

## SUMMARY

A sketch-planning analysis of a proposed subsidized pass sales program has been presented. The analysis has demonstrated that rough estimates of the impacts of such a program can be developed by using relatively scarce information on similar projects in other cities. This back-of-the-envelope approach was sufficient in this case to determine that a more detailed analysis was not warranted. It did, however, identify certain counter-intuitive impacts,

such as the net revenue gain to SEPTA of instituting the proposed program. Such an impact probably would not have been identified through a purely qualitative evaluation. Finally, apparent in this approach was the value of data drawn from other cities, particularly from projects in the UMTA Service and Management Demonstration program.

*Publication of this paper sponsored by Committee on Transit Service Characteristics.*

## Car Drivers Test Public Transportation: A Measure to Encourage Persons to Switch to Public Transportation

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Most of the advertising created by managers of public transportation systems in the Federal Republic of Germany has necessarily adhered to the classical methods of product marketing, i.e., campaigns to improve the image of public transportation and advertising targeted at the general public. However, it is doubtful whether such methods are suitable for service-oriented industries, especially public transportation. A series of special studies have revealed that persons do not use public transportation because they are not informed about the supply and because of their subjective perceptions of different aspects of the public transportation system. This means that one of the primary goals of efficient advertising is to inform persons about the public transportation system. The Stuttgart Integrated Public Transportation System took a decisive step in this direction with its campaign, Car Drivers Test Public Transportation. In this campaign, persons who were willing to use public transportation on a trial basis for a period of 1 month were selected through their places of employment. The social-scientific study done by Socialdata to accompany the campaign had two basic goals: (a) determine what percentage of the test persons continued to regularly use public transportation after the month of testing had been completed, and (b) study the effect of practical experiences with public transportation on the attitudes that persons previously inadequately informed about public transportation supply would then have toward public transportation. For this purpose, surveys were done of travel behavior before, during, and after the test, and studies were done to determine the opinions of the persons surveyed.

In 1980 the Stuttgart Integrated Transportation System (VVS), together with the German Automobile Club, initiated a campaign called, Car Drivers Test Public Transportation. As part of the campaign, car drivers who were employed were given free monthly passes and were requested to use public transportation on a trial basis so that they might experience the public transportation system at first hand. This action was used as a new type of publicity campaign and to further public relations work. This idea was based on the theory that many persons do not use public transportation because they are unfamiliar with it and do not realize how attractive an alternative it can be (1).

A multistage social-scientific study accompanied this campaign in order to determine whether changes in attitudes toward public transportation and

changes in travel behavior had taken place (2). Thus before and after the campaign surveys dealing with the attitudes and transport behavior of the test persons were done. Travel behavior during the month of testing was also surveyed.

The surveys, which were conducted before, during, and after the campaign, were done at 1-month intervals, and travel behavior was also studied 1 year after the campaign had taken place. The family members of the test persons were also included in the surveys on behavior because a change in the travel behavior of the first person could also affect other family members; e.g., a car no longer being used by the test person could now be used by another member of the family (3). A few of the most important results of this study are presented in this paper.

### CHANGES IN TRAVEL BEHAVIOR

#### Mobility

##### Test Persons

The first factor used to describe travel behavior is the share of mobile persons, i.e., the percentage of persons who participated in out-of-house activities on the day of sampling. Due to the goals of the study, most of the test persons in the sample were employed. Therefore, this group is highly mobile; i.e., they almost all made trips on the sample days.

Before the test month and during the month of testing, the test persons had an almost identical rate of mobility. On the other hand, the percentage of persons with out-of-house activities in the month following the test was 16 percent less (Table 1).

Two factors were mainly responsible for the decrease in mobility.

1. The target persons received questionnaires five times within a period of 4 months. Although the response rate was satisfactory in all of the surveys, it can be assumed that at a certain point some

Table 1. Mobility.

Item	Test Persons			Family Members			
	Total	Before the Test	During the Test	After the Test	Before the Test	During the Test	After the Test
Base	3,876	472	472	472	820	820	820
Share of persons who did not leave their homes on the sampling day (%)	18.0	4.0	5.7	21.6	11.6	19.0	36.2
Share of persons who left their homes on the sampling day (%)	82.0	96.0	94.3	78.4	88.4	81.0	63.8
Share of persons (%) on sampling day who made							
1 trip	0.8	1.1	1.7	0.4	0.7	0.9	0.4
2 trips	33.5	35.2	45.0	35.7	30.9	31.7	29.1
3 trips	7.2	12.7	8.5	8.9	6.5	5.8	4.5
4 trips	22.7	24.6	21.7	17.4	27.2	24.2	19.1
5 trips	6.5	8.5	7.0	9.1	7.4	5.5	3.8
6 trips	7.3	7.4	6.2	3.8	10.3	9.4	4.6
>7 trips	4.2	6.6	4.5	3.2	5.5	4.0	2.2
Avg no. of trips per person per sample day in relation to all persons for all sample days	2.85	3.41	3.06	2.58	3.28	2.89	2.11
Avg no. of trips per person per sample day in relation to mobile persons on the sample day	3.48	3.55	3.25	3.30	3.71	3.57	3.31

Note: Data for all days on which persons were sampled.

persons were no longer willing to respond; thus they simply wrote that they had made no trips on the given sample day (4).

2. The second and quantitatively more decisive factor also has to do with nonreported trips (5). Nevertheless, this second factor will be dealt with separately because it is directly related to the study. A number of those persons who partly or totally reverted to their old habits the month following the campaign tried to hide this fact by claiming that they were immobile on the sample days after the campaign.

Based on the sample days on which persons were mobile, the data in Table 1 reveal that from the time before the campaign to the time of the campaign, the median mobility fell from 3.55 trips to 3.25 trips per day and following the campaign it rose to 3.30 trips per day. This means that changing to public transportation had a significant effect on the activity programs of the test persons. Further results indicate that those activities that occurred on the way to work and back home (such as shopping) were excluded from the activity programs of the test persons during the time of testing. During the test, most of these activities were taken over by other family members. After the campaign, if the test persons decided to stop using public transportation, they resumed their previous activities (Table 2). The percentage of persons who made exactly 2 trips on the sample day (i.e., usually simply made 1 trip to work and 1 back home) increased by 10 percent during the campaign and afterwards reached its old level (Table 1).

#### Family Members

Far fewer of the family members of the test persons are employed than the test persons themselves. Therefore, the other family members make fewer trips. On the sample days, about 12 percent of the family members were immobile (Table 1). In the two following survey stages, their immobility drastically increased. The reasons for this were as follows:

1. Their increasing unwillingness to respond to each further survey stage; however, this tendency is not as systematically related to travel behavior among the family members as among the test persons; and
2. They did not understand why they should answer three sets of questions simply because one per-

son in their family had decided to participate in the test.

Therefore, the average number of trips per sample day also revealed a declining tendency among the family members.

By looking at the data about the mobility of persons on the sample day, it becomes clear that a considerable decrease in the average number of trips occurs only with the third stage (after the campaign). One reason is that parts of the third survey stage took place during Pentecost, which is a vacation period in the Federal Republic of Germany. There were a considerable number of children among the family members who, as shown in the categorization of trips according to trip purpose and destination, made fewer educational trips but more recreational trips during this period.

That such particulars could be pinpointed indicates the high quality of the instrument of measurement.

#### Activities

As already noted, the test persons changed their activity programs as a result of the public transportation campaign. Those activities not necessarily restricted to the test persons (e.g., shopping) were engaged in less frequently during the test period than either previously or subsequently.

The median frequency of work trips per mobile person per sample day was identical in the first two stages; however, after the campaign had been completed (the third stage), the number of trips was reduced by almost one-fourth. Most important here were those work trips that were consciously not reported because they were made by car (Table 2).

#### Modal Split

##### Test Persons

Before the test, the test persons made the vast majority of their trips by car (i.e., 2.55 trips per mobile person per sample day). The number of trips made with public transportation before the test was 0.52 trips, which was almost the same as the number of trips made with nonmotorized modes—0.47 trips per day. During the month of testing, the public transport share almost quadrupled, whereas the share of trips made with private motor vehicles was reduced to less than one-third of its previous volume.

About 6 weeks after the test, an average of just less than 1 public transportation trip was made per mobile person per day. This means that

1. About 28 percent of the increased number of trips made with public transportation could be stabilized up until that time;
2. In contrast to the month before the test, a total stabilized public transportation trip increase of 81 percent could be attained; and
3. Approximately every other person in the test continued to use public transportation after the test had been completed.

The questionnaires given after 1 year revealed the following:

1. The total number of trips per mobile person on the sample day was again equivalent to what it had been before the test;
2. The average number of trips made with private motor vehicles increased by 10 percent; i.e., the theory that trips made with private motor vehicles were systematically suppressed during the month following the test was proven to be true; and
3. The number of public transportation trips per person per day increased minimally, which indicated that about half of the test persons became stable users of public transportation (Table 3).

An analysis of actual public transportation trips reveals the following.

1. The greatest increase in the use of public transportation during the test month was in the rapid train system. In this mode the greatest percentage of trips was stabilized; after the test there was an increase of 118 percent.
2. For subways and streetcars, there was also a high gain during the test month, but only a small

number of these trips could be stabilized. Therefore, compared to the time before the test, a 6 percent increase remained (Table 4).

*Family Members*

The public transportation campaign hardly changed the modal choice of family members. Before as well as after the test they made a quarter of their trips by using public transportation. Relatively, it is possible to discern a slight increase in the number of trips they made by using private motor vehicles; however, this occurs solely at the cost of non-motorized modes. Thus, although family members increased their use of the test person's car, this hardly caused a decrease in their use of public transportation (Table 3).

MULTIVARIATE ANALYSIS OF ATTITUDES TOWARD PUBLIC TRANSPORT

This study was designed to give information on the extent to which practical experiences with public transportation for 1 month would give the test persons a different, preferably better, picture of the quality of public transportation in Stuttgart. The study was also designed to determine whether (and to what extent) a positive change in attitude would cause a habitually increased use of public transportation.

Thus the general attitude that test persons have toward public transportation in Stuttgart was important, and not what their opinions of specific parameters were. A method of analysis (6) was therefore needed that would make it possible to summarize individual attitudes pertaining to specific parameters as a whole and to divide all of the persons studied into groups according to multiple factors.

Cluster analysis fulfilled these requirements.

Table 2. Activities.

Item	Total	Test Persons			Family Members		
		Before the Test	During the Test	After the Test	Before the Test	During the Test	After the Test
Base	3,180	453	445	370	725	664	523
Avg no. of trips per mobile person per sample day with the following activity							
Work	0.58	1.07	1.07	0.83	0.30	0.29	0.25
Business	0.11	0.27	0.24	0.18	0.03	0.02	0.02
Education	0.29	0.02	0.03	0.01	0.51	0.51	0.39
Shopping, visits to doctor, and so forth	0.48	0.41	0.29	0.36	0.65	0.57	0.42
Recreation	0.46	0.37	0.33	0.56	0.46	0.44	0.66
Home	1.45	1.29	1.24	1.28	1.63	1.60	1.46
Other	0.11	0.12	0.05	0.08	0.13	0.14	0.11
Total	3.48	3.55	3.25	3.30	3.71	3.57	3.31

Note: Data for all registered mobile persons on the sampling days.

Table 3. Modal split.

Item	Total	Test Persons				Family Members			
		Before the Test	During the Test	After the Test	After 1 Yr	Before the Test	During the Test	After the Test	After 1 Yr
Base	3,180	453	445	370	320	725	664	523	492
Avg no. of trips per mobile person on sampling days using the following modes									
Nonmotorized	1.07	0.47	0.42	0.59	0.62	1.59	1.42	1.35	1.61
Private motor vehicles	1.40	2.55	0.79	1.76	1.92	1.16	1.23	1.22	1.40
Public transportation	1.00	0.52	2.04	0.94	1.05	0.95	0.91	0.74	0.93
No response	0.01	0.01	0.00	0.01	0.00	0.01	0.01	-	-
Total	3.48	3.55	3.25	3.30	3.59	3.71	3.57	3.31	3.94

Note: Data for all registered mobile persons on the sampling days.

Table 4. Mode used.

Item	Total	Test Persons			Family Members		
		Before the Test	During the Test	After the Test	Before the Test	During the Test	After the Test
Base	3,180	453	445	370	725	664	523
Avg no. of trips per mobile person on the sampling days using the following modes <sup>a</sup>							
Walking, bicycle or mofa	1.07	0.47	0.42	0.59	1.59	1.42	1.35
Car as driver or passenger; moped or motorcycle	1.40	2.55	0.79	1.76	1.16	1.23	1.22
Bus	0.19	0.09	0.17	0.11	0.26	0.23	0.18
Streetcar	0.45	0.19	0.86	0.34	0.49	0.46	0.34
Subway	0.02	0.02	0.05	0.01	0.01	0.02	0.02
Rapid train	0.27	0.17	0.79	0.37	0.16	0.16	0.14
Train	0.04	0.04	0.15	0.09	0.01	0.01	0.02
Taxi	0.01	0.00	0.01	0.02	0.00	0.01	0.01
Other	0.02	0.01	0.01	0.00	0.02	0.02	0.02
No response	0.01	0.01	0.00	0.01	0.01	0.01	-
Total	3.48	3.55	3.25	3.30	3.71	3.57	3.31

Note: Data for all registered mobile persons on the sampling days.

<sup>a</sup>Only main mode used.

Cluster analysis makes it possible to combine the opinion profiles of individuals into similar groups. These groups are called clusters. Clustering makes it possible, to put it somewhat simplistically, to collect similar characteristic profiles into one cluster and to sort different characteristic profiles into different clusters. The variables used to define the groups (i.e., the active variables) were the result of a scale that had been used to measure the feelings (7) of persons that used public transportation before and after the test.

#### Description of Types of Attitudes

After several tests were done, a configuration of six types of persons proved to be the ideal solution. These types of persons are described as follows.

The first type of person is unreservedly in favor of public transportation. Thus it is natural to refer to these persons as having a "totally positive attitude". Fourteen percent of the respondents were in this category before the test, and 17 percent were in this category after the test. Thus the size of this group increased.

The second type of person also has a positive basic attitude toward public transportation. With two exceptions, all of the values that these persons gave to different aspects of public transportation were in the positive section of the scale. Mild criticism toward public transportation could be noted in the areas of flexibility and accessibility of destination. These persons can be said to have a "predominantly positive attitude".

Of all of the groups, this group includes the most persons. Before the test 28.6 percent of the total belonged to this group. After the test only 22.4 percent of the persons belonged to this group. An analysis of the changes in the clusters indicates the direction that these losses took place.

The third type of person evaluates most of the items pertaining to public transportation more positively than the second type. However, for two items the values are so negative that this group must be considered separately. The two items are (a) flexibility ("I can't come and go as I please when I use public transportation"); and (b) accessibility ("It's not possible to get everywhere I want to go with public transportation").

These persons appear to be at ease when using public transportation, but its dependency on a fixed network and time schedules gives these persons the belief that they cannot always organize things as

they might wish to. These persons appear to think that public transportation should be unrealistically flexible. This desire for flexibility is the result of an exaggerated need for security, articulated by persons who more or less force themselves to be ever ready to expect the unexpected. Thus this group can best be described as being "perfectionistic". Their basic attitude toward public transportation is definitely positive, and it can be assumed that these persons are also a future potential for the Stuttgart public transportation system, which should not be neglected. Before the test, this group accounted for 18.4 percent of the total, and afterwards for 19.6 percent of the total.

The fourth type of person is a difficult potential client for the Stuttgart public transportation system. These persons evaluate their experiences with public transportation positively, but they believe that using public transportation negatively influences their social status. They believe that their colleagues would be surprised if they were to use public transportation, and they also believe that their families would look down on their use of public transportation. These persons orient themselves more to the effect of their behavior on others and place their own positive attitudes toward public transportation in the background. It is difficult to induce these persons to use public transportation. Thus this group could be referred to as "influenced by others".

This group accounted for 8.2 percent of the total before the test and 10.2 percent after the test; their relative share is thus small. Nevertheless, because of the special characteristics of this type, it was not appropriate to neglect this group in this paper.

The fifth type of person evaluated almost half of all of the items negatively. These persons tend to associate use of public transportation with hassles, but they also negatively evaluated the areas of flexibility and accessibility of destination. Therefore, this group was referred to as persons with a "rather negative attitude".

This group is quantitatively important because it initially accounted for 23.5 percent of the respondents; after the test it was reduced to 19.2 percent. Nevertheless, here too the analysis of the changes in the clusters indicates the direction of the changes.

The sixth type of person is diametrically opposed to the first type. These persons gave almost all of the items negative, and sometimes extremely negative, values. The only exception was that this

group deemed public transportation to be up-to-date as a mode of transportation. Thus this group was referred to as persons with a "totally negative attitude".

Before the test this group accounted for 7.5 percent of the total, and after the test 11.8 percent of the total.

Analysis of Changes in Clusters

The analysis of the changes in the clusters revealed how attitudes held before the test changed after the test had been completed. The test resulted in changes in all of the groups. The greatest increase can be discerned in the two types of attitudes on the extreme ends of the scale. This leads to the conclusion that the test resulted in a polarization of attitudes. Positive attitudes were reinforced, but negative attitudes were also reinforced.

An analysis of the changes in the clusters led to the construction of six types of attitudes. It was demonstrated that

1. About a quarter of the total had their negative or positive attitudes reinforced (i.e., their opinions were stabilized);
2. In about 17 percent of the cases a positive prejudice was turned about due to the unsatisfactory experiences that the persons had when using public transportation; and
3. In about 15 percent of the cases negative attitudes were improved by the test (Table 5).

Group Discussions

At the conclusion of the study, 60 participants were chosen according to the criteria "change in behaviour attitude". A total of five group discussions dealt with the following topics.

1. A systematic discussion of experiences and criticisms of the discussion by other participants.

2. Concrete suggestions to improve the public transportation system as a result of experiences made with public transportation. The participants in the discussion were first to use a brain-storming method to collect all possible suggestions, and then they were to list these in order of importance, in light of the effect that the costs for improvements will have on the price of public transportation.

The most important measures suggested by the participants were divided into the following areas:

1. Increasing the frequency with which different types of public transportation run;
2. Improved coordination of the scheduling of different public transportation modes;
3. Making the schedules easier to read;
4. Integrating privately owned bus systems into the Stuttgart public transportation system; and
5. Improving the possibility of taking along baby carriages and bicycles.

CONCLUSIONS

The campaign Car Drivers Test Public Transportation by the Stuttgart VVS was an attempt to use a new kind of publicity for public transportation in order to reach new target groups. When the VVS was introduced in Stuttgart, advertising and public relations work were aimed at informing the regular users of public transportation of alterations in the system and changes in the fare rates. The current campaign was aimed at familiarizing car drivers with the public transportation supply. The social-scientific study was to explain the expectations that car drivers have of the Stuttgart VVS; what transport mode was used before, during, and after the cam-

Table 5. Defining persons with different types of attitudes.

Category	Type of Attitude Before Test	Type of Attitude After Test	Change in Attitude
Type A	Totally positive Totally positive Rather positive Rather positive Totally positive Totally positive Rather positive	Totally positive Rather positive Rather positive Totally positive Perfectionistic Perfectionistic	Positive attitude that is stable = 27.7 percent
Type B	Totally positive Totally positive Totally positive Rather positive Rather positive Rather positive Perfectionistic Perfectionistic Perfectionistic	Influenced by others Rather negative Totally negative Influenced by others Rather negative Totally negative Influenced by others Rather negative Totally negative	Deterioration of a positive attitude = 17.3 percent
Type C	Perfectionistic	Perfectionistic	Perfectionists with no change in their attitudes = 6.8 percent
Type D	Perfectionistic Perfectionistic	Totally positive Rather positive	Perfectionists whose attitudes improved = 9.1 percent
Type E	Influenced by others Influenced by others Influenced by others Rather negative Rather negative Rather negative Totally negative Totally negative Totally negative	Influenced by others Rather negative Totally negative Influenced by others Rather negative Totally negative Influenced by others Rather negative Totally negative	Negative attitude that is stable = 24.1 percent
Type F	Influenced by others Influenced by others Influenced by others Rather negative Rather negative Rather negative Totally negative Totally negative Totally negative	Totally positive Rather positive Perfectionistic Totally positive Rather positive Rather positive Perfectionistic Totally positive Rather positive Perfectionistic	Improvement of a negative attitude = 15.0 percent

campaign; and the experiences that the car drivers had with public transportation. Thus the study also examined the success of this relatively expensive public-relations work.

From the point of view of the Stuttgart VVS, the following results of the study were of special interest.

The decision of car drivers to use public transportation is influenced by the criterion "an economical form of transportation", and also by such criteria as speed, stress-free form of transportation, dependability, and comfort. Modern public transportation facilities and a supply geared to the needs of the users are capable of fulfilling these requirements.

Most of the car drivers who participated in the campaign are members of the middle to upper classes. This group is increasingly interested in the possibilities of public transportation.

More than half of the participants in the test are still using public transportation to get to work. Furthermore, the attitudes of many of the participants toward public transportation changed for the better during the campaign. Thus the campaign proved to be an effective instrument of goal-directed public-relations work.

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*Publication of this paper sponsored by Committee on Transit Service Characteristics.*