent by lower Manhattan firms. As Figures 2 and 3 show, a very high proportion, some 66 percent of the firm's employees, are scheduled to begin work between 9:00 and 9:14 a.m., and 64 percent are scheduled to leave work between 5:00 and 5:14 p.m. In some zones, particularly where there was a tremendous concentration of banking and securities firms, the percentage of employees starting at about 9:00 a.m. and quitting at 5:00 p.m. was approximately 75 percent.

The results of the 1969 Staggered Work-Hour Survey and recent transportation surveys sponsored by DLMA indicated clearly that there had been no moderation of the peak hour, or indeed the peak 15-min phenomenon in lower Manhattan. They strongly suggested the urgent need for a cooperative industry-government program to achieve a reduction of the sharp peaking of starting and quitting hours of employment that so seriously affected the transportation facilities serving lower Manhattan.

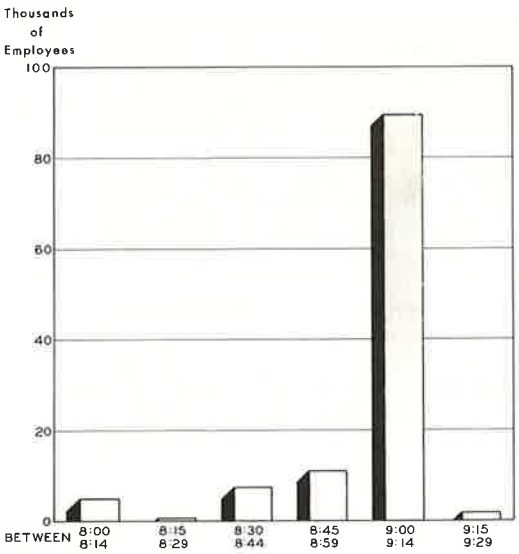

Figure 2. Employee starting times in downtown lower Manhattan.

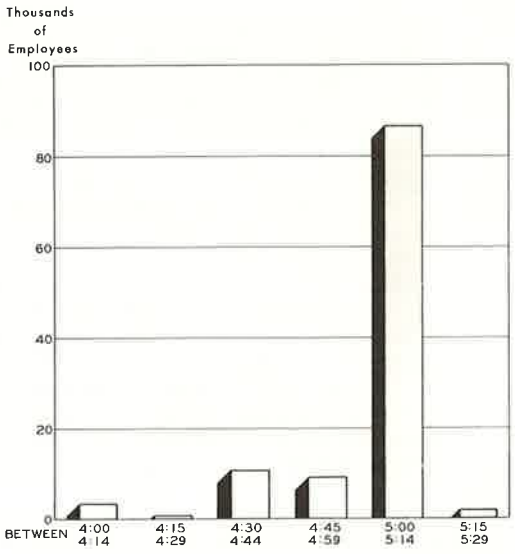

Figure 3. Employee quitting times in downtown lower Manhattan.

Support of Building Business Community

The results of the staggered work-hour survey were transmitted in November 1969 to all of the DLMA firms by a letter from the president that recited the survey findings and solicited the support of DLMA members to alter their work hours. The letter is a good example of the approach used to sell the project and excerpts from the text are as follows:

> On February 19, 1969, I sent to each member of the Association a questionnaire designed to gather information on the work schedule practices of firms in lower Manhattan. This questionnaire constituted the first important phase of what we felt should be a new survey and effort to design and implement a workable staggered hours program in this area. . . .
>
> Some 113 of our member firms responded to this questionnaire, and the results have now been analyzed by The Port of New York Authority. As you will read in the enclosed report, the problem of concentrated peak hour congestion has not been eased at all since the D-LMA first advocated staggered work hours in the early 1960's. . . .
>
> All of the members of the Association are aware that we are pushing as hard as possible to have additional subway facilities provided in lower Manhattan. Even the most optimistic of us know, however, that the Water Street subway is at least 8 to 10 years away. In light of this, we feel strongly that the only practicable solution to our terrible peak hour problems is the concept of staggered work hours. . . .
>
> In the last few weeks, the officers and Planning Committee of the Association have been discussing with representatives of the Port Authority the possible future steps we could take toward implementing staggered work hours in lower Manhattan. Because of the Port Authority's interest in this concept, they conducted an experiment in their own organization. The report of their findings and conclusions is enclosed. The results show that Port Authority operations and employee morale were not adversely affected by staggered work hours. In fact, more than 40 percent of the Port Authority headquarters' employees have remained voluntarily on staggered work hours after the formal experiment ended. . . .
>
> Our present thought is to enlist about 100,000 employees of as many firms as possible to participate in a six-month experiment working an 8:30 a.m. to 4:30 p.m. schedule, which we would hope could begin early next year. A task force comprised primarily of John Goodman, D-LMA's Executive Vice President, and Roger Gilman, Director of the Port Authority's Department of

> Planning and Development, will be getting in touch with some of you within the next few weeks to discuss the proposed six months experiment. I would hope that the firms who are contacted will cooperate to the maximum extent possible. If you should not be contacted and wish to undertake such an experiment, please feel free to do so; however, it would be appreciated if you would advise the Association so that your experiences and findings would be part of the overall results.
>
> During the experiment, this same task force of D-LMA and Port Authority representatives will ask the management of the participating firms to report the effect of the experiment on the output and efficiency of the firms and on the morale of their employees. After assessing the effects of the experiment, the task force would recommend to the D-LMA Board of Directors whether staggered work hours should be further expanded.
>
> To some of you, I am sure that staggered work hours is an old story, often talked about but seldom if ever tried in a systematic and meaningful way. Because of the transportation crisis we are now facing, however, I am confident that this new attempt can and must be far more successful than past endeavors. I am convinced and so are members of the Planning Committee that the concept of staggered work hours is the only solution over the next decade which can provide more comfortable commuting for the hundreds of thousands of men and women who travel into and out of lower Manhattan every working day.

The letter was followed up with a series of meetings with the principal industry groups in lower Manhattan. In January and February, luncheon meetings were held with the major banks, investment firms, insurance companies, and firms with corporate headquarters in the area to discuss the survey findings in detail and describe the transportation problems that resulted from too great an adherence to the traditional 9-to-5 schedule.

Both Wagner and Gilman hosted these meetings and told the business leaders that the congestion problem of lower Manhattan was one of the penalties of a most successful effort to revitalize this area. Lower Manhattan was then and is now undergoing an office-building boom that will result in a swelling of the daytime population from 460,000 persons in 1968 to an estimated 580,000 by end of 1972. Greatly enlarged figures were displayed showing peak-hour passenger demand curves on PATH and the New York City subways and the current sharply peaked nature of transit use. It was suggested that the problem might become worse in future years if efforts are not made to stagger hours.

Gilman pointed out that a decision to participate in the project need not be irrevocable and that the project would be closely monitored to assess the effects on transportation facilities and to determine the attitudes and opinions of individual employees toward the changed hours. These pre-project promotional efforts culminated a large kickoff luncheon meeting in March 1970 that was attended by more than 100 industry and government representatives and operating officials of the area's transportation facilities. Wagner announced that pledges of support had been received from some 45 firms and government agencies who had committed about 50,000 of their employees to the project. The project formally began on April 1, 1970.

Reduced Travel Peaking

Passenger counts taken on PATH and the New York City subways in March and June indicated that the project already has had significant effects in reducing some peak-hour congestion. The most dramatic effects occurred at PATH's Hudson Terminal where passenger trips during the time of heavy traffic between 5:00 and 5:15 p.m. declined by 16 percent while traffic grew by 30 percent between 4:30 and 4:45 p.m., a period in which PATH previously had had underutilized capacity. As Figure 4 shows, many of PATH's passengers who previously traveled during the height of the peak apparently had shifted to earlier time periods. Volume declined from 7,500 to 6,300 passengers in the 5:00 to 5:15 p.m. period, while it grew from 3,100 to 4,200 in the 4:30 to 4:45 p.m. period.

Some congestion reduction also has been noted on certain of the lines of the New York City Transit Authority (NYCTA), although not to the extent observed at PATH. To analyze the subway effects, we used a level-of-service concept developed by Port Authority engineer Jack Fruin as part of a doctoral program at Brooklyn Polytechnic Institute on

pedestrian design standards. Train counts were made on the IRT and BMT Lines of the NYCTA both before and during the project. To derive density levels, we then computed the amount of space that each standing passenger occupied. As developed by Fruin, a density of 2 to 3 sq ft per person is termed level of service E that "can only be sustained for short periods of time without physical and psychological discomfort. The only recommended application would be elevators." The next higher level of service, level D, is equivalent to an average area of 3 to 7 sq ft per person. Again Fruin believes, "At this level of service, adequate area is provided for standing without personal contact with others." As Figures 5 and 6 show, passengers riding certain IRT and BMT services during the project were consistently accommodated at level of service D, whereas before the project they encountered conditions under level of service E. Turnstile counts taken at three of the busiest lower Manhattan subway stations confirmed the shifting of Brooklyn-to-Manhattan commuters to earlier traveling periods in both the morning and evening. In the peak 10-min

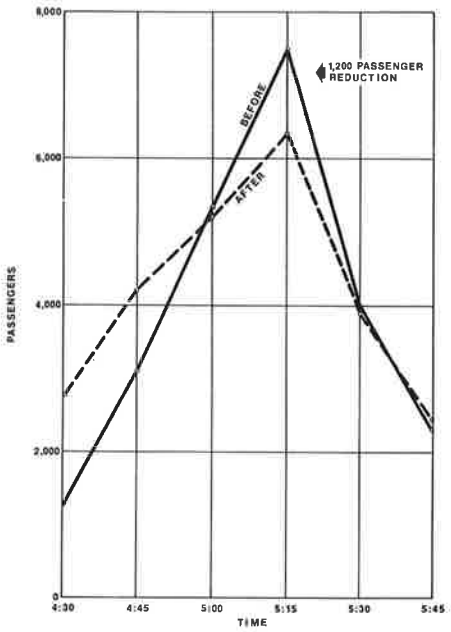

Figure 4. Effects of staggered work hours on passenger volumes at PATH Hudson Terminal.

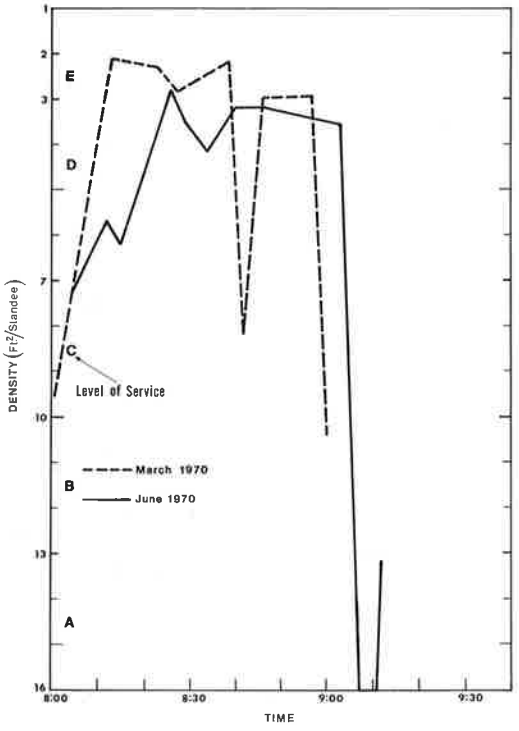

Figure 5. Effect of staggered work hours on densities of IRT Seventh Avenue-White Plains Road Express at Clark Street Station.

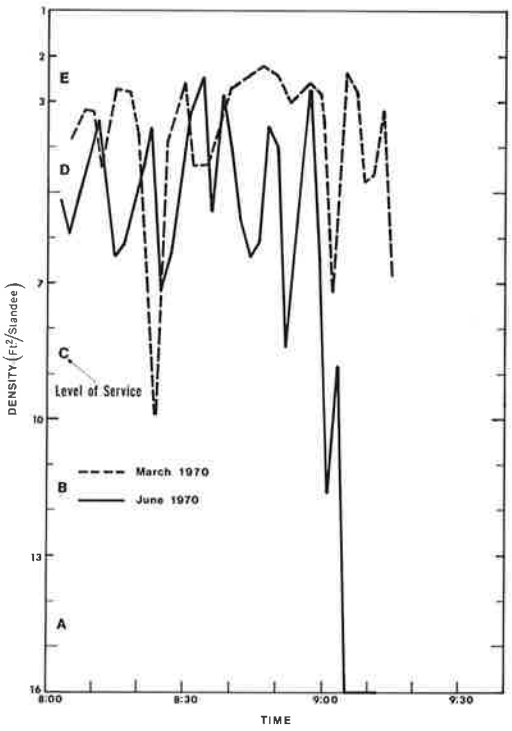

Figure 6. Effect of staggered work hours on densities of BMT train at Court Street Station.

period from 9:00 to 9:10 a.m., about 6 percent of the passengers (4,620 out of 75,000) moved out of this period into earlier ones. The shifting of passengers that occurred is given in Table 1.

This shifting of passengers naturally affected the operations of the area's transit systems, and many have already made adjustments in their schedules. To pinpoint the problems that did occur, questionnaires were distributed to each participating firm for distribution to employees who reported transportation difficulties as a result of changing their hours. About 2,000 questionnaires were returned, and, after analysis, we met with the area's commuter rail and transit system operators to suggest certain operating and schedule changes to better serve project participants. As a result, PATH added extra trains on its evening service from Hudson Terminal to Newark, the NYCTA improved its evening IND "E" service to Brooklyn, and the Erie-Lackawanna is providing improved service on two of its branches. Discussions are continuing with other transportation operators, and all have given us their assurance of cooperation in the project.

TABLE 1

CHANGES IN PATRONAGE AT THREE LOWER MANHATTAN STATIONS

Beginning of 10-Minute Period	Passengers During Peak 90 Minutes[a] (percent)		
	Before Project	During Project	Change
Morning Passengers Leaving Trains (75,900 Passengers)			
8:00	6	5	-1
8:10	9	8	-1
8:20	8	10	+2
8:30	11	14	+3
8:40	14	15	+1
8:50	20	18	-2 (-1,370)
9:00	18	12	-6 (-4,650)
9:10	9	10	+1
9:20	5	8	+3
Evening Passengers Boarding Trains (53,700 Passengers)			
4:00	5	4	-2
4:10	5	6	+1
4:20	6	7	+1
4:30	11	12	+1
4:40	11	12	+1
4:50	17	15	-1 (-1,360)
5:00	21	19	-2 (-1,170)
5:10	14	15	+1
5:20	10	10	0

Note: Lines and stations include BMT at Broad Street, IRT Lexington at Wall Street, IRT Seventh Avenue at Wall Street.

[a]Rounded to nearest whole percent.

CONCLUSIONS

August 1970 marked the fifth month of the Staggered Work-Hour Project in lower Manhattan. As of that date, over 50,000 men and women from some 50 business firms and governmental agencies were participating in the program. From regular contacts with representatives in each of the participating organizations, we know that the program was well accepted by employees. Only one firm with a sizable number of participants decided to drop out of the project by that time. This was one of the banks with corporate headquarters in California that found the time-zone difference a problem in conducting its operations.

The DLMA and the Port Authority have continued efforts to broaden participation in the program. The New York Stock Exchange has been actively engaged in the project and, under its aegis, a Brokerage Industry Steering Committee has sought ways of increasing the extent of participation from the investment community. A similar committee representing the major banks was notably successful in bringing

Wouldn't You Rather Switch ...Than Fight?

Start earlier, start later, but leave the 9 to 5 crowd. Join us in the Staggered Work Hours Project

Staggered Work Hours Project
Downtown Lower Manhattan Association
120 Broadway, New York 10005 N.Y.

Figure 7. Promotional poster.

all of the major Clearing House banks into the project. In addition, the Authority has continued to work closely with officials of New York City and the federal government agencies in lower Manhattan to solicit their participation in the project.

On the promotional front, the public material distributed on the program featured a poster urging lower Manhattan employees to "switch rather than fight". Copies of this poster were shown in newspaper articles, and some 22,000 copies were on display in the cars of PATH, the New York City Transit Authority system, and the area's commuter railroads (Fig. 7).

Although certain assessment studies remain to be conducted, the results of the program have indicated that staggered work hours are feasible and can help relieve peak-hour congestion on urban transit systems. The efforts of the project sponsors have been focused on promoting additional participation in the program and discussing with appropriate agencies the expansion of the project to the midtown area.

ACKNOWLEDGMENTS

Because employees are sometimes hesitant to express candidly their views on such matters—particularly if they are negative—the Port Authority arranged for the Center for New York City Affairs of the New School for Social Research to conduct the employee-attitude study. Derek Phillips, Associate Professor of Sociology at New York University, worked with Center Director Henry Cohen on the study.

The Staggered Work Hours Project was jointly sponsored by the Downtown-Lower Manhattan Association and The Port of New York Authority.