RECRUITING CARPOOLERS: DYNAMIC RIDESHARING WITH INCENTIVES IN CENTRAL TEXAS

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ABSTRACT

Dynamic, or real-time ridesharing offers potential for helping drivers and riders coordinate to save trips, but few case studies exist to evaluate the effectiveness of various recruitment methods. This study summarizes the process and findings of a pilot project evaluating the use of dynamic ridesharing to verify occupancy for toll road discounts in Central Texas. Participants’ registration rates are evaluated in terms of association with ridesharing program efforts and incentives. Researchers classified a wide range of recruitment activities, and evaluated the daily relationship with the number of people actually registering for this dynamic ridesharing program. Regression analysis suggests that mass media interaction, such as paid advertisements and news coverage, offer the greatest immediate potential for encouraging ridesharing registration. Advancing technology offers a platform for increasing transportation system efficiency, but substantial recruitment efforts are necessary to create a critical mass of dynamic ridesharing drivers and riders.

Keywords: Real-time ridesharing; recruitment; ICTs; travel demand management; carpooling; dynamic ridesharing; crowdsourcing
INTRODUCTION

Software applications for real-time ridesharing (RTR, also called dynamic ridesharing, terms we use interchangeably) match carpool partners at the time the trip is needed or scheduled for a specific time and place. Smartphones with global positioning systems (GPS) help advertise spare seats to match drivers and potential riders using information and communication technologies. These methods constitute a new test of technology to deal with long-standing challenges of traffic and the efficiency of our transportation systems, but there are few studies of how participants are recruited into dynamic ridesharing. Private sector developers have applied significant resources into developing technology-based transportation solutions, but transportation agencies are still working out how to partner with them to reduce demand for single-occupant vehicle travel. This paper assesses recruitment and use of a real-time ridesharing app with an added incentive of toll road discounts for carpooling, between a regional transportation agency and a private software vendor. Following a review of dynamic ridesharing literature, this paper describes the context, methods, and results of participant recruitment in this pilot project.

Brief Evolution of Dynamic Ridesharing as a form of Travel Demand Management

Real-time ridesharing evolved from traditional carpooling programs, such as employer sponsored ride matching programs, roadway incentives for high-occupant vehicles, and informal “slug-lines”. However, the principal difference between real-time ridesharing and its predecessors is the emphasis of on-demand ride matching facilitated by social media and smart phone technology. While real-time ridesharing has existed as concept since at least the early 1990’s (1), pilot programs before the advent of the internet and subsequent technological advances were largely unsuccessful (2–4). Well-known examples of these programs were developed and deployed in Los Angeles, California (1994), Sacramento, California (1994), Coachella Valley, California (1994), Bellevue, Washington (1995), and Seattle, Washington (1996). Although the success of these programs was limited, they resulted in much interest among researchers to develop new solutions to the ride matching problem (5, 6) and identify market demand characteristics (4, 7, 8).

Since 2010, there have been many studies intended to research the potential impact of RTR on reducing congestion and single-occupant vehicle use. These studies took place during a time when social media and smart phone technologies where beginning to reach critical mass, allowing for some measurable successes. One of the first full-scale real-time ridesharing pilot programs was operated from 2010–2011 through a private-public partnership on the SH 520 corridor in Seattle, Washington. The project was funded in part by a grant of $400,000 from the Washington Department of Transportation (WSDOT) and was facilitated by smartphone app developer the Avego Corporation, now known as Carma. The scope of the project was primarily focused on recruitment with a goal of registering 1,000 users.

The app allowed users to choose to be either a rider or a driver. It charged riders a vehicle miles traveled fee, payable to the drivers, which created an incentive for drivers to make room available in their car (9). The marketing campaign had three elements: a dedicated website, a recruitment campaign among the area’s larger employers, and a publicity campaign. Focused promotional work resulted in the enlistment of 962 participants and sustained interest in the project (measured by website traffic) (9).

Participants were recruited and subjected to security checks administered by WSDOT. These background checks included submittal of the participants’ Social Security number so that a
background check could be performed, proof of insurance up to $300,000, and a copy of their driving record; drivers also needed to certify that they had followed the vehicles’ prescribed maintenance guidelines. Although Avego reported difficulty in retaining participants due to the rigor of the checks, WSDOT defended the security checks as essential to the legal responsibilities of the state.

Another pilot program in Santa Barbara, California provided additional practical insights (10). Starting in 2012, the same firm from the previous example tested performance of real time ridesharing in combination with various pricing strategies on travel behavior. Originally an 18-month pilot, it was extended to three years to account for “extensive beta testing of multiple versions of the app, as well as limited staff resources”. During this pilot, 755 people downloaded the app, but only 31 users took two or more trips using the service. The project report noted several key lessons, including the need for a more refined service that is a stable technology from the public’s perspective. The project was branded as SmartRide™, which was chosen to provide a consistent image and terminology that was separate from the smartphone app used, which did go through branding and function changes during the project. Also, local context factors such as toll lanes, priced parking, and the existence of high occupancy lanes are likely to play a positive role in future use of dynamic ridesharing.

The Northern Virginia Real-time Ridesharing Pilot Project focused on the I-95/395/495 corridor from Fredericksburg, VA to Washington, D.C. for six months in 2013 (11). Personal communication with the project coordinator at the Virginia Regional Commission suggested that rapid changes in the app during the project confused participants, and may have contributed to the relatively low utilization—900 total users completed 250 user trips (11). Reporting from this pilot revealed that “based on the number of registrations and positive feedback that the most effective marketing tool has been on site events at targeted military installations” (11), which is consistent with previous studies that indicated direct marketing through major employers are effective methods to recruit carpoolers (1, 12). Key issues in both of these pilots was recruitment—the level of effort needed to get users to try a new service and change their commuting habits is substantial. Other research in travel demand management supports their findings concerning resistance to changing travel patterns in the context of free or inexpensive parking, relatively inexpensive fuel prices, and lack of other supportive travel options (13–15).

Beyond case studies, several researchers have taken theoretical, programmatic, and modeling approaches to understanding the potential for dynamic ridesharing. Amey et al. identified major economic, technical, and social challenges that face RTR (1). These challenges were identified through interviews and workshops with both public and private service providers, including a 2-day event attended by participants from five countries. The challenges identified are important in giving context to decisions regarding potential dynamic ridesharing programs.

Many of these challenges were evident in the case studies already mentioned and contributed to the limited success or failure of previous programs. Perhaps the most cited challenge faced by any ridesharing program is that of stranger danger. This term reflects the mistrust between two unacquainted parties in a trip transaction. A series of surveys cited by Amey et al. shows that as little as 3 percent of ridesharing takes place between strangers (1). Consistently, concern over entering the car of a stranger has been cited as a major drawback in the aforementioned case studies. Attempts to alleviate these fears, such as an active profile on a social network, have been employed with a degree of success; however, this will likely continue to be an important factor in riders’ choices. There is an inherent power mismatch between participants as well. Drivers are seen to have more power to decide departure times; riders give up this ability in order to receive a
ride. Reliability of service and flexibility in schedules are also key challenges faced by RTR programs.

Dynamic ridesharing relies on details about personal identity, and the origins, destinations, and timing of trips. As more users interact with a given ridesharing system, commuter patterns and behavior can be established. Requiring personal identification results in the ability to associate travel patterns with specific users. The associated loss of personal privacy is an important legal concern. Questions of who will maintain traveler information and who will have access to such information currently vary from program to program.

Since the service relies on technology and pricing arrangements in an industry undergoing rapid change, service characteristics and definitions such as provided by Rayle, et al. are important (16). The service used in the present study provides arrangements by listing drivers and riders with similar trips. The app uses an estimate of the cost of a trip for riders at US$0.20 per 1.6 kilometers (1 mile), and offers drivers the option of providing free trips to riders. This service is distinguished from ride-hailing apps provided by transportation network companies (TNCs), because the total charge from multiple occupants cannot exceed the federally approved reimbursable driving rate—which in the year 2014 was US$0.56 per 1.6 kilometers (1 mile). Limiting rider charges to cost recovery categorizes this system within the definition of real-time ridesharing, rather than a ride-hailing service, in United States Public Law 112-141 (17) “…as projects where drivers, using an electronic transfer of funds, recover costs directly associated with the trip provided through the use of location technology to quantify those direct costs, subject to the condition that the cost recovered does not exceed the cost of the trip provided”. Project participants coordinated early with local officials to ensure this distinction was understood to differentiate from ride-hailing services.

Central Texas Experiment with Toll Road Discounts

This pilot ridesharing project, called “Austin-area real-time carpooling automated toll discounts” by the primary project sponsor (18), demonstrates an operational concept of using ridesharing technology with an existing tolling system for express lane occupancy verification. The pilot’s local technical name was “Real-Time Ridesharing Technology to Support Differential Tolling by Occupancy”, was supported by the Federal Highway Administration Value Pricing Pilot Program, with local leadership through the Central Texas Regional Mobility Authority (CTRMA). Key project partners include Carma, the Capital Area Metropolitan Planning Organization (CAMPO), and the Texas Department of Transportation (TxDOT). This study documents the process and findings of this pilot project, focusing on recruitment and retention of participants in this carpooling program, and an evaluation of travel behavior change.

This project focuses on CTRMA’s two tolled facilities: 183A and Manor Expressway. Both corridors connect suburban and rural areas to north-central Austin, Texas, a major hub of employment, education, and increasing residential density. The 183A corridor has a higher average density than the Manor Expressway corridor (Figure 1). Residential density within two miles of the Manor Expressway corridor is higher on the western, downstream end of the facility, and the eastern end is largely undeveloped. Therefore, this corridor currently experiences lighter traffic, but regional growth may change this over time. Overall, the Austin region has relatively low residential density at 757 people per square kilometer, within the primary transit agency’s service area. Furthermore, the local transit system is used at a rate of 405 annual passenger kilometers per person—ranked 6th out of 9 in a recent peer study of transit service equity (19). This context sets
a favorable stage for this new experiment in carpooling, which would theoretically serve this type of region well.

FIGURE 1. Population and Traffic of Pilot Ridesharing Corridors (20, 21)
The pilot was publicly launched on CTRMA’s 183A toll road connecting Austin and Leander, Texas, on February 27, 2014, and then added service on the full length of the Manor Expressway connecting Austin to Manor, Texas, with the facility’s grand opening May 17, 2014. For the 183A toll road, the toll varied from $0.51 to $1.86 for each gantry. For the US 290 Manor Expressway, the toll varied from $0.71 to $1.41 for each gantry (for two-axle passenger vehicle trips during 2014). This study includes data gathered through December 31, 2014. Though the pilot program in the year 2014 provided toll reimbursements only on these tollways, the ridesharing system was used throughout the region.

**Program Registration, Carpool Coordination and Toll Reimbursement**

Though the ridesharing app is available for download to anyone, toll road reimbursements were available only to registered participants in the study. The registration process in this study ensured researchers only had access to data from knowing participants through the protocol established and approved by Texas A&M University’s Human Subjects Protection Program. This process controlled access to and use of participant data. After participants registered online and downloaded the Carma app, they could then list their common start and ending locations and times. The smartphone app or website interface will suggest riders or drivers that are not far out of the seeker’s way, and they can send a private message to others to confirm trips. Once registered participants take a trip with at least one rider, their information is matched to the toll transactions so that the discounts can be processed before the next month’s bill arrives.

This pilot provided to registered drivers with one rider a 50 percent discount on the toll, and trips with two or more riders (3+ total) got the full toll waived. This dynamic ridesharing pilot project with toll road incentives may provide valuable information for improving transportation planning, but the extent of the data is dependent on an adequate number of participants.

**Recruitment and Trip Goals**

Based on the early trials of dynamic ridesharing (9, 10), the original proposal for this project estimated 3,000-5,000 participant sign-ups were needed, assuming 500-1,000 people becoming active participants in the pilot. As of December 31, 2014, 2,008 people had downloaded the app, and 314 registered as drivers. Many of these drivers used the ridesharing system without the toll road incentive—a total of 95 unique drivers were provided toll rebates for 2,213 trips, totaling $2,393.67. The project operated under-budget through 2014, and was extended following continued interest from the tolling authority, department of transportation, and local users. Travel behavior change and operational characteristics of this pilot are of interest, but the present study is focused on recruitment as a critical path to growing effective ridesharing programs.

**RECRUITMENT DATA AND ANALYSIS METHODS**

Registration counts and dates for the full toll reimbursement study (not app downloads) comprise the dependent variable for this study. Explanatory variables were developed with dates of actual recruitment actions, such as advertisements and promotional events. The project team implemented many kinds of recruitment activities, in-person and remote, sometimes focused on individual employers or as broad as radio ads. Researchers classified all of these activities into seven categories, as briefly described below (Table 1):
TABLE 1. Recruitment activity categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Activity examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighborhood</td>
<td>Advertisements on doorhandles, coffee events, postcards</td>
</tr>
<tr>
<td>Major Event</td>
<td>Ribbon-cutting of tollway expansion, free breakfast event, December gift card incentive</td>
</tr>
<tr>
<td>Paid Media</td>
<td>Radio ads, billboards, print ads in local newspapers</td>
</tr>
<tr>
<td>Earned Media</td>
<td>News media such as local newspaper articles, television news and radio spots</td>
</tr>
<tr>
<td>Driver</td>
<td>Transportation agency communication to drivers through web site banners, bill inserts, and newsletter mentions</td>
</tr>
<tr>
<td>Employer</td>
<td>National Instruments (major local employer) breakfast and information table</td>
</tr>
<tr>
<td>Digital</td>
<td>Project website, blogging, Twitter, Facebook</td>
</tr>
</tbody>
</table>

We assigned dates to each activity for each day in the year 2014, and categorized them in a matrix as dummy variables (1 on a date with a given activity, 0 for no activity of that type on the date). In many cases, several recruitment activities could be ongoing on any given day, and data reduction as dummy variables allowed analysis of activities on a given day with new daily registrations in the study.

Analysis

Analysis methods include recruitment timeline visualization, estimation of the probability of concurrent daily recruitment events using a Poisson distribution function, and multi-variate regression. To visualize the timeline of activities, we graphed the seven categories in a Gantt chart, overlaying monthly registration and registered carpool trip activity (Figure 2). The graph includes two vertical axes, with the vertical bars showing the number of vehicles that people signed up as TxTag toll pass registrants, referred to in the chart as additional vehicles registered (monthly, not cumulative), and the line depicts the number of individual trips those people took by carpooling using the smartphone app (noted as person-carpools, also monthly, not cumulative).
FIGURE 2. Pilot Recruitment Activities, Registration, and Carpool Trips

Digital: blog, flyer, webinars, invitations, radio

Total: 1st media banner, CTRMA ad insert and newsletter mention

0 10 20 30 40 50 60 70

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Additional Vehicles Registered

0 100 200 300 400 500

Person Carpools

Neighborhood
Events/Campaigns
Paid Media
Earned Media
Driver
Employer
Digital

Blackhorse Creek: doorhangers 3/24, morning coffee 2/26, BBQ 4/26, postcards 4/24
Major doorhangers 3/28, postcards 5/29
1stA ribbon cutting Feb. 27

radio, billboards, print ads
2 print, 1 TV, 1 web

2 print, 1 TV

2 print articles, 1 TV spot

2 print articles

1stA ribbon cutting May 17

Mobility Week Campaign whole foods breakfast 6/1, 20-24
RightStart 1st/11th: education seminar
Drive for Thanksgiving
Amtrak incentive Dec. 1-15

multiple appearances
As Figure 2 shows, several types of recruitment activities were likely to happen on some days, and so we added these simultaneous activities on a daily basis for the year 2014, and computed a Poisson distribution to graph this likelihood. Finally, we analyze the relationship of program registration with the seven categories of recruitment activities using multivariate regression.

RESULTS

Evaluation of Recruitment Activities

In total, 314 people registered as driving participants in the real-time ridesharing program through December 31, 2014. Coding recruitment activities on specific days enables calculation of basic statistics on the program’s efforts. Some efforts need only to be created once, then maintained, such as the constantly-available project website in the digital category. Face-to-face events, on the other hand, require significant preparation time and staffing, so it fits that major events, neighborhood activities and employer outreach constituted the least proportion of event-days, 13% in total (Table 2). Some days had multiple concurrent activities occurring, adding up to a total of 980 event-days; so there were approximately 2.7 activities on any given day in 2014.

Table 2. Recruitment Activity Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Total event-days</th>
<th>Percent of total event-days</th>
<th>Avg. Events/Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighborhood</td>
<td>52</td>
<td>5.3%</td>
<td>0.14</td>
</tr>
<tr>
<td>Major Event</td>
<td>25</td>
<td>2.6%</td>
<td>0.07</td>
</tr>
<tr>
<td>Paid Media</td>
<td>172</td>
<td>17.6%</td>
<td>0.47</td>
</tr>
<tr>
<td>Earned Media</td>
<td>174</td>
<td>17.8%</td>
<td>0.48</td>
</tr>
<tr>
<td>Driver</td>
<td>142</td>
<td>14.5%</td>
<td>0.48</td>
</tr>
<tr>
<td>Employer</td>
<td>50</td>
<td>5.1%</td>
<td>0.39</td>
</tr>
<tr>
<td>Digital</td>
<td>365</td>
<td>37.2%</td>
<td>1.00</td>
</tr>
<tr>
<td>concurrent</td>
<td>980</td>
<td>100.0%</td>
<td>2.68</td>
</tr>
</tbody>
</table>

Program staff paid attention to sequencing of the activities to align with travel seasons for students, holidays, and planned roadway infrastructure changes. During the approximately 14-week period from late February through May, bracketing the two toll road openings, pilot study participants signed up in their largest numbers; in February, there were more than 60 new sign-ups, and sign-up levels from March through May hovered around 40 each month. This activity roughly mirrors the spike in general Austin member sign-ups for February, which lessened but nevertheless grew steadily throughout the summer. This was a period of high outreach activity on the part of the project partner organizations, and of high earned media coverage in print, television, and radio. However, all of these outreach and promotional activities were also leveraging the energy from the activities of transportation providers in the opening of new roads. Those events in themselves generated community awareness and knowledge that the program benefitted from. Coordinated timing of recruitment activities helped to recruit new users.

Pilot study member sign-ups spiked again into the mid-20s in September and October as the program increased outreach activity in preparation for the Mobility Week campaign in October. Carma ran web ads, reached out again to a target neighborhood near 183A, and began outreach to
several new large employers in the area. At the same time, they were the subject of healthy earned media exposure: two print articles and one television spot.

The final measure of the carpooling campaign is the number of trips users took as carpool participants. This number climbed steadily through the study period from its dramatic spike in March, with 283 carpools registered in that month, to its final year-to-date total in December of 515 (Figure 2). Carpool trips on the tollway corridors that qualified for reimbursement totaled 2,213, and 80% of those were two-person carpools. The distribution of trips per driver varied considerably. The driver with the highest number of carpool trips took 254 rebated trips during the pilot period. More than half of all participating drivers took less than 10 toll-rebated trips. User trips showed their greatest jumps in June, after the Manor ribbon cutting event in mid-May; in October, around the Mobility Week campaign; and in early December, when $25 gift cards from Amazon were offered to users who carpooled at least 10 times between December 1 and 15, 2014. These results suggest behavior changes are more likely when participants are offered more than one recruitment stimulus over the same period. Since recruitment activities changed and overlapped multiple times during the yearlong pilot, the next section considers the effect of concurrent recruitment activities.

**Concurrent Activities**

Travel behavior tends to be a “sticky” part of individuals choices, based on convenience, time constraints, and predictability. Research on social marketing for travel demand management suggests the importance of reaching potential carpoolers through multiple methods (22). Poisson distribution of concurrent recruitment activities reveals the likelihood of reaching people multiple ways, even on the same day, to encourage program registration and subsequent travel behavior change. Within the project’s budget and staffing constraints, there was still on average 2.7 events in a given day, with at least an 80% chance that three or more recruitment activities were underway on a given day (Figure 3).

![FIGURE 3. Probability of Concurrent Daily Recruitment Actions](image-url)
Regression analysis revealed each of the actions to positively correlate with daily program registrations. The most significant explanatory variable was the category of paid media, which included newspaper and radio ads. The rate of change of the conditional mean of this program’s ridesharing registrations with respect to daily paid media alone was estimated to be between 0.5 and 2.0 with a 95% confidence interval (Table 3). The occurrences of major events such as toll road expansions and earned news media were nearer the lower end of that spectrum in impact. Promotion by transportation agencies, noted as focused towards drivers in the DRIVER variable was also significant. Neighborhood and employer outreach also had a positive impact, but at a very low rate. The six recruitment categories (digital methods excluded since they were continuous through the study period) accounted for 11.4 percent of the variation in daily registrations over each day throughout the year 2014 (S.E. 1.6).

**TABLE 3. Recruitment action predictors of daily program registration**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Lower 95% C.I.</th>
<th>Upper 95% C.I.</th>
<th>t Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.1382</td>
<td>0.1755</td>
<td>-0.4834</td>
<td>0.2070</td>
<td>-0.7873</td>
</tr>
<tr>
<td>NEIGHBORHOOD</td>
<td>0.1706</td>
<td>0.2807</td>
<td>-0.3815</td>
<td>0.7226</td>
<td>0.6076</td>
</tr>
<tr>
<td>MAJOR EVENT</td>
<td>0.7605*</td>
<td>0.3715</td>
<td>0.0299</td>
<td>1.4911</td>
<td>2.0470</td>
</tr>
<tr>
<td>PAID MEDIA</td>
<td>0.8839**</td>
<td>0.1989</td>
<td>0.4927</td>
<td>1.2752</td>
<td>4.4432</td>
</tr>
<tr>
<td>EARNED MEDIA</td>
<td>0.6524*</td>
<td>0.2010</td>
<td>0.2571</td>
<td>1.0476</td>
<td>3.2455</td>
</tr>
<tr>
<td>DRIVER</td>
<td>0.4701*</td>
<td>0.2002</td>
<td>0.0764</td>
<td>0.8638</td>
<td>2.3484</td>
</tr>
<tr>
<td>EMPLOYER</td>
<td>0.0851</td>
<td>0.2539</td>
<td>-0.4142</td>
<td>0.5845</td>
<td>0.3352</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01

Note: Digital efforts such as the website and social media were excluded from regression because they were ongoing for all dates, with no impact to the model.

**DISCUSSION**

**Challenges to Promoting Ridesharing**

The program team planned and executed a substantial amount of recruitment activities to encourage ridesharing with new technology and an added incentive of toll road discounts, and success to date can be considered moderate. Presently, few people are familiar with real-time ridesharing technology, and the steep learning curve was only one barrier to entry. There at least five challenges to promoting ridesharing: dropping gas prices, technology access, limited user knowledge with varying terminology, safety concerns, and lack of a pre-existing critical mass of users.

During the 2014 project evaluation, gas prices dropped $1.42 per gallon—roughly equal to the northern 2 toll gantries on 183A, but more than the $1.08 average toll reimbursement per trip in this pilot study (23, 24). Lowering gas prices may have lessened the appeal of the intended financial incentive of toll road discounts, especially for individuals whose primary interest in carpooling is financial, rather than environmental. Driving costs can be highly localized, depending on the presence or absence of factors like toll roads, the fuel and maintenance costs of
long distances travelled, and paid parking—all of which help determine the market for dynamic
ridesharing (7).

Real-time ridesharing adds to the challenges of traditional carpooling layer of technology
that may encourage use by some, but is also an additional barrier to those who may not have access
or trust of these methods. Stranger danger, or the perceived concern about getting in a car with
someone new, is still an issue, despite the social information provided in the app (25, 26).

Ridesharing terminology has changed quickly in the media and public discourse during
this study. Carpooling and taxi services were recognized as distinct services, that have been blurred
through the provision of “ride-hailing” services such as Uber and Lyft, that do not limit a driver’s
income below the cost of the trip, distinguishing ridesharing and traditional carpooling from taxi-
like services. The Associated Press took a strong stance on the issue by updating their Stylebook
to suggest the terms ride-booking or ride-hailing for obtaining a private car service using an app
(27). To the user, the difference may seem small, but in terms of transportation demand, carpooling
results in an average vehicle occupancy of at least two. Though the technologies continue to
evolve, public terminology is starting to catch up.

Consistent with previous studies, some of the discrepancy between the number of people
downloading the app and using the service might also be attributed to users searching, and not
finding, a perfect match for a trip’s origin, destination, and timing (28, 29). This issue goes back
to the need to develop a community of carpoolers that constitute a critical mass of drivers in all
needed directions, across the times and places desired (30).

Relative Efficiency of Recruitment Activities

Classification of recruitment activities and regression analysis allowed comparison of the
magnitude of impact of these activities on registration for the ridesharing program, with positive
results from each effort. Though this program did not strictly adhere to social marketing outreach
methods used in previous studies (22, 31), the substantial effort with local neighborhoods and large
employers was overshadowed by the impact of mass media in this particular case. Whether paid
or “earned” news spots, regression analysis of this case study’s recruitment efforts suggest an
important role for the media in promotion of real-time ridesharing efforts. Mass media categories
of recruitment (paid, earned media and driver-based communication from transportation agencies)
explain a significant level of variation in daily program registration, suggesting the importance of
developing and facilitating an active relationship with the media to promote travel demand
management. This finding should not be interpreted to dissuade current or future efforts in social
marketing of other travel demand management measures. The successes of this particular case may
also reflect the strengths of the recruitment team, and adding other efforts such as individualized
marketing could be expected to yield positive returns as well. Nonetheless, the timing of rapid
changes in real-time ridesharing fits well with the descriptive strengths of mass media.

Limitations

Collinearity may exist between the variables that could not be assessed due to dummy variable
representation in the model. Indeed, new data sources would be needed to address ambiguity of
causality in recruitment activities and registration for a ridesharing service. Furthermore, this study
assumes that one day of an event for one type of recruitment effort is comparable with another,
despite variation that occurs at each event, along with other potential mitigating factors such as
rain at during an outdoor event. Rather than attempt to control for these and other factors, this study employed a day-level, year-long approach that seeks to balance out this variation by estimating coefficients on 365 days of recruitment and registration data. Despite these limitations, this study provides analysis of new ridesharing technologies and policies using standard methods.

CONCLUSIONS

This case study addresses a documented challenge of recruiting users in a carpooling program, and identifies methods and magnitudes of success in outreach methods. This pilot project demonstrated that the occupancy of a carpool can be digitally verified with a smartphone app, and suggests that various carpooling incentives and recruitment activities may work together to cause changes in travel behavior. Though this study achieved a relatively large pool of participants, recruitment may have been stymied by a simultaneous drop in gas prices during this study. Gas prices and tolls have documented effects on driving habits, and for many commuters in this 2014 study, the incentives for carpools provided did not exceed the natural discount of falling fuel price. Overall, rapid change in the technology and public understanding of how to use dynamic ridesharing continues to be a leading challenge to adoption, in addition to the existing issues with the relative attractiveness of carpooling in the United States.

Out of the carpooling recruitment efforts included in this study, the top four categories in order of program recruitment impact were: paid media, earned media, planned major events, and driver-focused messaging. Examples of paid media used were ads on radio, newspaper, and on billboards in each corridor. Earned media included local newspaper articles, television news and radio spots. Planned major events included free breakfast event, and a temporary gift card incentive. Driver-focused messaging strategies involved communication by transportation agencies to drivers through web site banners, bill inserts, and mentions in agency newsletters. Neighborhood recruitment events, social media, and employer-based events also had a positive impact on recruitment, and support the other activities. Since this study is the first of its kind, these recruitment activities may or may not have similar effects in other contexts. Costs, in particular, will vary widely with different partnerships. For instance, this project included outreach to the media from the private company and local transportation agencies in partnership. With sufficient resources, concurrent recruitment activities are more likely to make an impact on behavior change than running efforts at separate times.

Clearly, many beneficial recruitment methods exist to promote ridesharing, but transportation agencies need more guidance on how to achieve the most impact with limited resources. Real-time ridesharing technologies offer a non-infrastructural change to the transportation system that, in the present case of automating toll road discounts, appears to function as a type of “virtual high occupancy lane”. Though this pilot study’s carpool toll reimbursements were supported with federal funding, additional sources of funding such as local transportation or environmental fees could potentially be leveraged to ensure the financial sustainability of an ongoing ridesharing toll discount program. At the present stage of development, dynamic ridesharing is a moving target that offers potential to improve performance measures related to traffic congestion, personal transport costs, urban parking space utilization, and emissions. To realize these benefits, ridesharing and recruitment efforts will need to evolve quickly to leverage technology that could supplement, or even supplant certain vehicle capacity improvements.
Toward a Broader Notion of Crowdsourced Mobility

In only the last three years, ridesharing and other advancements have begun to blur the lines between traditional transportation modes and roles with that of technology companies. Rather than a discrete set of passenger modes, a gradient of transportation services may be emerging, ranging from traditional vehicles owned by individuals, towards a shared use of vehicle trips and the vehicles themselves as part of a sharing economy. Ridesharing services, as opposed to ride-hailing meant to make a profit for the driver, could offer potential to increase low-cost access to mobility in places under-served by transit.

Smartphones currently facilitate trip-making as a supplement to vehicle technology, but merging ridesharing and further automation of driving may be a likely reality in the near future. The efficiency improvements of mobility as part of a crowd-based solution could reduce or eliminate the current arrangement, where vehicles are parked the vast majority of their useful life (32). Transportation agencies can best seize the opportunities for system efficiency through ridesharing by first fostering ride-sharing amongst their own employee base, using existing applications, and then using their own lessons learned, to lead communities in these and other travel demand management practices. This study suggests there are several productive means of recruiting new participants, and future carpooling recruitment activities should consider cost-effective marketing and leveraging of mass media to yield immediate users in a ridesharing program.

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REFERENCES


