

Work Schedule Changes to Reduce Peak Transportation Demand

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This paper discusses a program to reduce transportation congestion by encouraging voluntary work schedule changes in New York-New Jersey central business districts. More than 220,000 workers in more than 400 organizations in Manhattan are participating by staggering their work hours by at least a half hour earlier or later than the customary work schedule of 9 a.m. to 5 p.m. First started in lower Manhattan in 1970, the program has been expanded to include midtown Manhattan and is now under study for Newark, New Jersey. The results of surveys of transportation systems, worker attitudes, work schedules, and productivity are included. The survey conclusions in almost every case were positive and have been used in an ongoing program to expand participation. Elements of the marketing effort are discussed. Also discussed is the recent UNTA technical study grant that will enable the sponsors to fully document the program and provide instructions that can be used by other central business districts considering implementation of staggered work hours to help reduce transportation congestion.

On April 1, 1970, the Port Authority of New York and New Jersey in cooperation with the Downtown-Lower Manhattan Association (D-LMA) initiated a staggered work hours program (SWHP) that is expected to affect more than 2 million workers in the constricted central business districts of the New York-New Jersey region by easing their work trips. Corollary advantages of full participation will be improved efficiency of business operations, reduction of vertical travel time in buildings and building lobby congestion, employee punctuality, better morale, and possibly less crowded lunch periods in restaurants.

After the completion of a successful experimental program conducted solely among headquarters staff of the port authority, the program was implemented in downtown Manhattan (south of Canal Street). In 1972, the program was expanded to midtown Manhattan through the support of major civic and government organizations, and studies have been initiated to determine whether it should be expanded to Newark.

The goal of the program is to ease the problems in commuting to and from work by persuading organizations to alter work schedules from peak commuting times. If participation can be secured on a sufficiently broad scale, future capital requirements for transportation facilities may be decreased.

As the chairman of the port authority noted:

Staggering working hours is definitely a program that could lead to savings on the part of the public transportation operators throughout the country, if it is participated in fully enough.

In highly congested central business districts, a major portion of the capital cost for transportation facilities is based on the demand which these facilities are expected to handle during peak travel periods. If this demand could be permanently altered downward by work-schedule changes, we could alter downward the physical requirements.

ROOTS OF STAGGERED HOURS PROGRAM

For many years prior to the SWHP, interest had been shown in staggering work hours to help reduce transportation congestion in the Manhattan CBD. A number of plans were developed and implemented on a small scale during World War II, but were abandoned at the war's end. In the early 1960s, an exhaustive study was commissioned by the City of New York. However, the recommended plan for staggered work hours was never implemented. In 1970 the port authority and the D-LMA decided to implement the SWHP in lower Manhattan.

Downtown lower Manhattan, the area between the Battery and Canal Street, has undergone tremendous changes. Old inefficient office buildings have been replaced by taller, more modern ones. The growth of office space in Manhattan has been tremendous.

Midtown Manhattan has congestion problems similar to those downtown, but midtown has a greater area, more employment, and greater problems. More than 1½ million people work in midtown, and almost all subway, rail, and bus lines converge on the area.

To cope with the growth in employment, the New York City Transit Authority and the Port Authority Trans-Hudson (PATH) Corporation have provided expanded transportation facilities. However, these improved transit facilities could be used more efficiently if the highly peaked demand for transportation were spread out. Before SWHP was implemented in downtown Manhattan, some port authority studies had indicated that an effective program involving the shifting of a substantial number of workers from the traditional 9 to 5 work schedule offered a promising avenue for relieving transportation congestion.

After the downtown program was under way and its success had been demonstrated, the program was extended to midtown Manhattan. Late in 1972 the Midtown Staggered Work Hours Task Force was created to cosponsor the midtown phase along with the port authority.

In 1974 the Greater Newark Chamber of Commerce requested the port authority's assistance in conducting studies in Newark and its environs to determine the feasibility of staggering work hours there. The studies will cover more than 85,000 workers in downtown Newark. Experience with Newark is expected to be particularly worthwhile because Newark probably is more typical of other U.S. cities on the standpoint of transit and automobile access during commuting hours. The employees are not so concentrated as in uptown or downtown Manhattan and are probably more dependent on transit than are the employees in Manhattan.

In 1973 the U.S. Department of Transportation via the Tri-State Regional Planning Commission awarded a \$200,000 technical study grant to investigate and advance the SWHP. Under the grant a number of pioneering areas are being fully documented as the Manhattan SWHP leads the way in the nation. Federal funding is a boost to the program, in terms of financial support for expanding the efforts and the recognition of the Manhattan program as a pioneer in this concept.

One of the most important but time-consuming aspects of the program procedure, and the key to its success, has been the task of convincing business and industry to change from their usual 9 to 5 work schedules. The port authority tackled this problem by securing the assistance of prominent businessmen and creating cooperative task forces composed of civic and trade organizations and public agencies.

The first step followed in the program is to conduct a work schedule survey of all businesses in the area to determine work hours, the number of employees on each

schedule, and their mode of transportation and area of residence. If this survey shows that work schedules are unusually concentrated at certain starting or quitting times and that this pattern can be directly related to transportation congestion, individual firms are requested to change their hours of work. The port authority, as project director, maintains a careful record of all contacts and coordinates follow-up with the individual firms requested to participate. This method holds costs to a minimum, and the backing of the prominent civic and business organizations lends force to the requests for participation.

Effects on Transportation

The prime focus of attention has been to determine the effect of staggered work hours on transportation patterns. The goal is to adjust work schedules so that all transportation systems serving Manhattan will have less congestion, which now is largely caused by everyone commuting at the same time.

All transportation professionals are familiar with the twice-daily peaks that occur in American cities. The thrust of staggered work hours is not to accept this demand pattern as a given. When a peaking problem exists, as opposed to a capacity problem, there are ways in which demand can be altered to better use existing facilities. This is the thrust of current national emphasis on low-capital measures to reduce urban transportation congestion. Staggered hours ranks high on the list of such measures.

Before and after surveys conducted as part of the downtown Manhattan effort have shown dramatic reductions in peaking. The more comprehensive surveys in midtown Manhattan have yet to reflect much change because participation there is still low.

As early as 1972, changing demand patterns in three of the busiest subway stations in lower Manhattan and at PATH's World Trade Center terminal provided clear indications that the program was reducing congestion. Passenger counts taken before and during the project indicate that peaking at these locations has been significantly reduced.

Surveys taken in 1970 and 1972 revealed a substantial and continuing reduction in congestion of 26 percent in the peak 15 minutes at three of the busiest transit authority subway stations. In the peak from 9:00 to 9:15 a.m., passenger travel has been reduced from 17,658 to 13,074. In the earlier 8:30 to 8:45 a.m. period, when greater platform and stairway capacity is available because of lighter crowds, passenger travel increased at these three stations from 12,024 before the program to 14,864 at the present time, a 24 percent increase (Fig. 1).

At PATH's World Trade Center terminal in lower Manhattan, similar congestion reduction was determined by comparing 1970, 1971, and 1972 surveys. Passenger counts during the 5:00 to 5:15 p.m. peak are down 18 percent since the program began: from 7,500 to 6,224. During the 4:30 to 4:45 p.m. period, when additional train capacity is available, passenger travel has increased by more than 50 percent from 3,100 to 4,750 (Fig. 2). On PATH, in fact, the demand pattern in the afternoon is almost level for almost 45 minutes—a considerable improvement over the pattern that existed several years ago.

The project sponsors have been gratified by these changes inasmuch as the principal aim of the project was to provide improved levels of service on public transit systems. Greater use of previously underutilized train and station capacity in what were off-peak periods provides this improvement to all subway and PATH passengers.

When congestion has been reduced that much at all rail transit stations in lower Manhattan, as is possible, many thousands of commuters will be affected. This is significant, for about 85 percent of lower Manhattan's workers ride rail transportation to work. It is expected that congestion reduction will continue as additional firms implement staggered hours.

Surveys to assess the impact of the program on transportation in midtown Manhattan are more comprehensive, although we have yet to see large reductions in congestion because fewer than 100,000 of the 1.5 million workers in the area have shifted work hours.

Figure 1. Passenger counts at three major downtown Manhattan subway stations before and after the SWHP.

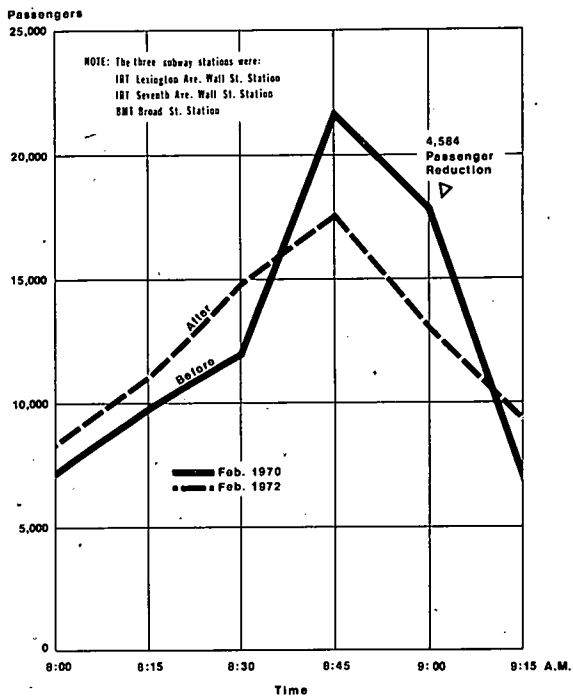
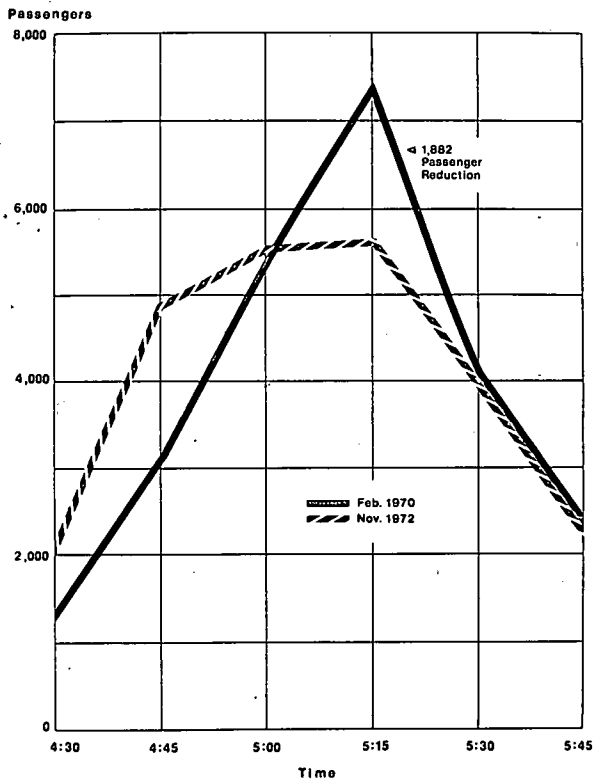


Figure 2. Evening peak passenger counts at PATH World Trade Center station.



Further, midtown differs from lower Manhattan, and the differences complicate the effect of staggered hours on transportation. Midtown is much larger, its employment level is greater, and its complex transportation network intermingles commuter, transit, pedestrian, bus, and vehicular operations. In addition, there is a large overlap of transportation between the separated CBDs of midtown and lower Manhattan. This is being carefully examined in order to avoid nullifying the achievement in lower Manhattan with an "out-of-phase" midtown plan.

A major strategy in midtown has been to focus on the larger firms and to base work schedule recommendations on the number of employees. Those with under 700 staff received recommendations keyed to their postal zip code. Firms with more than 700 employees received recommendations tailored to their work schedule data as submitted to the midtown task force. From a transportation standpoint, the enlistment of a major firm can mean instant and significant congestion relief in the immediate area. For example, when New York Life Insurance's 3,500 employees shifted from 9:00 to 4:30 to 8:30 to 4:00, there was an immediate diversion of over 1,000 people on the IRT and BMT lines serving the 28th Street stations.

We have conducted numerous traffic and passenger surveys to determine the peaking phenomenon on various modes serving midtown. These include rail transit, commuter rail, transit bus, commuter bus, pedestrian, and automobile.

For the surveys, data are gathered on at least 2 weekdays, usually Tuesdays and Wednesdays (Thursday evening is a shopping night in Manhattan and may present unusual patterns). We take 5-minute intervals in almost all surveys, especially in areas of highly peaked demand such as at transit stations.

Queuing at escalators

Commuters arriving for a 9 a.m. start experience heavy backups on escalators in Grand Central Station. On escalators from the IRT Flushing Line exiting to Third Avenue, for example, an unbroken queue forms for 30 minutes until 9:00. Although more than 250 persons wait before 9:00 a.m., the queue sharply reduces to no waiting just minutes later after 9:05 a.m. (Fig. 3).

Subway station counts

Counts of subway riders entering the IND 47-50 Street station at Rockefeller Center reflect the intense 5:00 p.m. quitting time; 75 percent more passengers enter between 5:00 and 5:15 p.m. than in the 15-minute intervals immediately before and immediately after (7,757 versus 4,423 and 4,544). Subway train operations on several midtown lines were found to become strained immediately after 5:00 p.m. when concentrated passenger arrivals contribute to large increases in station dwell times. For example, for IRT No. 7 trains at Grand Central terminal bound for Queens dwell times quickly rise by 50 percent after 5:00 p.m. from an average of 27 seconds per train from 4:30 to 5:00 p.m. to 41 seconds from 5:00 to 5:30. Heavier train loadings and frequent door-holding result in longer travel times and delays to following trains, similar to backups on highways.

Subway travel times

Surveys taken at checkpoints on various subway lines traversing the Manhattan CBD show a marked decrease in operating speed during the buildup of the 9:00 a.m. and 5:00 p.m. peaks, particularly in the afternoon.

Automobile volumes at Lincoln and Queens-Midtown Tunnels

A series of traffic counts over the past several years at the Lincoln and Queens-Midtown Tunnels, which connect the Manhattan CBD with New Jersey and Queens, shows

that there is very little peaking. Instead, the essentially flat demand curve at both facilities during the peak periods suggests a capacity problem in which the demand is tempered by the ability of the tunnels to accommodate the traffic.

Transit bus

Counts taken on a representative sample of north-south, crosstown, and combination north-south and crosstown bus routes in midtown suggest that buses also are caught up in peak traffic delays or are subject to passenger overloading due to the 9 and 5 habit.

Work schedule and transportation operations relationship

The crux of the analyses we are performing, largely under the technical study grant, is the correlation between work schedules and transportation operations. Obviously, one is related to the other in a CBD, but to what degree and to what sensitivity?

In a first attempt to combine all our data in a single case study, we looked at the peaking problem on the IND E&F subway line to Queens during the afternoon peak. Ridership on this high-capacity route is very heavy, and the equipment is modern and runs well. In a comparison of the quitting times in the zip code area surrounding the Lexington Avenue station, the maximum load point, the pattern of quitting times almost matched the arrivals at the station (Fig. 4). Further, because these arrivals peak sharply after 5:00 p.m., the dwell time correspondingly increases, for more people hold doors on crowded trains. This leads to delaying other trains and slowing train speeds through midtown.

It can be theorized, therefore, that spreading out quitting times in this area would reduce delays to train operations. We are going to great lengths to quantify these results so that clear benefits may be seen from our staggered hours effort.

Transit Service Adjustments

The large-scale shifting of workers to staggered work hours has naturally affected the demand on the area's transit systems, and many have already made adjustments in their schedules. To pinpoint any problems that do occur, transportation survey forms (Fig. 5), the so-called "complaint" questionnaire, are distributed to each participating firm for distribution to employees who report transportation difficulties only as a result of changing their hours.

The approach of following up on any problems is more effective than trying to predict and effectuate service changes prior to (and assuming large participation in) staggered work hours. There are several reasons for this.

1. There is usually no way to accurately predict the level of participation in staggered hours, the work schedule change, transportation mode, residential distribution, or transportation impact from these variables until it in fact happens.
2. When problems do surface, however, the anonymous mail-back questionnaire enables the project staff to pinpoint specific transportation problems, and present them to the appropriate transportation operator, who can make suitable service changes.

Initially, in lower Manhattan, the rate of return of the questionnaires was moderate; about 2,000 were returned. After analysis, D-LMA and port authority staff suggested to area commuter rail and transit system operators certain schedule changes to better serve project participants. As a result, PATH has several times added extra trains to its evening peak service from the World Trade Center terminal to Newark. The New York City Transit Authority improved its IND-BMT E and RR services; the Erie Lackawanna Railroad provided improved service on several of its branches; the Central Railroad of New Jersey, though bankrupt, began running a new main-line train; and the Penn Central adjusted schedules or added cars to its trains, or both, on several sub-

Figure 3. Passenger queuing at Grand Central Station escalators during and after the morning peak.

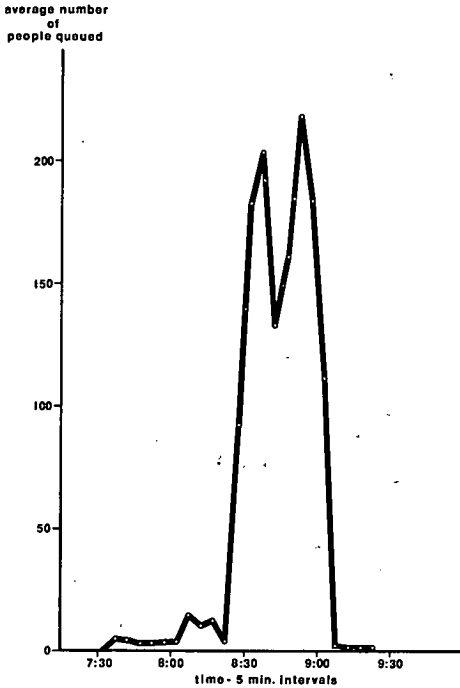


Figure 4. Case study of the peaking problem.

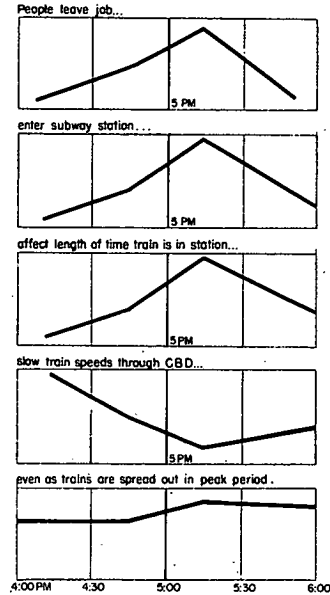


Figure 5. Transportation survey forms ("complaint" questionnaire) distributed to midtown Manhattan participants in SWHP.

1 Where do you live?
 Number & Street or Nearest Intersection _____ City _____ State _____ Zip _____

2 Where do you work?
 Company _____
 Number & Street or Nearest Intersection _____ City _____ State _____ Zip _____

3 A. What is your current working schedule?
 8:00 am-4:00 pm 8:30 am-4:30 pm
 8:15 am-4:15 pm 9:30 am-5:30 pm Other please specify _____

B. Which trip on this new schedule is less convenient?
 a. Morning, (If a, answer question 4 only.)
 b. Evening, (If b, answer question 5 only.)
 c. Both (If c, answer both questions 4 and 5.)

4 Morning Trip. How do you get to your office? (If more than one mode used, please indicate order of usage.)
 Example: Railroad Subway
 Auto To Office To other mode of transportation
 Bus N.Y. City Bus Line & Route _____ PABT Bus Line & Route _____
 GWBBS Bus Line & Route _____ Other Line & Route _____

What time do you board the bus?
 Railroad
 Penn Central _____ N.Y. Central Div.
 Pennsylvania Div. _____ New Haven Div.
 Long Island _____ CNJ
 Erie-Lack., NJ & NY _____ S.I. Rapid Transit

What time do you board the train?
 At what station do you board the train?
 Staten Island Ferry. What time does your Ferry leave St. George?
 PATH. What time do you board PATH?
 At what station do you board PATH?
 Subway. Indicate Division & Line (A, #2, RR, etc.)
 IRT BMT IND

What time do you board the Subway?
 At what station do you board the Subway?
 At what station do you get off the Subway?
5 Evening Trip. How do you get home? (If more than one mode used, please indicate order of usage.)
 Example: Subway Railroad
 Subway. Indicate Division & Line (A, #2, RR, etc.)
 IRT BMT IND
 What time do you board the Subway?
 At what station do you board the Subway?
 At what station do you get off the Subway?
 PATH. What time do you board PATH?
 At what station do you board PATH?
 Staten Island Ferry. What time does your Ferry leave Manhattan?
 Railroad
 Penn Central _____ N.Y. Central Div.
 Pennsylvania Div. _____ New Haven Div.
 Long Island _____ CNJ
 Erie-Lack., NJ & NY _____ S.I. Rapid Transit

What time do you board the train?
 At what station do you leave the train?
 Bus N.Y. City Bus Line & Route _____ PABT Bus Line & Route _____
 GWBBS Bus Line & Route _____ Other Line & Route _____

What time do you board the bus?
 Auto From Office From Other Mode of Transportation

6 Nature of transportation inconvenience resulting from your schedule change. Please give full details.

Thank you.

urban divisions. Discussions continue with transportation operators on other changes as they become necessary, and all have given their assurances of continuing cooperation in the project.

This follow-up effort, it is felt, gives tremendous credibility to the New York program in that, once a firm has adopted a different work schedule, there is still contact with the project staff. However, the tremendous breadth of transportation services offered in the New York-New Jersey region is certainly more pervasive than in most areas, so the luxury of waiting to hear from the "squeaky wheels" regarding problems incurred is reasonable. Other urban areas may not be able to do this, especially if there is an obvious lack of public transit schedules for periods to which people's work schedules are being shifted. It appears certain, however, that attempting to make major changes in transit schedules before shifts in work schedules occur is a fruitless exercise, especially if there is little success in enlisting significant participation in staggered work hours.

Elevator and Lobby Congestion

It was anticipated that the adoption of staggered arrivals and departures in Manhattan firms would have a beneficial effect on elevator operations in buildings. Studies conducted in the Chase Manhattan, Federal Reserve, and Morgan Guaranty Trust office buildings in lower Manhattan indicated conclusively that staggered work hours reduced elevator waiting times for workers in these firms. This also contributed to the increased employee punctuality reported by many firms.

The studies indicated that, prior to the SWHP, employees in the buildings surveyed experienced delays that averaged more than 2½ minutes during peak periods. This waiting time was reduced by more than half after the project began, with delays averaging only about 1 minute. Another service improvement at the Morgan Guaranty Trust building indicated by the survey was that only 278 persons had to wait for elevators during the program as compared to 673 on a typical weekday before the program. Moreover, the maximum waiting time declined from 6 minutes to 2 minutes. Before the new hours, as many as 112 persons waited in the lobby just prior to 9:00 a.m., whereas after staggering only 37 people, at most, waited for elevator service (Fig. 6).

Three observations are particularly important with regard to elevators.

1. Although some organizations may be apprehensive about staggering work hours to reduce congestion on transportation systems, they will readily identify with elevator congestion in their buildings, especially when it is associated with punctuality problems. This is a strong selling point.
2. Building managers always insist that their elevators provide excellent service and are very sensitive to this issue; therefore, elevator congestion data should be used cautiously.
3. Whereas it may be logical to assume that spreading out the peak load on elevators will reduce the number needed in a given building, the minimum number required is fixed by fire regulations for mandatory quick and complete building evacuation.

Transportation Tardy Study

The transportation operators in the New York-New Jersey region also cooperated in a transportation tardiness study, a detailed examination of the probability and magnitude of train delays during various parts of the morning peak period.

After most participants in lower Manhattan shifted to an earlier schedule, a number of firms reported increased employee punctuality. This was apparently due to fewer and less severe transportation delays in the morning peak period. The tardiness study investigated the relative reliability of rail transportation systems during the morning peak period. For instance, would a person working earlier than a 9 to 5 schedule be less likely to incur a transit or commuter rail delay in going to work? This is of

Figure 6. Passengers waiting for elevators in Morgan Guaranty Trust Bank building before and after SWHP.

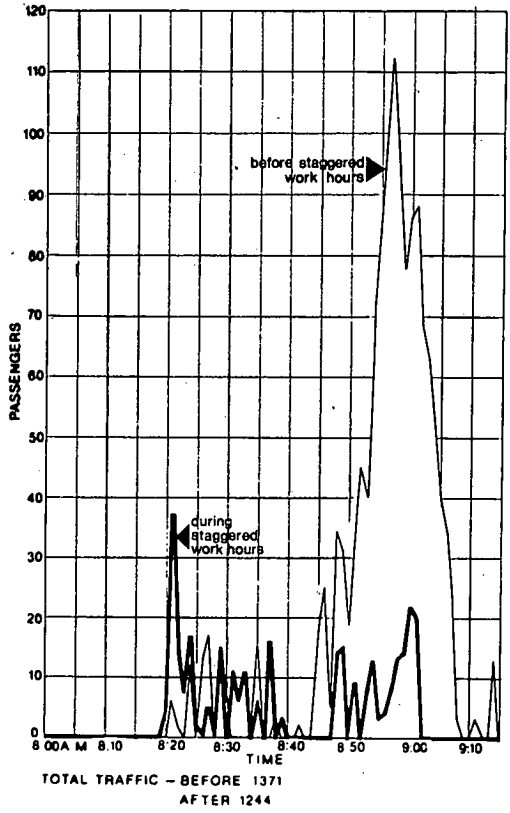
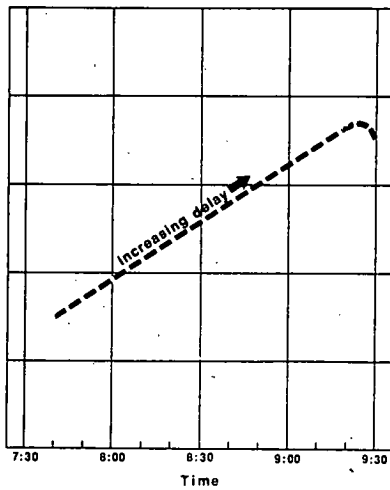


Figure 7. Rail transit delay pattern during morning peak.



obvious importance to the SWHP because, if patterns of train delay were found to build up during the morning peak period, employees who started work at 8:30 could be expected to be punctual more often than those who started at 9:00.

The tardiness study was limited to commuter and transit rail systems, inasmuch as 85 percent of lower Manhattan employees use the rail mode for a significant portion of their work trip. With the cooperation of the rail transportation operators in the region, train "on-time" arrival data were collected for each morning peak-period train for 13 randomly selected days in 1970. Rail systems surveyed included all New York-New Jersey area commuter lines at their inbound terminals, several New York City Transit Authority subway lines at key stations, and the PATH system. For the purpose of the study, a train was considered delayed if it arrived at its checkpoint terminal or station at least 5 minutes behind schedule.

In the tardiness study, significant relationships were found on many of the commuter and transit rail systems studied, which indicated an increasing pattern of train delays as the morning peak period progressed. These patterns represented either an increasing likelihood (or probability) of train delay or an actual increase in train delay, or both, during the major portion of the peak period (Fig. 7).

The tardiness study also revealed that Manhattan employees using the rail systems encountered greater and more frequent delays if they started work at 9:00 than if they started at 8:30. Rail delays were even less before an 8:30 start. Findings for the transit systems studied indicated more than a 25 percent greater likelihood of train delay and over a 40 percent increase in the average length of delay time for a 9:00 start versus an 8:30 start.

The commuter railroad systems serving Manhattan exhibited similar relationships for the 8:30 and 9:00 a.m. starting times. The chance of being delayed is two-thirds greater for the later starting time, whereas the average delay is 50 percent greater for the 9:00 a.m. start.

The difference in length of time delay means, in other words, that Manhattan employees using rail systems in the morning saved on the average more than 1 hour of commuting time every month if they started work at 8:30 a.m. rather than 9:00 a.m. Commuters would save additional travel time if they started before 8:30 since delays before 8:30 are even lower.

Rail transit service for the systems surveyed is almost as frequent for an 8:30 start time as it is for a 9:00 start in the New York area. Between 8:10 and 8:30 a.m., 2,369 trains are scheduled, whereas 2,427 are scheduled between 8:40 and 9:00 a.m.

Work Schedule Survey

Before we can judge whether adherence to certain work schedules contributes significantly to the transportation congestion being experienced, we must determine the prevailing work schedule practices followed by organizations in the area under study.

The port authority has refined the work schedule survey by conducting separate surveys in lower Manhattan, midtown Manhattan, and downtown Newark and among Manhattan advertising agencies and consulting engineers. Each is briefly discussed below. A sample of the work schedule survey form used is shown as Figure 8.

Downtown Manhattan

In 1970, a work schedule survey questionnaire was prepared and distributed by the president of the D-LMA to all its member firms. The mode of transportation used by employees was not asked, for it was feared this might inhibit the preparation of the information and reduce the response rate. Experience with the midtown and Newark surveys suggests this may not be a problem. Approximately 70 percent of the D-LMA membership, 113 firms employing about 136,000 individuals, responded to the questionnaire, and a high concentration of the 9 to 5 schedule was evident: 66 percent

Figure 8. Work schedule survey distributed to midtown firms.

Please complete one questionnaire for your principal location and one for each subsidiary location, if any. Do not complete a questionnaire for subsidiary locations in which a relatively small number of employees (less than 50) are located, such as bank branches, small stores, etc. Please only include locations which are between 14th Street and 59th Street in Manhattan, and immediately adjacent areas.

1. Name of Company: _____
2. Address: _____
3. Number of employees working at this location in Midtown Manhattan between 14th and 59th Streets or immediately adjacent areas: _____
4. Do all of your employees work on the same time schedule?
 Yes: _____ Schedule is: _____ a.m. to _____ p.m.
 No: _____ Go to Question #5
5. If the answer to #4 is "No", how many different schedules does your firm work? _____

Please list approximate number of employees on each schedule:

- | | |
|-----------------------------------|-------------------------|
| (a) From _____ a.m. to _____ p.m. | No. of employees: _____ |
| (b) From _____ a.m. to _____ p.m. | No. of employees: _____ |
| (c) From _____ a.m. to _____ p.m. | No. of employees: _____ |
| (d) From _____ a.m. to _____ p.m. | No. of employees: _____ |

6. Would you estimate how many of your employees live in: *

New York City

Manhattan _____	New Jersey _____
Brbxx _____	Rockland & Orange _____
Queens _____	Long Island _____
Brooklyn _____	Westchester, Putnam & Dutchess _____
Staten Island _____	Connecticut _____

7. If such information is readily available, would you estimate how many of your employees use the following modes of transportation for the major portion of their commuting trip? Please do not complete this question if it would require an arduous and costly firm-wide survey.

	<u>Approximate Number of Employees</u>
Subway	_____
Commuter Railroad into Grand Central Station	_____
Commuter Railroad into Penn Station, New York	_____
PATH System into 33rd Street Station	_____
Bus into Port Authority Bus Terminal	_____
Automobile into Manhattan Central Business District	_____
Other modes please specify	_____

If your firm maintains automated records of employee residences by zip code, such zip code summaries would be quite helpful.

were scheduled to start at 9 a.m., and 64 percent quit work at 5 p.m. The results of the survey revealed that the lower Manhattan firms had not adopted a staggered work hours system to any considerable extent even though they had been urged to do so by the D-LMA as early as 1961.

Midtown Manhattan

The midtown work schedule survey, conducted in 1972, gathered information on the work schedules, residences, and travel habits of almost 300,000 workers from 1,450 firms. This represents about one-fifth of total midtown Manhattan employment. The results indicated that about 54 percent of the midtown employees were scheduled to start at 9 a.m. and quit at 5 p.m. In contrast, only 15 percent began at 8:30 a.m., the next most preferred starting time.

The midtown work schedule survey was the most comprehensive of those performed. Questionnaires were sent to the 26 member business, civic, and trade organizations of the Midtown Task Force on Staggered Work Hours, an organization specially set up for the purpose of communicating with the business community.

Of the 2,800 questionnaires mailed, 1,450 were returned. Of these, 1,192 qualified on the basis of location. These returns represented a sample size of about 300,000 midtown employees, about 20 percent of the approximately 1.5 million persons employed in midtown Manhattan. Further validity of the sample was sought by comparing the results of the survey to the journey-to-work study conducted by the New York/New Jersey Transportation Agency in 1961.

Comparison of the peaking phenomenon in similar surveys taken a decade earlier indicated that peaking had apparently increased. In all probability this was caused by the decline in manufacturing jobs in the Manhattan CBD and an increase in office and clerical jobs, with relatively more dependence on shorter workdays and peak-hour schedules. Since the future of Manhattan will undoubtedly be toward expansion of the office function, the peaking phenomenon can be expected to worsen unless counter-measures are taken.

Advertising Agencies and Consulting Engineers

Separate work schedule surveys were conducted of Manhattan advertising agencies and consulting engineers to ensure complete understanding of their work scheduling practices. In addition, these two industries were not well represented in the 26 midtown task force associations.

Conducting the surveys was considered worthwhile because it revealed the variety of scheduling practices that exist from industry to industry. It also provided a means to initiate communications with many firms not already contacted.

Newark, New Jersey

A work schedule survey was conducted in Newark in 1974 to determine work scheduling practices by downtown Newark organizations and whether a staggered work hours program is desirable to reduce peak transportation demands.

Employee Response (Attitude)

Although the port authority's prime interest in staggered work hours was to determine whether it would relieve transportation congestion, we realized that the program would never succeed if the people involved reacted negatively to revised work hours. To study this aspect, the port authority and the D-LMA engaged Dr. Derek Phillips, associate professor of sociology at New York University. The necessary data were obtained by distributing questionnaires to the employees of 27 of the companies participating in the downtown project. Employment at these firms ranged from some 5,000

or more to 400 or fewer. The survey returns included ample representation from firms in the four major segments of the lower Manhattan business community: banking, insurance, investment, and corporation headquarters groups.

The study found that about 85 percent of the employees sampled had a favorable overall reaction to the project. With regard to organizational efficiency, the results emphasize that, in all the industry groups, the changed hours had very few negative effects on efficiency. In fact, some organizations reported positive gains in work effectiveness.

The positive way in which the SWHP is viewed was apparent in answers to the question, On the new schedule, does the workday seem to you to be longer, shorter, or about the same? The results showed that, even though people were working the same number of hours, three times as many felt the day was shorter under the new schedules. Moreover, although nothing was changed but their work schedule, four times as many were more satisfied with their jobs than were less satisfied.

Because the SWHP is aimed at relieving the peak-hour congestion that workers in lower Manhattan face in commuting to and from work, it was of interest to find out how the participants felt about their daily commuting. Almost 50 percent of those who changed their work schedules reported that they were more satisfied with their trips to and from work. Only 9.8 percent were less satisfied. These findings were highly significant, for they indicated that the improvements in transportation are very strongly perceived by those on staggered hours.

Those whose schedules changed and those whose did not also were asked to evaluate elevator congestion during the staggered hours project. Again, the responses were surprisingly positive: 45 percent reported less elevator congestion, whereas 50 percent reported no change.

Responses to questions to determine whether home lives were disrupted in any way by the new schedules, i.e., whether the new schedules caused inconvenience, show that, although certain changes did occur, they were viewed positively by the participants.

From the enthusiastic reactions of the participants in both government and industry and the positive effects recorded thus far on transportation facilities, the staggered hours project in lower Manhattan can be termed a success. Similar surveys conducted by companies in Manhattan have confirmed both the direction and the degree of the findings.

Management Response

Regardless of how employees feel about staggering work hours, such a program cannot be implemented unless management is convinced that the efficiency of operations will not suffer. Phillips investigated this aspect and reported that

1. Six times as many supervisors reported gains in productivity under the new hours as reported losses and
2. The punctuality of employees increased.

In summary, all surveys have indicated that the changed hours had very few negative effects.

One of the important specifics on the question of work efficiency was whether shifted starting times affected internal or external communications among participating firms. A substantial majority of unit heads surveyed reported that no severe communications problems resulted from the changed hours. About 15 percent cited some impact, but evidently the problems were not sufficient to cause a drop in efficiency.

In discussions with company representatives before the experiment, many commented on current problems of employee punctuality and asked that this area be studied. For this reason, unit heads have been specifically asked about punctuality. They reported that staggered hours appear to have a beneficial effect. Compared to previous experience, almost 80 percent of the supervisors said their employees were arriving

on time or earlier under the new schedules. Only 11.6 percent reported that they were arriving later. This generally agrees with the findings of the tardiness study discussed earlier.

It is also worthwhile to note the individual experience of major firms in adjusting to new work schedules. For example, the New York Life Insurance Company reported, "It is gratifying to be able to report that service and productivity had been very adequately maintained during the two months of experimental activity on staggered work hours." After adopting a permanent staggered work hours program, the Bristol Myers Company, Union Carbide, Inc., Westvaco, and Sears, Roebuck, Inc., made similar comments.

Firms that communicate regularly with western time zones often express concern about keeping in touch on earlier staggered schedules. We therefore canvassed several major New York corporations that have successfully shifted to staggered hours, and none has found this to be a serious problem. There are several reasons for this; the major reason is simply that the new work hours required only a small adjustment in communications habits.

General Program

Although the approach to individual companies and government organizations to change their work hours has remained relatively similar since the earliest efforts, there has been constant improvement in the sales technique as additional studies provide success stories and enable us to develop additional sales and promotional tools. It is also important to note that efforts to implement the SWHP in the New York-New Jersey region were developed from scratch and few guidelines were available.

Generally, the procedure has been as follows. After sponsoring organizations have been secured, as many companies as possible are surveyed to determine their work hours. Subsequently personalized requests to consider SWHP are made to company officers. In many instances, questionnaires are prepared for distribution to the company's employees to assist the company in deciding whether to experiment with staggered work hours. Basically, these questionnaires request employees' opinions on their work schedule preferences and the effects of a change of hours on their home lives and their journey to work. Having a company agree to survey its staff usually ensures eventual participation, for employee interest is invariably overwhelmingly favorable. After the change has been made to a different work schedule, questionnaires are distributed to determine employees' attitudes and actual effects on transportation and living habits.

The following sequential steps are usually taken in an organization considering the adoption of staggered hours:

1. Discussion with company officials and presentation of the results of the SWHP in other companies, usually via an association of which the firm is a member;
2. A work schedule survey of the hours actually worked and the age, sex, marital status, place of residence, and mode of travel of the employee;
3. A subsequent survey of the employee's attitude toward the shift in work hours generally tabulated by department, age, sex, and so on; and
4. A summary report on the results of the staggered work hours experiment.

Concurrently, when a sufficient number of employees have shifted their hours, studies are made of the congestion on local streets and at transportation facilities as well as in building lobbies. Management is also questioned on data regarding the efficiency of employees on new schedules, the rate of absenteeism and tardiness, and any operating problems such as faulty communications with out-of-town offices or customers that might have occurred.

All of the material received is used in personal solicitation with firms that have not yet joined the program, and every effort is made to circulate literature and newspaper

articles that will encourage further participation.

Specific Case Histories

It is illustrative to describe briefly the case histories of a number of Manhattan organizations that have adopted staggered work hours in the last 4 years. Additional information on any of the situations may be obtained from the author.

1. Union Carbide switched all 3,500 headquarters staff from 9 to 5 to 8:30 to 4:30 after a survey showed great preference for earlier hours. A later survey indicated that about 85 percent like earlier hours and that management was very pleased.
2. Bristol-Myers adopted a program similar to Union Carbide's although it took more than a year to convince management to make a staff survey, which showed 84 percent preferring earlier hours. The company switched to 8:30 to 4:30. It has now adopted a floating day, which allows staff to come in between 8:00 and 9:00 a.m. each day and leave the corresponding number of hours later.
3. Westvaco management was immediately enthused about staggered hours and conducted a survey of staff showing 75 percent like earlier hours. Westvaco shifted within a month to 8:30 to 4:30, and the after survey again showed that 86 percent favored staggered hours.
4. New York Life Insurance was on 9:00 to 4:30 schedule, and it took more than a year of persuasion, analyses, and surveys—mainly harping on their congested 9:00 a.m. start time—to convince the firm to try an 8:30 to 4:00 schedule for its 4,000 staff. Because of more free evening time and better commuting, 87 percent of employees like the new schedule. N.Y. Life adopted the earlier hours in the summer, which is an excellent time to make such an experimental change. Since the change, N.Y. Life has received much publicity from participation and has enjoyed the exposure.
5. Celanese Corporation shifted 1,000 staff to 8:30 to 4:30 after 2 years of effort. Critical were direct contact to the president of the corporation by staggered hours chairman Andrew Heiskell and also the company's recent move to consolidate staff.
6. Sears, Roebuck, the nation's largest retailer, shifted from 9 to 5 to 8:30 to 4:30 and 8:45 to 4:45 after a preference survey conducted by port authority staff. Much publicity was accorded its participation as the 400th firm to join the program.
7. McGraw-Hill switched from 9 to 5 a few weeks after a breakfast meeting sponsored by Rockefeller Center. Most of its staff adopted 8:30 to 4:30 schedules, although about 25 percent chose 9:30 to 5:30 hours.
8. Montgomery Ward adopted the floating day concept after moving from 9 to 5 (similar to Bristol-Myers).
9. Lever Brothers, after moving to 8:30 to 4:30, shaved 15 minutes off the lunch period to go to a 4:15 p.m. quitting time.

Promotion

As previously mentioned, no avenue of potential promotion should be overlooked if staggered work hours implementation and significant reductions in traffic congestion are to be achieved. Although these activities may seem out of the realm of transportation professionals, they are essential to enlist the broad participation needed to make staggered hours successful. Some examples of far-reaching promotional efforts are discussed below.

Real estate management firms and their leasing agents have been quite cooperative in the SWHP. Their properties are more attractive when lobbies are uncrowded and elevator service rapid. There may, however, be some resistance to staggered hours, for they may feel that future prospects will consider the program as necessary because of an inadequate physical plant. Appropriate real estate contacts can provide lists of new tenancies for staggered hours solicitation. In addition, spreading hours should promote sales in a building's ancillary facilities, such as stores and restaurants.

Minimum congestion in stores provides ease in shopping and frequently more space for new lines of merchandise.

All media should be contacted to the fullest extent possible. Newspapers should be used to run news stories and the resultant fact sheets distributed to prospective program participants. Under no circumstances should any opportunity for TV and radio interviews be ignored, and the television stations in particular should be advised that early quitting times may provide them with a larger night prime time audience. Public service announcements can be developed for TV and radio to take advantage of the non-profit nature of the program. These can often be done by advertising agencies on an out-of-pocket cost basis. A complete program of press releases for all newsworthy items is essential.

Banks should be urged to schedule their retail hours for early opening to accommodate program participants. Where banks do adjust their hours, tie-in promotions should be encouraged.

The trucking industry can be advised of the benefits of earlier deliveries, particularly if participants have an early opening and a late closing. Several trucking firms have requested the names of firms on staggered hours to facilitate earlier deliveries.

A formal program including a newsletter and up-to-date mailing lists should be maintained. Periodic reports should be issued to participants and prospective participants. Participating companies should be urged to include in "help wanted" advertising the fact that they are on preferred hour schedules.

Wherever possible, restaurants should be encouraged to provide "early-bird" breakfasts, say to 8:30 a.m., and cocktail lounges can provide early "happy hours," say to 4:30 p.m.

In addition, the SWHP should be run in a strictly businesslike manner with attractive stationery, business cards, and descriptive hand-out materials. Brochures keyed to staggered work hours can be distributed with telephone and department store bills to encourage increased participation and to further public knowledge of the program. Business associations should be encouraged to report in their house organs particular items of staggered work hours interest.

A very successful event calling attention to the Manhattan program was held on May 7, 1974, at the MTA's new 57th Street subway station. A ceremony there highlighted the installation of some 12,000 staggered work hours cards and posters (Fig. 9) that depict crowded conditions in a cartoon. On May 7, New York City public and corporate officials plus several hundred men and women from participating firms simulated with good spirit and much enthusiasm the crowded conditions shown on the poster. The event attracted wide coverage by TV and radio stations and newspapers.

FLEXIBLE HOURS, 4-DAY WEEK, AND OTHER CONCEPTS

There are other work schedule concepts that may relieve traffic congestion in a central business district without major investment in physical facilities. Notable is the use of flexible work hours or a shortened workweek. Flexible work hour scheduling, also called flextime, Gleitzeit, and gliding work hours, is spreading rapidly in Europe and is now being tried by many American firms. Basically, this concept permits employees to set their own starting and quitting times around a "core" time when all must be at their work station.

Not only does the flexible hours concept have the advantage of reducing traffic congestion, but also it has been found to be personally desirable. Employers find that more time is actually spent working by staff. It is notable, however, that the flexible hours concept is more difficult to adapt to assembly line operations, particularly where groups are unionized or where overtime payments are a factor.

The port authority plans to experiment with flexible hours. This experiment will probably include about 1,000 professional and clerical personnel and, as with the original port authority SWHP experiment, will provide in-depth documentation on the effects of flexible hours on transportation, efficiency, and worker attitudes.

Figure 9. Card used to advertise the staggered work hours program.



The concept of a shortened workweek, usually 4 days, has also been receiving a great deal of attention. Under this concept, total work hours are compressed into fewer days or the total number of hours worked is reduced. The trend has been based on efforts both to give employees another full day of leisure and to conserve energy and reduce transportation congestion.

FEDERAL TECHNICAL STUDY GRANT

In 1973, the port authority was awarded a technical study grant of \$133,000 from the U.S. Department of Transportation to study the SWHP in midtown Manhattan. The grant, made by the Urban Mass Transportation Administration, is being administered by the Tri-State Regional Planning Commission.

In making the grant, UMTA asserted its support of efforts by Manhattan firms to relieve transportation congestion through voluntary staggering of work hours. Support was expressed for such low-capital projects as a way in which local communities can do something now about urban transportation congestion.

The port authority's responsibility will include the preparation of a technical report detailing the nature of objectives of the project, the work performed, and an analysis of the results with concomitant recommendations. Also included will be a manual containing criteria for determining the feasibility of staggered work hours in any CBD. The manual will discuss ways and means of developing alternate work schedules and an evaluation of the many variations of staggered work hours in terms of their effect on transportation peaking. This will include split shifts within an individual company, flexible hours, voluntary versus employer-prescribed hours, and the 4-day workweek.

CONCLUSION

At the risk of being repetitious, it should be emphasized again that the success of any staggered work hours program is dependent on constant documentation, promotion, and sales effort. The gains in employee comfort and the reduction in transport congestion from SWHP have been amply demonstrated by many studies, including those reported in this paper. Implementation, however, has generally not achieved satisfactory levels of participation in many areas because sales effort and promotional programs have not been stressed. As noted, the backing of influential businessmen and civic leaders is a prerequisite to a successful program. Obviously, these leaders must first be convinced of the value of the program to their own organizations, to their personnel, and to the community as a whole. After this, success can only come through constant unremitting effort.