Ridematching System Effectiveness: A Coast-to-Coast Perspective

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Although ridematching is one of the most widely used transportation demand management strategies, little information has been gathered about the characteristics and effectiveness of the systems used to provide the service. A nationwide survey of 84 ridematching systems was conducted in spring 1990. The systems are described with respect to five components: information storage, matching techniques, information dissemination, data base maintenance, and evaluation. The components are compared with the effectiveness of the systems in an attempt to identify cause-and-effect relationships. Program effectiveness is measured by the percentage of commuters using the service who successfully find alternative commuting arrangements through the program. A surprisingly small number of organizations, 27 of 84, monitored placement. Seven program characteristics are compared with placement. Positive but weak relationships were identified between placement and data base size, level of automation, match-list delivery, and follow-up activities. Parking supply, commute distance, and other elements of the commute environment may have a stronger effect on placement than ridematching system characteristics.

Matching commuters to share rides (ridematching) is one of the oldest transportation demand management strategies used to mitigate congestion and air pollution on the nation's highways. However, little current information is available on the various systems being used around the country. This research provides some perspective on the state of ridematching. Its objective is to identify common ridematching system characteristics and relate them to system effectiveness. Ridematching system effectiveness could be defined in a number of ways (e.g., the number of commuters using the system, the vehicle-miles of travel reduced, etc.). Effectiveness is defined here as the percent of commuters using the system that actually find or continue to use alternatives to driving alone as a result of using the ridematching service.

The emphasis of this study is not on the details of software design. Ridematching is viewed as a system that includes a number of elements in addition to the software. Although the software is essential for storing and matching commuter records, the interaction between rideshare system operators and commuters, as well as follow-up activities, is essential to the operation of an effective system. A good example is the well-documented Silver Spring, Maryland, Share-A-Ride program, which uses an extensive array of follow-up procedures—including personalized match letters, rematch post cards, and follow-up calls—to improve the effectiveness of the system.

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Most major cities in the United States have ridematching organizations. They are operated under various structures; some are part of local, regional, or state governments; some are operated by transit authorities; and others are operated as private companies. Most have a common goal of helping commuters to join, form, or expand carpools or vanpools or to make use of transit for their trip to work or school. Although most organizations share a common goal, few share a common vocabulary. For example, the commuters who use the ridematching service are called "applicants," "registrants," or "candidates," among other terms. Every effort is made here to use the most common terminology.

METHODOLOGY

Simply identifying organizations around the country that provide ridematching services was a more formidable task than first imagined. Fortunately, the Association for Commuter Transportation (ACT) recently completed a broad-based national survey of organizations involved in commuter transportation. Although the questionnaire did not ask directly if the responding organization provided ridematching services, several questions indicated that such a service was provided. On the basis of responses to five questions on the ACT survey, a list of approximately 110 organizations was compiled that were likely to provide ridematching services.

Mail-back questionnaires were sent to these 110 prospective ridematching service providers. Follow-up reminders were sent to everyone who had not responded by the original due date. Ninety-two of these were returned, for a response rate of 84 percent; all but eight provided ridematching services. Finally, a telephone interview was completed with those organizations that monitored program effectiveness; details that required probing were ascertained through the telephone interviews. The questionnaires and interviews were completed by the person in the organization who was most familiar with its ridematching system. The data and opinions reported here are from the country's most knowledgeable ridematching system administrators.

RIDEMATCHING SYSTEM CHARACTERISTICS

A potentially unlimited array of ridematching system characteristics exists. In order to focus on those elements that are likely to influence effectiveness, it is helpful to identify the key attributes of an effective system. Respondents were asked to identify these key elements (Table 1). An accurate data

TABLE 1 KEY ATTRIBUTES OF AN EFFECTIVE RIDEMATCHING SYSTEM

system attributes	number*	percent*
Accurate database	27	33
Promotion of service	23	28
Quick response	19	23
Follow-up procedures	17	21
Personal service	17	21
Large database	13	16
Incentives	11	13
Employer commitment	11	13
Other	5	4

* multiple responses permitted

base was the most frequently cited attribute. Quick response, personal service, and follow-up all ranked high on the list; together these attributes make a strong case for customer service. Promoting the service was considered more important than many of the system's actual attributes. Few respondents mentioned only one characteristic. Most cited a combination of two or three attributes necessary to operate an effective system.

The results of this research indicate that a comprehensive ridematching system includes the following components:

- Means for storing information about individual commute trips;
- Means for matching the information on commuters to determine which have the highest potential for sharing a ride;
- Means for disseminating the information to commuters;
- Means for validating and updating information to ensure accuracy, and
- Means for evaluating what is happening with users of the system in a timely way; this is the subject of the latter part of this study.

Information Storage

An accurate data base is viewed as the most important attribute of an effective ridematching system (Table 1). The storage and matching of commuter records are important components of data base accuracy. Ridematching information storage is an ideal job for the computer. Only six of the respondents indicated that their matching service was provided manually (Figure 1). Four of the six manual systems had data bases of less than 500. Although few were completely manual, 29 respondents indicated that their system was of a hybrid nature using both manual techniques and computer assistance.

Programs with customized software were the most common; 45 of the ridematching systems were customized. There does not appear to be a relationship between the use of a hybrid-type system and data base size.

Matching

The most common criteria used for matching were start and stop work time and geographic location. The types of ride-

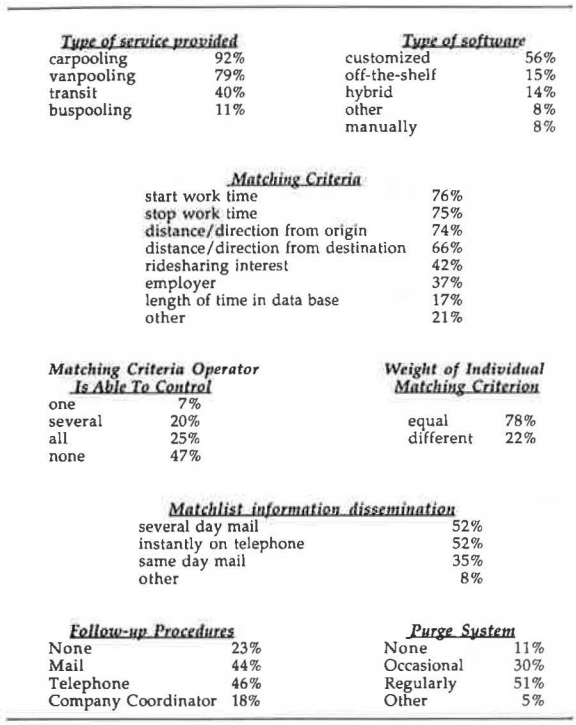

FIGURE 1 Summary of system characteristics.

sharing arrangement requested by the applicant (e.g., vanpool passenger and shared driving carpool) and the employer were also used by a large number of programs as matching criteria (Figure 1).

In addition to the criteria used, the operator's ability to control them (e.g., expanding the geographic area searched or searching additional areas along the route) and the relative weight or degree of importance assigned to each criterion can potentially influence the quality of matching. Matching is more than an automated function for many of the respondents' programs. About half indicated that the operators of their program were able to control several or all of the matching criteria (Figure 1). The other half were completely automated, offering the operator no control over the matching criteria. An equal number of customized and off-the-shelf programs used operator-controlled criteria. It is less common for the matching program to assign different levels of importance to specific matching criteria. Only about one-quarter of the programs assigned different weights to different criteria.

Information Dissemination

Two of the key attributes of a successful ridematching service mentioned earlier—personal service and a quick response—relate directly to information dissemination. Four primary methods of information dissemination were identified—instantly by phone, mailed the same day, mailed within a few days, and through a company coordinator (Figure 1). It is most common to provide information instantly over the phone and put a matchlist in the mail within a few days. About a quarter of the programs use company coordinators to disseminate matchlist information. Some of the less common meth-

ods (used by one or two programs) include same-day call back, in-person pick-up, and delivery by fax.

Data Base Maintenance

Maintenance is possibly the most important part of an accurate data base. There are two distinct components to data base maintenance. One is updating records that are to remain in the data base through follow-up procedures. The second is removing or purging of commuter records when requested or when their potential for matching is lower because of the length of time they have been inactive in the data base.

Three follow-up methods were identified by respondents: mail, telephone, and through company coordinators. Attesting to the importance of follow-up activities, three out of four programs initiated follow-up contacts. Purging is an important part of keeping a data base up-to-date. Most programs purge on a regular basis. It is difficult to identify an ideal purge frequency from the broad range that programs currently use. The purge frequency varies from 4 months to 2 years; the average is just over 10 months. Some programs (17 percent) select records for matching on the basis of how recently they were entered or updated. The newest records receive a higher priority in the matching process. This potentially reduces the negative impact of disseminating out-of-date information.

PROGRAM EFFECTIVENESS

There are two common indicators of a ridesharing organization's effectiveness: the number of commuters using the service and the percentage of those commuters who successfully find alternative commuting arrangements. The latter is referred to here as the "placement rate."

Placement Rate

Placement rate is the indicator that most closely reflects the effectiveness of the ridematching system. It is defined as the percentage of commuters who find alternative commuting arrangements through contacts made as a result of receiving a matchlist. It is subdivided in this study into carpool, vanpool, and transit placements.

Surprisingly few programs, 27 of 84 (32 percent), actually monitor placement rate. One might guess that it is simply the smaller programs that do not have the resources to track placement. However, results of this survey indicated only a weak relationship between size and monitoring placement (Table 2). Four indicators of average organization size are presented—total staff, number of staff working directly with the ridematching service, budget, and service area population. Although those organizations that do track placement are slightly larger, the difference is relatively small.

If placement rate is an important indicator of program effectiveness, why do so few programs actually monitor it? Because organization size does not seem to be directly related to monitoring placement, there are two other possibilities.

TABLE 2 COMPARISON OF PROGRAMS THAT DO AND THAT DO NOT TRACK PLACEMENT

indicator of program size (average)	*track placement*	*do not track placement*
Total Staff	14	12
Ridematching Staff	5	4
Budget	$587,000	$522,000
Population	1,748,000	1,472,000
	n=27	n=57

The first possibility is simply that not everyone considers it an important indicator. The second possibility is that although placement may be considered important, it may not be important enough to justify the resources needed to consistently monitor it.

Most organizations attempt to improve their ridematching system's effectiveness through marketing or promotional efforts designed to increase the size of the data base. This process works on the basis of the theory that a larger data base may increase the potential of finding a good match. Only 5 of the 27 programs that monitor placement rate indicated that they are involved in any special projects to increase the percentage of commuters placed. These projects include distinguishing between an applicant with limited interest and one who is more highly motivated, follow-up calls to specific segments of the data base, actually making calls for matchlist recipients, updating commute records in the data base through mail-back post cards, and generating matchlists at an employment site.

Placement Evaluation Methodologies

In order to compare the characteristics of programs monitoring placement, it was necessary to confirm that everyone was defining and measuring placement in the same way. Follow-up phone calls were made to organizations where the methodology was not clear. A few discrepancies were found; the most common difference was measuring the percent who received potential matches (i.e., valid names appear on the matchlist), rather than the percent who successfully made carpool or vanpool arrangements or began using transit as a result of having received a matchlist.

There are three methods commonly used to determine placement. One is a telephone survey of commuters who have used the service. The second is a mail-back survey of commuters who have used the service. It is common for these surveys to be done either annually or every other year. The third method uses follow-up calls done several weeks after a commuter enters the system. There are pluses and minuses to all three of these approaches. Surveys are a relatively efficient way to collect the data, but because they are done so infrequently it is difficult to relate changes in placement to the myriad of events that occur over a 1- or 2-year period. Follow-up calls provide information at regular intervals, but are labor-intensive and if made too soon they potentially miss placements that may take longer to successfully find alternative arrangements.

PLACEMENT RATE CORRELATIONS

Almost all of the 27 programs that monitor placement include carpool estimates (Table 3). Ten include separate vanpool placement estimates and eight include separate transit placement estimates. Placement rates vary considerably from program to program; carpool placement varies from a high of 60 percent to a low of 3 percent; vanpool placement varies from a high of 40 percent to a low of 1 percent.

In order to account for this significant variation in placement, a comparison was done of system characteristics discussed in the previous section and placement rates. Seven program characteristics were analyzed to look for cause and effect relationships:

- Staff to service area ratio,
- Level of automation,
- Matching criteria,
- Information delivery,
- Size of data base,
- Follow-up contact, and
- Purge system.

TABLE 3 REPORTED PLACEMENT RATES

Carpool *		
High	60%	
Low	3%	
Average	23%	n=26
Vanpool		
High	40%	
Low	1%	
Average	4%	n=10
Transit		
High	12%	
Low	1%	
Average	5%	n=8

* Some organizations do not distinguish between carpool, vanpool and transit placements. In this table, these combined placements are included with the carpool group.

TABLE 4 PLACEMENT RATES VERSUS RATIOS OF STAFF TO SERVICE AREA POPULATION AND STAFF TO DATA BASE SIZE

Staff To Service Area Population		
one staff person per population of:	*placement Rate*	
50,000 or less	22%	n=5
51,000 to 100,000	40%	n=5
101,000 to 250,000	25%	n=6
251,000 to 500,000	26%	n=6
501,000 or more	30%	n=5

Staff To Database Size		
one staff person per records in database:	*placement rate*	
500 or fewer	31%	n=7
501 to 1000	30%	n=5
1001 to 2500	25%	n=7
2500 or more	23%	n=7

Ratio of Ridematching Staff to Service Area

As staff size increases relative to the population of the service area, one would anticipate placement rate increasing (Table 4). However, the results do not support this assumption. Placement rate is highest at one of the higher staff-to-population ratios (1 to 51,000–100,000), but the second highest placement rate level is actually for the lowest staff-to-population ratio (1 to 501,000 or more). The relationship between staff size and service area (as defined by population) is weak.

Because staff-to-population ratio was such a dismal predictor, the ratio of staff to data base size was also examined (Table 4). A much more positive relationship was found. As the number of staff persons to the size of the data base decreased, so did placement. This more rational finding lends credibility to the data.

Level of Automation and Matching Criteria

Two measures of program automation were compared with placement rate. The first was a fully automated system versus a system that included manual techniques. One of the key attributes of an effective system described earlier (Table 1) was personalized service. A fully automated system may reduce the ability to provide personalized service. The results showed that fully automated systems actually had a higher average placement rate: 29 percent placement for the automated systems and 22 percent placement for the hybrid systems. Four of the five programs that had the lowest placement rates allowed the operator to control all matching criteria. The second comparison was between customized and off-the-shelf software. Placement rate was equal for these two; each averaged 28 percent.

There are two potential relationships between the selection of matching criteria and placement rate. One is that the more control given to the operator the better; the second is that the less control (or the more standardized) the better. The evidence supports the more standardized approach. The more criteria used, the lower the placement rate. Three or fewer matching criteria had an average placement rate of 30 percent; four or five matching criteria had an average placement rate of 27 percent, and six or seven had an average rate of 25 percent.

Matchlist Information Delivery

The most common distribution methods are by mail within a few days and instantly over the phone (Table 5). Surprisingly, placement rate varies little for the different distribution methods. The only noticeable difference is the increase in placement rate associated with putting the matchlist in the mail on the same day. The five programs with the highest placement rates all mailed matchlists on the same day that the commuter contacted them. This supports the hypothesis that a quick response is an important component of an effective system. However, if a quick response is important, one would also expect those programs offering instant service over the telephone to be significantly higher. There was no difference

TABLE 5 MATCHLIST INFORMATION DELIVERY

delivery method	*placement rate*	*% using method*
Instantly on phone	26%	50
Mailed same day	30%	35
Mailed within X days	26%	53
Via company coordinator	24%	24

between programs offering combined instant telephone and same-day mail and those offering instant telephone and several-day mail. Both had an average placement rate of 31 percent. This fact could be interpreted to mean that instant telephone service is the most important delivery method and that mailing the matchlist on the same day or within several days does not influence placement.

Data Base Size

An interesting relationship exists between data base size and placement (Figure 2). The smallest (less than 500) data bases do not do well, perhaps because they do not have the necessary entries to provide consistent matches. Somewhat larger data bases (500 to 1,000 and 1,001 to 5,000) have the best placement rates. At these levels, sufficient entries may exist to produce good matches, and their size is such that personal service and follow-up can be done effectively. At the 5,000 to 10,000 level, the placement drops. This size appears to be awkward—perhaps too large for personal service, but not large enough for the numbers to compensate for the lack of personal service. Another peak occurs in the 10,001 to 15,000 category for which entries are numerous and personal service possible, but not as effective as for the smaller categories. For the largest data bases, it may be difficult to provide personal service and effective follow-up, although they obviously have numerous entries. Examining the top and bottom five programs supports these findings. The average data base size for the programs with the five highest placement rates was within the 501 to 1,000 range; the five programs with the lowest placement rates had average data base sizes between 5,001 and 10,000.

Follow-Up Contacts

The opinions presented earlier (Table 1) indicated that follow-up activities are a key attribute of effective systems. Time series studies from one program also indicated a strong relationship (RIDES for Bay Area Commuters, Inc., unpublished data). In three consecutive surveys of ridematching system users conducted in 1986, 1988, and 1990, customers that received follow-up contact had a dramatically increased placement rate. The differences in placement rate were 45 versus 27 percent in 1986, 49 versus 29 percent in 1988, and 38 versus 16 percent in 1990. Despite opinions of respondents and this evidence that follow-up activities were an important ingredient in an effective program, Table 6 does not indicate a consistent increase in effectiveness with increased follow-up activity. Programs offering no follow-up contact had placement rates as high as those providing follow-up by telephone and through company coordinators. Follow-up contact through the mail appeared to increase placement.

Purge System

One might expect to find a relationship between purge frequency and placement rate. However, the scatter plot (Figure 3) of purge frequency and placement indicates an amazing lack of correlation between the two. Purge frequency is used here as a rough indicator of the accuracy of the data base. The more frequently a data base is purged, the more accurate the records in it should be. There are two potential explanations for this poor correlation. It is possible that the hypothesis is wrong and that a regular purge cycle does not significantly affect the accuracy of a data base. A second explanation is that an accurate data base may not mean a significantly better placement rate. The data do not indicate any sign of an inverse correlation. An inverse correlation would indicate that infrequent purging improves placement—perhaps by keeping the number of potential matches high.

TABLE 6 FOLLOW-UP CONTACT AND EFFECTIVENESS

type of follow-up activity	*% placed*	
No Follow-up Contact	25	n=4
Mail only	32	n=3
Telephone only	24	n=5
Mail and Telephone	32	n=11
Telephone & Company Coordinator	24	n=4

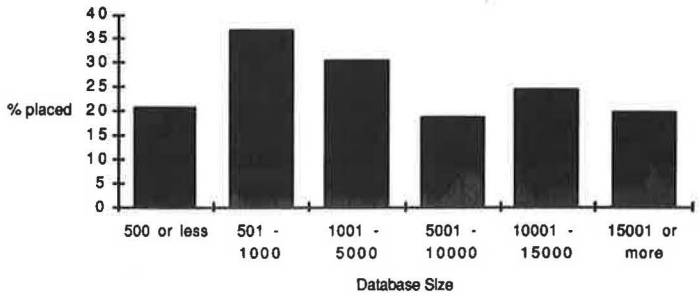

FIGURE 2 Data base size and placement.

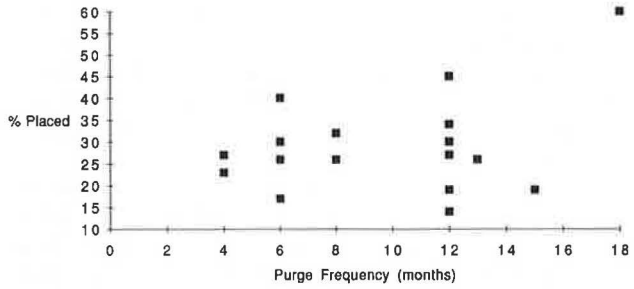

FIGURE 3 Purge frequency and placement.

CONCLUSIONS

The limited amount of current research on the subject of ridematching effectiveness is indicative of the limited resources organizations devote to this issue. Of the 84 responses to this questionnaire, only 27 monitor placement rate. Of the 27 that monitor placement, only 5 indicated that they were involved in special projects (other than promotional efforts) to improve placement. Thus most organizations did not know how many commuters actually started pooling or using transit as a result of their ridematching service. The supporters of these programs acted without this type of information. On the other hand, ridematching is viewed by many as a practical, hands-on service that produces immediate results at relatively low cost; it may not seem that important to devote additional resources to rigorously evaluate results.

Few programs monitored placement, and few correlations were found between ridematching system characteristics and placement rate. If more programs monitored placement, stronger relationships might be evident. The information analyzed here indicates that fully automated matching systems, mailing the matchlist on the same day, and follow-up contact through the mail all positively influence placement. An interesting relationship was found between data base size and placement. The highest placement rates were found among the small-to-medium size data bases (500 to 5,000 records) and the medium-to-large size data bases (10,000 to 15,000 records). The smallest data bases may not do well because they do not have the necessary entries to provide consistent matches. The largest data bases may not do well because of the difficulty in providing personal service to so many commuters. At the 500 to 5,000 and 10,000 to 15,000 levels, sufficient entries may exist to find good matches, yet their numbers are such that personal service and follow-up can be done effectively.

The relationship between data base size and placement is interesting but by no means conclusive. The lack of a strong relationship between other system characteristics and placement is probably more conclusive. There must be other factors that strongly influence placement. The two programs with the highest placement rates do not have any outstanding system design features. However, both have unique commute environments that appear to create strong incentives for ridesharing. They both cater to suburban markets with limited transit service. One area is dominated by long commutes and the other by a difficult parking situation at the work end.

Commute distance, lack of transit options, and difficult parking create commute environments that enhance the desirability of ridesharing. These environmental factors appear to more strongly influence placement rate than the ridematching system characteristics. This finding does not suggest system design is unimportant, but rather that creating a total environment that combines a good ridematching service with other incentives will produce the best results. In addition, each ridematching program looked at here is unique; attempting to reduce them to numbers and categories may not work. The individual parts may not provide a good representation of the sum. Perhaps what is required is a more detailed qualitative look that includes service philosophy and more emphasis on the commute environment to better understand the relationship between ridematching system design and system effectiveness.

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