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Casual carpooling in the San Francisco Bay Area: Understanding user characteristics, behaviors, and motivations

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ABSTRACT

Casual carpooling is an informal form of commuter ridesharing operating in Washington, D.C.; Houston, Texas; and San Francisco, California. In contrast to new forms of shared-use mobility, casual carpooling has been in existence for over 30 years and uses no information communication technology, and is entirely run informally by its users. Researchers have been fascinated by this phenomenon and have conducted studies in the past, but there remains a lack of up-to-date quantitative data. This study examines the motivations and behaviors of casual carpoolers in the San Francisco Bay Area to understand user characteristics and motivations. In Winter 2014, the authors observed and counted participants and vehicles at four casual carpooling locations, interviewed participants riding in carpooling vehicles ($N=16$), and conducted intercept surveys ($N=503$) at 10 East Bay pickup locations. The results indicate that the motivations for casual carpooling participation include convenience, time savings, and monetary savings, while environmental and community-based motivations ranked low. Casual carpooling is an efficient transportation option for these commuters, while environmental sustainability benefits are a positive byproduct. Seventy-five percent of casual carpool users were previously public transit riders, and over 10% formerly drove alone. Logit modeling found that casual carpool role (i.e., always a rider or sometimes a driver), age, and employment status were key drivers in modal choice. Further research on a larger scale is needed to identify the elements needed for system replication in different areas.

1. Introduction

Casual carpooling is a user-run, informal form of ridesharing, which is formed with three or more commuters per vehicle. It provides participants' time and cost benefits through access to a high-occupancy vehicle (HOV) lane and often tolling discounts. Casual carpooling fits into the broader framework of the sharing economy, also known by other names, including the peer economy and collaborative consumption. The sharing economy is a popularized term for consumption focused on access to goods and services through borrowing and renting rather than owning them. What ties the sharing economy with casual carpooling is collaborative consumption of assets among peers – which can lower consumer costs and environmental impacts (Botsman and Rogers, 2010). Casual carpooling is a user-organized system of ridesharing at little to no cost—reducing both the driver and passenger burdens of car ownership. Moreover, because casual carpooling uses available vehicle occupancy, it decreases the number of automobiles traveling during peak travel periods, reducing congestion, greenhouse gas (GHG) emissions, and vehicle delays.

Casual carpooling is part of a wider spectrum of ride services that are rapidly emerging today, including long-distance ride-matching; taxi and e-hail applications ("apps"); and app-based, on-demand ride services, also known as transportation network companies (TNCs) or ridesourcing. The authors also examine casual carpooling motivations, behaviors, and opinions to identify which of these motivations are critical to system success and how casual carpooling might be supported or enhanced. A major contribution of this research was the use of a custom-built mobile app to accurately capture wait times at different casual carpooling pickup locations. Previous studies only estimated passenger wait times and volumes from anecdotal evidence or counted by hand, leading to empirical gaps in the literature, while the mobile "Carma Carpool" app collected quantitative data.

This paper has five key sections. First, the authors present literature on prior research and describe where casual carpooling falls into the ride services spectrum; next, the data collection

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methodology is discussed. Third, the observational count data, interview findings, and intercept surveys are evaluated. In the final sections, findings and conclusions are discussed.

2. Literature review

This section presents an overview of the history of casual carpooling and research into participant motivations and travel behavior, with a focus on the San Francisco Bay Area. The scope of this background remains within the United States, because casual carpooling does not exist elsewhere. The authors also examine several pilot projects, which attempted to replicate casual carpooling's flexibility and enhance it with technology or by supplementing public transit. The authors also discuss how this fits into a broader spectrum of ride services by comparing a number of features including cashless payment, average trip length, cost per kilometer/mile, and peer-to-peer ratings.

2.1. Casual carpooling

Casual carpooling (also known as "slugging") is a user-run, informal type of *ad hoc* ridesharing (Chan and Shaheen, 2012). Impromptu carpools form with three or more commuters per vehicle: one driver and two or more passengers. These carpools form at park-and-ride facilities, public transit centers, or near public transit pickup points during the morning commute hours and take advantage of HOV lanes to get to a common employment center. Some carpools also form during the evening commute but typically on a smaller scale. Casual carpooling began during the 1970s and exists today in three United States (U.S.) metropolitan areas: Washington, D.C. and Northern Virginia; Houston, Texas; and the San Francisco Bay Area, California.

Casual carpooling began between communities north and east of the San Francisco Bay and downtown San Francisco due to public transit fare increases and service disruptions in the 1970s. Casual carpooling grew over the past 30 years due to a new HOV lane on Interstate 80, as well as a HOV/bus-only lane with no toll approaching the San Francisco–Oakland Bay Bridge. There are currently 23 pickup locations in the East Bay and North Bay. There are two dropoff locations in San Francisco, the main one at the intersection of Howard Street and Fremont Street, and a smaller one at Market Street and 9th Street. Until 2010, carpools of three or more paid no toll, but they now pay a discounted toll of US$2.50 in the westbound direction. There is no toll in the eastbound direction.

Several casual carpooling surveys have been conducted as early as the mid-1980s to approximate the number of casual carpooling participants. A 1985 survey estimated the number of daily Bay Area casual carpool participants at 3000 (Beroldo, 1990). A 1987 update found that number grew to 5000:1666 drivers and 3333 passengers (Maltzman and Beroldo, 1987). Studies in the 1990s saw the average daily participants settle around 8000 (Beroldo, 1990, 1999). However, these studies were conducted when carpools paid no toll. The Metropolitan Transportation Commission (MTC) 511 Rideshare program estimated 6700 participants in 2010, before the toll went into effect. A 2011 update estimated a 9% decrease in casual carpoolers after toll implementation, at 6100 daily participants (MTC, 2011).

A smaller casual carpooling system for the evening commute was established after the 1997 Bay Area Rapid Transit (BART) strike, from downtown San Francisco to certain East Bay and North Bay locations. A 1998 survey observed only 187 evening carpools, much less than the 3000 morning carpools (Beroldo, 1999). While evening carpooling is growing, casual carpooling in the Bay Area remains mainly a one-way morning trip phenomenon. Previous research has shown that evening trips are typically made by public transit for morning casual carpool passengers and by driving alone for drivers.

2.1.1. Travel behavior and social norms

Not only did previous studies examine the volume of participants, but some also conducted surveys to understand their travel behavior. A 1987 study in the Bay Area incorporated a mail-back survey ($N=562$), which found the top two reasons for participating in casual carpooling were that it was cheaper and faster than other commuting modes. It further revealed that casual carpooling was only a morning phenomenon—less than 2% carpooled during the evening commute and over 70% took public transit home (Maltzman and Beroldo, 1997). The 1998 study update ($N=725$) found that drivers mainly casual carpooled to save time, while passengers casual carpooled to save money. Again, this survey discovered almost 85% of morning casual carpool passengers took public transit home, and over 70% of morning casual carpool drivers drove home alone (Beroldo, 1999).

Mote and Whitestone (2011) analyzed the sociology of slugging in Washington, D.C. through 12 interviews with drivers and riders. They assert that the social context of the region—urban life, demographics, and commute patterns—helped lead to the institutionalization and configuration of slugging in the region. Over time, the slugs developed a routine, leading to structure and greater perceived security. Thus, despite similarities to hitchhiking, structuration in the system, including social norms (e.g., never leaving a female slug alone at a pickup location), have allowed slugging to grow successfully.

2.1.2. Impact on congestion and associated policy issues

There have been conflicting estimations on the impacts on congestion and transit ridership due to casual carpooling. Beroldo (1990) estimated a range between 89 vehicles removed from the corridor and 565 added due to differing model assumptions and concluded that the Bay Bridge impact is unclear. The 1998 survey found casual carpooling added vehicles to the road. Based on this survey, between 500 and 650 automobiles would be removed from the road, if casual carpooling were not an option for drivers (Beroldo, 1999). The study noted this finding does not include other casual carpooling benefits, such as efficient HOV lane use and relief for crowded transit lines, so others may be encouraged to take public transit.

Concerns have arisen due to casual carpooling's success and unclear impacts on congestion and modal split. Public transit agencies have been concerned that casual carpooling takes riders off bus and rail services, while taking up parking spaces at transit stations (Beroldo, 1990). Thus, research is needed to accurately determine the impact casual carpooling has on public transit systems and peak-period congestion, as well as the associated costs and environmental impacts.

2.1.3. Lessons learned

Studies have identified the following casual carpooling success factors: (1) a time savings incentive for drivers; (2) monetary savings for passengers; (3) pickup locations near freeways, residences, parking, or public transit stops; (4) a common dropoff location; (5) reliable public transit for the return trip; and (6) an HOV requirement of three or more occupants (Beroldo, 1990; Reno et al., 1989). A 1999 study reemphasized the need to attract drivers to the system (Beroldo, 1999).

A recent analysis was conducted on casual carpooling in smaller cities. The Lawrence OnBoard ridesharing system (rebranded as CarmaHop in July 2014) is a carpooling system in Lawrence, Kansas, where potential passengers note their destination on a handheld whiteboard, which drivers observe on the road