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Abridgment

Potential Demand for Passenger Rail Intercity Traffic and Possibility of Increasing Demand

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In the spring 1979, the Deutsche Bundesbahn (DB) (German Railroad Association) introduced a new system—Intercity (IC) 1979. Due to its innovations (average travel-time reduction by 20 percent, two-class train system, increased number of trains on a firm hourly schedule, and improved comfort), DB hoped to increase its number of potential passengers by inducing those who had previously used automobiles and airplanes to use the IC 1979 trains. The survey described here confirmed that this new concept would be successful. This was shown not only in the users' positive evaluations of the new system but also in the increased amount of travel (about 15 percent) on IC trains during the survey. Almost all the new passengers travel second class because of the deliberate change from exclusive IC trains to a fast, comfortable transportation mode for a broader spectrum of the population. An analysis of the potential increase in the number of passengers has proved the effectiveness of the new IC 1979 system.

Analysis of the entire market for intercity travel in the Federal Republic of Germany and the trend of the market in passenger rail travel in special segments of this market has shown basic changes in market potential and market structure in recent years. The percentage of trips for which individual transportation modes are used has consistently increased; it is now about 80 percent. In contrast to this, in 1975, for instance, passenger rail traffic accounted for only about 9 percent of the intercity traffic volume. In order to compete with cars and airplanes, it was of utmost importance for the Deutsche Bundesbahn (DB) (German Railroad Association) to improve the speed with which their trains traveled. The DB's market position could only be improved by catering to the most important customer demands. Thus, a thorough analysis of the total intercity passenger market and the development in demand for passenger rail traffic in the different market areas and intensive market research studies were performed prior to the institution of a new (two-class) train system.

The goal of the research was to show all the ways in which an improved offer could be adapted to market requirements and to extend the improvements to as much as possible. This meant that one needed to

identify the criteria that determined choice of mode of transportation, to analyze these criteria, and then to classify them according to order of importance. The investigation identified the following factors as important for keeping current railroad patrons and substantially increasing the number of future railroad customers:

1. Travel time must be reduced,
2. Number of direct connections must be increased,
3. Trains must travel more frequently, and
4. Traveling must be made more comfortable.

For this purpose, DB introduced new and improved intercity (IC) 1979 trains on May 27, 1979, after a preliminary one-year test of this offer on the route from Hamburg to Cologne. Important characteristics of the new IC trains for passengers were introduction of the two-class system for all IC trains, increasing the speed of IC trains by 26 percent or 20 km/h as compared with that of the D-Züge trains, and a consistent hourly schedule. The results of these and other measures were to be studied in a market survey (1).

Four kinds of trains for intercity travel are mentioned repeatedly in this paper. These are the trans-European express (TEE) trains, which travel between the major cities of Europe, make relatively few stops, and only have first-class cars; IC trains, which are similar to TEE trains but travel only within Germany; and the new IC 1979 trains mentioned in this paper, which now have two classes—the D-Züge, a two-class express train that travels within Germany and is slower than the TEE and IC trains and makes more stops, and the Eilzüge, which has two classes and is used for short trips.

RESEARCH CONCEPT

In order to deal successfully with the primary goal

Table 1. Trip purpose.

Purpose	Total (%)	Travelers Who Used	
		First Class (%)	Second Class (%)
Vacation	18	11	20
Personal	45	27	50
Business	27	58	19
Work and education	6	4	6
Armed forces personnel	4	-	5

Table 2. Response to survey of major improvements in IC 1979 train system.

Response	Mode			Total (%)
	Train (%)	Airplane (%)	Car (%)	
Improvements mentioned	55	42	36	39
Hourly train schedule	26 ^a	27 ^a	19 ^a	21 ^a
Second class	22	15	17	18
Faster transfers	19	12	9	10
Enlarged network	3	4	3	3
Comfort	5	4	2	3
Need for fewer transfers	1	0	1	1
IC surcharge	2	0	0	1
No improvements mentioned	18	16	14	14
Not familiar with IC system	19	38	37	35
No response	8	4	13	2

^aMultiple answers.

Table 3. Perception of IC 1979 system.

Response	Travelers Who Used		Total (%)
	First Class (%)	Second Class (%)	
Advantages	53	62	60
Travel-time reduction	38 ^a	50 ^a	48 ^a
Hourly schedule	15	6	8
Comfort	7	6	6
Second class	4	6	6
Less expense	1	3	2
Other	1	1	1
Disadvantages	7	4	5
IC surcharge	0 ^a	2 ^a	2 ^a
Short-distance train disturbances	3	1	2
Second class	2	-	0
Other	3	1	1
One system as good as other	15	12	13
No opinion	25	22	22

^aMultiple answers.

of the investigation, i.e., the current or likely quantitative and qualitative effects of the introduction of IC 1979 trains on railway traffic, it was necessary to interview actual users, i.e., persons who used the IC trains; to interview persons who traveled via car and airplane on routes covered by the IC trains; and to interview particular subsections of these groups intensively.

For these reasons, a three-step research concept was used:

1. A written survey of about 3000 passengers, most of whom were traveling on the IC trains;
2. A written mailback survey of about 2000 persons traveling between cities by railroad, car, or airplane on IC routes; and
3. Personal, in-depth interviews of 200 persons traveling between cities via railroad, car, or airplane on IC routes.

TRAVEL CHARACTERISTICS OF IC USERS

Travelers

The train-user survey showed that trip purpose was considerably different for persons traveling in the different classes of the new IC trains. There were twice as many persons on vacation trips in the second class as in the first class, whereas only about one-quarter of the second-class travelers were making business trips.

Through the introduction of this second class (previously, in IC trains, one could only travel first class), the train system structure was changed. This has had effects (described later) on the evaluation of the offer by passengers as well as on the passengers' resulting demands. The IC system, which was previously somewhat exclusive, has now become available to a wide spectrum of travelers (Table 1).

Trip Pattern

Only a third of all IC passengers reach their destinations without having to transfer to another train or trains. The remainder travel on an average of 1.5 additional trains, so that, on the average, almost every IC passenger has to transfer to another train. Most of the passengers use D-Züge trains to get to and from IC railroad stations. Passenger rail traffic on intercity stretches outside the IC network now tends to use the quicker and more comfortable IC connections whenever this is possible. This trend should be taken advantage of by encouraging and improving the transfer trains, such as the D-Züge and the Eilzüge. It does not suffice only to make transferring between IC trains less problematical and more comfortable, as had already been done at IC railroad junctions since the IC 1979 trains were introduced.

EFFECT AND EVALUATION OF IC 1979 TRAINS

Estimation of IC Potential

In estimating the potential demand, one is confronted with the basic problem that before the IC 1979 system was introduced on a national scale, it had been tested on the Hamburg-Cologne route and that these trains had been used by a number of the persons interviewed in the survey now being discussed. Therefore, the estimated change in potential demand can be seen in relation to two conditions--the situation prior to the test route and the situation prior to the national introduction of the IC 1979 trains.

In order to further clarify this problem, the percentage of passengers (statistics were supplied by DB) that had already used the IC trains on the test route was determined. For this group of persons, travel behavior prior to the institution of the IC route was estimated by using a mathematical computation under ceteris paribus conditions. The sum of the two values shows travel behavior prior to the introduction of IC 1979 trains (Tables 2 and 3).

According to this, one-third of the passengers who used IC 1979 trains had traveled with the IC and TEE trains during the previous year; approximately every second passenger had used a D-Züge train; every seventh passenger was induced to change mode or to make an additional trip due to the special offer. Also, the number of passengers who traveled on IC trains tripled, although four-fifths of this increased travel volume was caused by trips made on IC trains instead of on D-Züge trains. Most of the passengers who had previously traveled on D-Züge

trains used the second class; only every 20th person traveled first class. For other passengers, every 10th passenger used the first class.

In order to determine how many more persons were induced to use trains due to the introduction of the IC 1979 system, those persons had to be surveyed who had not previously used trains. Persons who had switched from D-Züge trains or other trains to the IC 1979 trains were not included. According to this survey, up to the fall of 1979, 13.7 percent more persons traveled by train due to the introduction of the IC 1979 system. Two out of three of the additional passengers had switched from the automobile to the train. Moreover, approximately every 15th passenger had already used an IC train on the test route. If one determines the probable behavior of these persons prior to the introduction of the test route, an additional potential of approximately 1.2 percent results. This means that the increased travel generated by the new system is about 14-16 percent in this estimation.

At the same time, the introduction of IC 1979 trains gave passengers the option of choosing between two classes. Those who changed the class in which they traveled could be divided into four groups:

1. Passengers who had previously used IC trains and will continue to do so but will travel second class instead of first class,
2. Passengers who had previously traveled first class on the D-Züge trains and now travel second class on the IC trains,
3. Passengers who had traveled second class on the test route but had previously traveled on IC trains and therefore first class, and
4. Passengers who had traveled second class on the test route but had previously traveled first class on the D-Züge trains.

In this estimation, the largest group that switched from one class to another was considered, i.e., those who changed classes for any of the train

connections. The number who changed classes was thus as follows (Tables 2 and 3):

1. For those who used the IC trains, about 11.8 percent since the introduction of the test route and about 12.9 percent prior to that;
2. For those who had traveled on D-Züge trains, about 13.9 percent since the introduction of the test route and about 15.2 percent before that.

Therefore, the percentage of those who switched classes was again about 14-16 percent for this survey.

Structure of Those Who Switched Classes and of Increased Demand

A classification of those who changed classes according to trip purpose shows that their structure is, for the most part, similar to that of those who came to use the IC 1979 trains in a different manner and immediately traveled second class. In contrast to those who changed classes, the trip purposes of the additional train passengers differ little from the hitherto existing potential. All in all, one can see that, in contrast to those who switched classes, the major impact is not on those traveling for private reasons but rather on those who were on official or business trips and especially for armed forces personnel (Table 3).

Evaluation of IC 1979 Trains

In addition to the two most important features of the IC system--the hourly train schedule and the two-class system--a number of other changes were introduced. For the most part, these changes were meant as orientation aids for passengers. The loud-speaker announcements in the trains were especially welcome as were the standardized car descriptions and the platform designations in color. The passenger's option of a free seat reservation is apparently not well enough known but can be evaluated

Figure 1. Changes in travel demand.

Used prior to introduction of IC '79	Total number of passengers			Percentage travelling		
	%	first class	second class	%	first class	second class
Standard IC/TEE trains	25.2 ⁺⁾	14.1 ⁺⁾	11.1 ⁺⁾	2.4 ⁺⁾	1.3 ⁺⁾	1.1 ⁺⁾
IC on the test route	8.4 ⁺⁺⁾	1.7 ⁺⁺⁾	6.7 ⁺⁺⁾			
1st class	2.4	1.7	0.7			
2nd class	6.0	-	6.0			
D-Zug	52.7	2.6	50.1	4.8	0.2	4.6
1st class	3.9	1.8	2.1	0.3	0.1	0.2
2nd class	48.8	0.8	48.0	4.5	0.1	4.4
(at night)	(4.6)	(0.4)	(4.2)	(0.4)	(0.0)	(0.4)
Car	9.1	0.9	8.2	0.8	0.1	0.7
Plane	2.0	0.4	1.6	0.2	0.1	0.1
Trip not taken	2.6	0.3	2.3	0.2	0.0	0.2
	100.0	20.0	80.0	8.4	1.7	6.7

+) The sum of the latter two columns is the figure given in the total

++) Mathematical classification of passengers on the test route

Figure 2. Increase in travel demand and changes in class.

Increased travel

<u>Used prior to introduction of IC '79</u>	Total number of passengers	Percentage travelling	
		first class	second class
		%	%
Car	9.1 ^{+))}	0.9 ^{+))}	8.2 ^{+))}
Plane	2.0	0.4	1.6
Trip not taken	2.6	0.3	2.3
	<u>13.7</u>	<u>1.6</u>	<u>12.1</u>

Test route

Total number of passengers	Percentage travelling		Total travel increase
	first class	second class	
	%	%	
0.8 ^{+))}	0.1 ^{+))}	0.7 ^{+))}	
0.2	0.1	0.1	
0.2	0.0	0.2	
<u>1.2</u>	<u>0.2</u>	<u>1.0</u>	14.9

Persons who
switched classes

<u>Used prior to introduction of IC '79</u>		
Standard IC/TEE		11.1 ^{+))}
IC on the test route		
1st class		0.7
D-Zug	1st class	2.4
		<u>13.9</u>

Total number
of persons who
change classes

1.1^{+))}

0.2

1.3

15.2

+) The sum of the latter two columns is the figure given in the total

as a positive change. There is also a positive response to the air conditioning installed in the cars, including some of the second-class cars (2).

On the negative side, passengers who had used the dining cars frequently criticized them, especially the "Quick-Pick", or self-service, restaurant. First-class passengers were particularly critical.

The best known of the IC system's improvements are the hourly schedule, the fact that one can travel second class, and, with certain exceptions, the fact that these trains are faster. The order of preference for these changes is the same for persons who usually travel by airplane, train, or automobile. The slogan "every hour on the hour" has been successfully propagated (Figure 1). Two-thirds of the actual users have a positive attitude toward the new system. By far the most important improvement is deemed to be the reduced travel time, whereas the hourly schedule is important only for first-class passengers, most of whom are making business trips (Figure 2). Thus, "every hour on the hour" was effective as a public-relations slogan, but for most of the actual users, it was of secondary im-

portance. For them, it was more important to travel inexpensively and as directly as possible with better connections and therefore more quickly (3).

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