

Expanding Traveler Choices Through the Use of Incentives: A Compendium of Examples



U.S. Department of Transportation
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| 16. Abstract With increased congestion across the Nation's roadways, transportation agencies, universities, and research institutions are testing new approaches and implementing programs to cause travelers to shift their behavior to alleviate congestion and proactively and dynamically manage the transportation system. Using behavioral economic theories, agencies have provided different "nudging" incentives to promote behavioral changes from travelers to shift modes, times of travel, or routes taken before and during their trips. This primer looks at different programs across the world to see how organizations have tackled congestion with these strategies. | | | | | |
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List of Abbreviations

| | |
|-----------------|--|
| AI | artificial intelligence |
| AMORE | Adaptive Mobility with Reliability and Efficiency |
| ARPA-E | U.S. Department of Energy’s Advanced Research Projects Agency-Energy |
| ATDM | active transportation and demand management |
| BART | Bay Area Rapid Transit |
| CAPRI | Stanford University’s Congestion and Parking Relief Incentives Study |
| CO ₂ | carbon dioxide |
| CSA | community supported agriculture |
| CUTR | Center for Urban Transportation Research |
| DDWA | Delta Dental of Washington |
| DOT | department of transportation |
| DUO | Driving Up Occupancy Module |
| FDOT | Florida Department of Transportation |
| FHWA | Federal Highway Administration |
| FTA | Federal Transit Authority |
| GPS | Global Positioning System |
| GUP | general use permit |
| ICT | information and communication technology |
| INSTANT | Infosys-STANford Traffic Program |
| IT | information technology |
| MaaS | Mobility-as-a-Service |
| MOD | mobility on demand |
| MODE | Mobility Options Discovery and Engagement |
| NECO | Neighborhood Eco Pass |
| RFID | radio-frequency identification |
| RTA | regional transportation authority |
| RTD | regional transportation district |
| SFCTA | San Francisco County Transportation Authority |
| SOV | single-occupancy vehicle |
| TDM | travel (or transportation) demand management |
| TMC | traffic management center |

List of Abbreviations (continued)

| | |
|-------------|--|
| TNC | transportation network company |
| TTI | travel time index |
| UC Berkeley | University of California, Berkeley |
| UN | United Nations |
| USDOT | United States Department of Transportation |
| VMT | vehicle miles traveled |

1 INTRODUCTION

Richard Thaler’s 2017 Nobel Prize in Economics generated increased interest in behavioral economics and, in particular, how we make choices. The general premise of Thaler’s work is that individuals often make choices based on habit or with limited rationality, leading to systematic errors resulting from inattention and procrastination. We see this frequently in transportation decisions when individuals make mobility choices that reflect an unwillingness to try different ways of reaching the places, people, and things that they need to access. This is true even when the evidence suggests that available mobility options could lead to better outcomes for individual travelers and for the larger community.

Standard economic approaches to changing traveler behavior that rely on individuals making rational economic choices based on pricing have proved less effective for motivating and sustaining changes in traveler behavior. (Avineri, 2009) “Evidence from behavioral, cognitive and social sciences is painting a more complex picture of decision-making processes. In real life the behavior of travelers is typified by limited cognitive resources—for example, difficulties in processing large amounts of data—bounded rationality (in many cases we fail to make the best choices) and emotional and habitual behavior.” (Avineri, 2009)

This primer describes how transportation agencies and other mobility services can address recurring and non-recurring congestion through “nudges” that incorporate behavioral economic concepts and encourage travelers to shift their mode, time of travel, or route. The primer provides case studies based on programs offered by State, regional, and local transportation agencies, universities and research institutions, and within the private sector that provide incentives designed to encourage individuals to consider alternatives. In addition to reducing congestion, these incentives can lead to improvements in air quality through reduced emissions, reductions in energy consumption, safer roadways, and more livable and sustainable communities.

Incentives for modifying traveler behavior have been in use for many years. For example, some employers provide convenient (or free) parking for carpool vehicles, some subsidize public transportation, some compensate employees for travel time while using mass transit, and some offer on-site services (e.g., child care, laundry, exercise equipment, dining facilities) to reduce extra trips. Employers may provide secure storage for bicycles and have shower facilities for employees who ride bicycles to work and offer flexible schedules and telecommuting options so that employees can manage their work schedules and travel patterns to avoid peak congestion periods. These employee benefits are “nudges” or incentives to encourage (or permit) employees to consider choices that benefit employers (they attract and retain good employees), employees (they have greater flexibility and more mobility choices), and the community at large (fewer people driving alone during peak periods).

Recent technology has opened up many more opportunities for travelers to modify their trips and transportation managers to influence travel in real-time in ways that previously were not possible. The ability for transportation managers to effect real-time shifts in traveler choices enables them to proactively manage the system and customize incentives to address the dynamic nature of non-recurring events. For example, traffic management centers (TMCs) can incentivize shifts specifically for short-term events such as a major incident, work zone, special event, or poor air quality day. Smartphone applications can provide information to travelers prior to their trips and en-route to help them avoid congested routes or events using a combination of public and private sector data and advanced analytics. Additionally, global positioning system (GPS) tracking on smartphones enables incentive program administrators and travelers to automatically track behavior and provide incentives accordingly. Advanced computing capabilities support predictive traffic information that can be combined with incentive programs to reduce congestion.

Incentivizing travelers to make dynamic shifts to their mode, time of travel, or route before and during their trips is a core concept of active transportation and demand management (ATDM). In particular, these incentives focus on the “active demand management” element of ATDM. Figure 1 illustrates the traveler decisions that ATDM strategies target to help manage overall system performance in real-time.

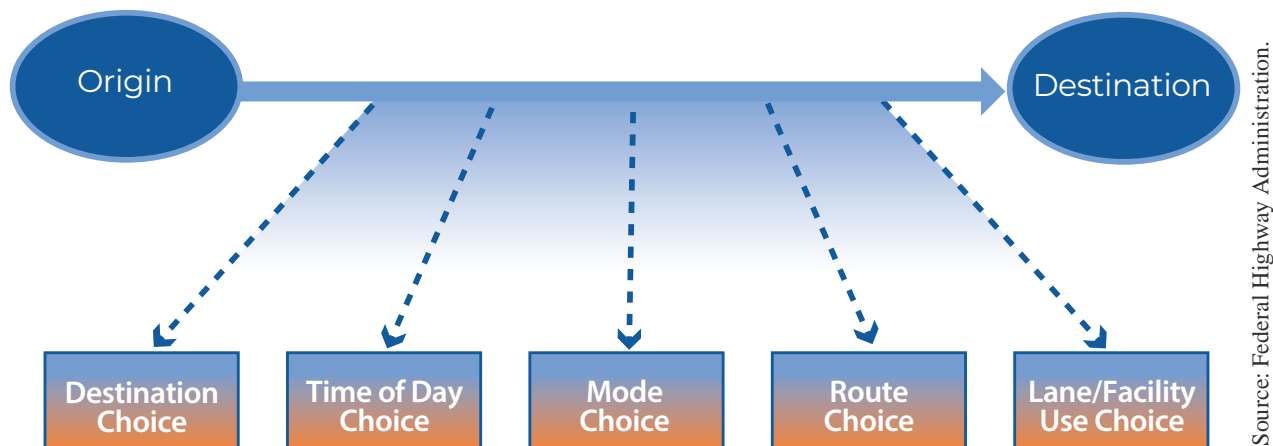


Figure 1. Illustration. Active Transportation and Demand Management strategies work to dynamically influence multiple traveler decisions across the trip.¹

This primer presents several specific examples of how these “nudges” have been implemented in ways that are designed to encourage travelers to consider alternative modes, routes, or times.

¹ Federal Highway Administration, Active Transportation and Demand Management (ATDM) Introduction, Presentation. Last modified on October 4, 2017. Available at: https://ops.fhwa.dot.gov/atdm/knowledge/presentations/atdm_overview/index.htm.

The number and variety of “nudges” suggest that many opportunities exist for changing traveler behavior. The primer provides a detailed description of several of these programs, which are offered by both transportation agencies as well as private sector entities (e.g., employers, retailers). Some examples of incentives for encouraging alternative mode choices include:

- ▶ Providing travelers with information on how their choices can reduce carbon dioxide (CO₂) emissions and awarding them “travel points” that can be redeemed for prizes or rewards.
- ▶ Entering employees into drawings where the chances of winning increase with points earned from using alternatives to single-occupancy vehicles (SOVs).
- ▶ Awarding points for transit use (or biking/walking) that can be redeemed at restaurants and retail outlets.
- ▶ Offering the opportunity to “sell” vehicle parking privileges for cash or other rewards.

Some examples of incentives for encouraging time of departure changes include:

- ▶ Providing a smartphone app that gives time of departure information and awards redeemable points for traveling during off-peak periods.
- ▶ Offering employees flextime schedules and cash prizes.
- ▶ Providing credits for traveling during off-peak times that increase the chances of winning a raffle.
- ▶ Awarding credits toward playing online games for biking, walking, or driving during off-peak hours.
- ▶ Earning cash or credits toward a new smartphone for off-peak travel.

Some programs that offer incentives for eliminating travel altogether include a reward for a reduction in total vehicle miles traveled (VMT) during a specified time period relative to previous periods. Others aim to incentivize travelers to change their routes by including rental credits for assisting with the redistribution of shared-use electric vehicles so that they have access to recharge stations and are available for other travelers.

Studies associated with incentivizing (or permitting) travelers to shift their travel times away from peak periods so that they avoid—and therefore reduce—peak period congestion were pervasive in the literature and appeared to have been effective at least in the near term. The nudges come from multiple directions, including employers that permit employees to work flexible hours (and weeks) so that they reduce or eliminate trips made during peak periods as well as a variety of rewards or points awarded for travel during off-peak periods. Other, more localized or focused nudges encourage or reward eliminating or reducing the use of vehicles and either reducing trips or using other modes (including non-motorized options) to complete trips. These nudges can come in the form of rewards for using alternatives to private vehicles or penalties (often in the form of pricing) for parking private vehicles in areas that are served by alternative travel modes.

In summary, evidence is growing that travelers are responsive to appropriately designed and implemented incentives that encourage behavioral changes that reduce dependence on SOVs or on traveling during peak demand periods. Examples are described in greater detail in this primer.

The primer is organized around the categories of choices described above. However, many of the incentives are designed to influence travelers' choices in multiple areas (e.g., time, mode, route) simultaneously. The primary intent of the primer is to stimulate thinking about how best to influence traveler behavior by describing the current state of the practice with the hope that others will build on this foundation.

2 APPLYING INCENTIVES TO MODIFY TRAVEL ROUTES

Travelers frequently change their routes to avoid congestion and achieve a faster travel time. They also may change routes to avoid flooded roads or intersections without power during weather events. While this route shift usually benefits the traveler, it also helps to reduce demand on congested road segments, intersections, or transit lines. Route shifting is considered to be the easiest shift if the traveler is aware of the time savings, personal safety, or other benefits that directly result from that change. These changes typically do not need additional incentives, and so they are not a common part of the travel incentive literature. The case study below is one exception, and it features incentives to change route so as to increase the efficiency of an electric car sharing service.

REBALANCING SHARED ELECTRIC VEHICLES IN SAN DIEGO

INCENTIVE SUMMARY

TYPE: **STUDY**

CURRENTLY: **INACTIVE**

STARTED IN: **2014**

INCENTIVE(S) APPLIED:

▶ **Service Credits.**

As part of the Federal Highway Administration Value Pricing Pilot grant program, researchers conducted a 2-year evaluation of incentives applied to a one-way, all electric car-sharing system that was measured using the car2go San Diego market. The evaluation began in 2014, and shortly after it ended, car2go left the San Diego market due to lack of demand. The goal of the incentive program was to redistribute electric vehicles available through the car2go car-sharing program, increasing access for users of the car2go system, and decreasing travel time for the car2go maintenance team, which was responsible for keeping the electric vehicle fleet charged.

Car2go, a subsidiary of Daimler North America Corporation, is a car-sharing service with its North American headquarters in Austin, Texas. Fees are based on how long a driver uses the car rather than by how far they travel. The system allows users to rent cars through a cell phone app, enabling them to pick up and drop off the car in different locations as opposed to the usual round-trip car-sharing experience. The incentive program was available to all car2go users across San Diego, as the entire fleet of car2go Smart Cars in this city were electric.

Users could take part in either of two incentives to help car2go reach its goal. The first incentive helped achieve the goal of moving cars closer to the charging area, decreasing travel time by car2go employees to bring in cars for charging. Drivers were eligible after driving a minimum of 15 minutes and parking the vehicle within a three-block by three-block zone (see Figure 2a upper map). The second incentive aimed to prevent an over-supply of cars in low-demand zones. In order to be eligible for this incentive, users would drive a car starting within two predefined regions for at least 10 minutes and park the car outside of those zones (see Figure 2b lower map). In both incentive scenarios, users received a 10-minute driving credit to their account in the car2go application.

Throughout the incentive program, surveys were sent to participants to measure how they used car2go and what their motivation for participating in the different incentives might be. The surveys found that participants most often used the service for recreational activities. Increased use of car2go resulted in some respondents reporting a change in their use of public transportation, taxis, and walking. One finding that was of interest to the research team was that respondents reported using ride-sourcing options, such as Lyft or Uber, more often. A possible explanation was that users might drive themselves via car2go to bars and restaurants, but take a ride-source option home to avoid drinking and driving.

When participants who were aware of the incentive but had not yet taken advantage of it were asked why they had not done so, responses generally indicated that the users' final destinations were not within the drop-off zones, and many believed they would use the incentive in the future. Thirty percent of all respondents to this survey reported vehicles having more of a charge than before. (Shaheen et al., 2018)

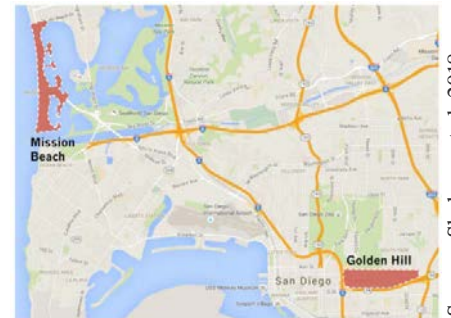
Respondents indicated that incentives in the form of driving minutes credited to their account were more valuable than the cash value.

After the incentive period had ended, surveys were sent out to query car2go users about how they might use these incentives in the future. Respondents indicated that incentives in the form of driving minutes credited to their account were more valuable than the cash value. When a hypothetical offer was made for the cash equivalent, users replied that they would be less likely to drive a vehicle to a charging zone.

For more information, see *One-way Electric Vehicle Carsharing in San Diego: An Exploration of Behavioral Impacts and the Impact of Pricing Incentives on Improving Operational Efficiency* by Susan A. Shaheen., Ph.D, Elliot Martin, Ph.D, and Apar Bansal. Available at: http://www.dot.ca.gov/newtech/researchreports/reports/2018/CA18-2499_FinalReport.pdf.



a) Charging area incentive zone.



b) Low demand incentive zone.

Figure 2. Maps. Compound figure depicts the car2go incentive zones in San Diego.

Source: Shaheen et al. 2018.

3 APPLYING INCENTIVES TO SHIFT TIME OF TRAVEL

Incentivizing travelers to change their time of travel can distribute the use of transportation facilities over a longer period and mitigate the crush of peak congestion, especially in highly urbanized areas where thousands of people often attempt to access these facilities at the same time. These shifts are also important to manage demand during special events. For example, businesses in a popular Colorado ski town would offer incentives to skiers to motivate some to stay longer and avoid the congested I-70 Mountain Pass during the prime departure time each weekend.

ENCOURAGING A SHIFT TO OFF-PEAK TRAVEL TIMES

INCENTIVE SUMMARY

TYPE: **MAINSTREAMED**

CURRENTLY: **ACTIVE**

STARTED IN: **2012**

INCENTIVE(S) APPLIED:

- ▶ **Online resources.**
- ▶ **Point-based rewards.**
- ▶ **Carpool matching.**

Metropia is a for-profit enterprise that offers Metropia Total Mobility, a smartphone-based platform to support congestion management strategies and policies. Metropia’s Total Mobility platform, which uses artificial intelligence (AI)-based algorithms, data analytics, and behavioral economics, provides a demand management framework that supports shifts in travel by time of day, mode, and route.

To support adjustments to off-peak travel, Metropia’s platform allows users to compare routes and time-of-departure choices, depicting travel time savings as well as informing the user about the external impacts of their choices, such as reductions or increases in carbon

dioxide (CO₂) emissions. The goal is to incentivize commuters to shift their departure to off-peak travel times using a system of reward points. By making this shift to what are called the “shoulders” of the peak period, users are able to earn more reward points, based on a variable point profile, than they would by departing during the peak periods.

In earlier versions of the platform, the level of rewards provided by the system depended on the travelers’ degree of behavioral change and their contribution to traffic congestion alleviation. The next generation version of the platform (expected for release in late 2018), utilizes a behavior engine (INDUCE), where rewards are based on the traveler’s “persona” (i.e., observed travel behaviors, information captured from micro-surveys, and inferred activity type from destinations

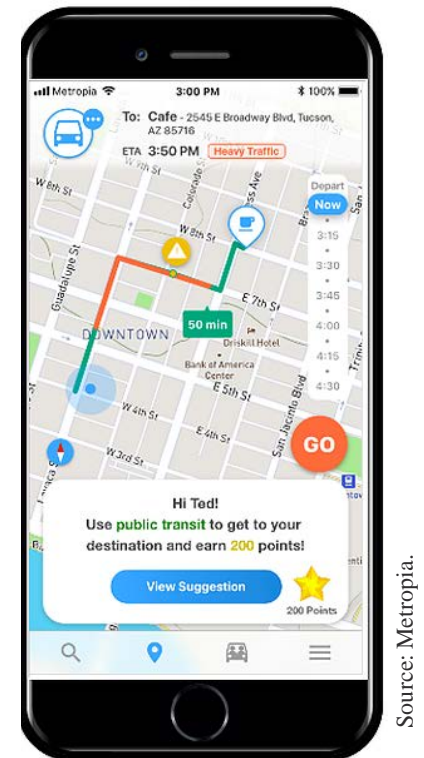
and time of day). By using AI-based algorithms, parameters are then matched to user persona characteristics to compute a likelihood of change coefficient. Users with high coefficients are more likely to try a suggested alternative. The value of INDUCE is that it helps pair attractive mobility options with more receptive users, with the ultimate goal of convincing the user to switch to a more sustainable mode (e.g., transit, carpool, etc.). Users can redeem points within the app for rewards such as gift cards from national retailers, gift cards from local stores and restaurants (supplied by partners), or they can redeem their points to plant a tree.

Metropia incorporates a user communication module to alert users to planned construction zones and lane closures as well as any unplanned events such as a flooding, incident, or signal outage at a major intersection, which may impact their trip. Additional in-application features include:

- ▶ A message inbox, where transportation agencies can directly inform users about planned and unplanned roadwork, lane closures, new corridor openings, traffic incidents, etc.
- ▶ Turn-by-turn navigation, guiding users along the fastest route possible. This is designed to identify underutilized roadways when traffic levels rise and reward drivers who opt to use those routes as a means of easing congestion on more overburdened roadways.

The social carpooling “Driving Up Occupancy” (DUO) module of the platform allows users to arrange carpools by creating or joining groups. The app verifies passenger participation in the carpool, and each person receives reward points. The reward points are based on a spinning wheel incorporated in the smartphone app as part of the gamification element of the platform. The driver also receives a portion of each passenger’s points as an additional reward. Another feature is Metropia’s integration with transportation network companies (TNC), which allows the user to request to share a TNC ride with others, rewarding them with additional points for opting to share their ride.

Over the past 3 years, Metropia has conducted several experiments on changing traveler behavior. To test drivers’ willingness to shift travel times, Metropia revised its point distribution system and conducted a month-long experiment among its El Paso, Texas, users. To incentivize more users to shift their departure times from 7:30 a.m. to 8:30 a.m. and from 4:15 p.m. to 5:15 p.m. the service decreased the number of points earned for travel during rush hour both in the morning and evening peak hours to just 10 points. The points available during the shoulders of rush hour spiked to 100 in an effort to lure drivers to travel at that time. A study (Metropia, 2018) of user behaviors during this experimental period indicated:



Source: Metropia.

Figure 3. Screenshot. Rewards from Metropia program.

- ▶ A 13 percent overall decrease in trips taken during the morning rush hour.
- ▶ A 7 percent rise in trips taken during the subsequent, less-congested hour of the morning commute period, reflecting a shift in departure times.
- ▶ A similar reduction in trips during the evening peak period, with trips increasing before and after peak congestion but dropping below previous levels during rush hour itself.

Similarly, the “Austin Don’t Rush” mobility challenge, issued by the mayor of Austin, Texas, on May 11, 2016, urged commuters to consider the simplicity of avoiding peak traffic times and carpooling when their schedule permitted. As with the El Paso experiment, Metropia lowered peak period rewards points and doubled points for travel on the shoulders of the morning and afternoon peak periods. Points for using Metropia’s DUO social carpooling feature were also doubled throughout the day. Observed improvements (Metropia, 2018) include the following:

- ▶ The Austin areas achieved a systemwide 4 percent drop in a common travel time reliability performance measure, the travel time index (TTI) for morning peak period and a 3 percent drop in the TTI for the afternoon peak period. A drop in TTI indicates an increase in travel time reliability.
- ▶ Those who shifted their morning commute experienced a 10 percent reduction in their travel times, and those who shifted their afternoon commutes realized a 6 percent reduction in travel time.

The Metropia system, which is funded through agreements with local governments and regional planning authorities, integrates an active demand management and data analytics platform to support the application. It has a back-end server system that calculates real-time traffic information from multiple sources and predicts traffic conditions, calculates routes, and manages all of the subsystem processes to support the front-end services. This backend analytics capability provides travel and traffic information to both commuters and cities during normal operations, pre-planned special events, or unexpected, extraordinary circumstances.

Metropia has active deployments in Austin, Texas; Tucson, Arizona; a binational deployment covering the El Paso–Juárez–Las Cruces region; and an upcoming deployment in Taiwan. Metropia’s platform also supports the Regional Transportation Authority of Pima County’s Mobility-on-Demand Sandbox grant from the from Federal Transit Authority and the Bay Area Rapid Transit’s Perks 2 incentive program. Future deployments are currently planned for a number of cities in the United States.

For more information, see: <http://www.metropia.com/>.

COMMUTER CONNECTIONS FLEXTIME REWARDS PROGRAM

INCENTIVE SUMMARY

TYPE: **MAINSTREAMED**

CURRENTLY: **ACTIVE**

STARTED IN: **2012**

INCENTIVE(S) APPLIED:

- ▶ **Online resources.**
- ▶ **Point-based rewards.**
- ▶ **Carpool matching.**

In the Washington, D.C. region, one program has been developed that targets a specific set of corridors particularly prone to bottlenecks during the morning and afternoon peak congestion periods. The Commuter Connections Flextime Rewards Program (Flextime Rewards), launched in December 2017 and currently running as a pilot, was developed by Commuter Connections, a regional network of transportation organizations coordinated by the Metropolitan Washington Council of Governments, in conjunction with the University of Maryland. The program is sponsored through an award from the U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E), and is jointly funded by the District

of Columbia, Maryland, and Virginia Departments of Transportation, as well as through grants from the U.S. Department of Transportation.

Flextime Rewards combines Commuter Connections' software with the analytics behind the University of Maryland's National Transportation Center incenTrip program to provide personalized, real-time traveler information that can calculate the estimated time of arrival. This data can be calculated up to 24 hours in advance and recalculates as traffic conditions change or an incident is detected. Commuter Connections uses this data to alert registered Flextime Rewards users that significant congestion has been identified along their route and will give alternative departure times that could improve the commuter's trip.

The Flextime Rewards program is open to commuters who are able and willing to commute during off-peak hours to avoid congestion along the four selected corridors targeted by the program. **At companies that allow their employees to utilize a flexible schedule, the Flextime Rewards program offers the option to adjust the times they arrive at and depart from work, reducing the overall number of people attempting to travel during the morning and afternoon peak periods.** Currently, the pilot program is available to employees working in the Washington, D.C. air quality non-attainment region.

To be eligible to participate and receive rewards, users must commute at least 2 days per week on one of the four eligible corridors. They must download the Commuter Connections app, which is the mechanism by which users are notified of higher-than-average congestion along the eligible corridor which they commute. In response, the user must adjust his/her normal commute trip and record the action using Commuter Connections' software to be eligible for a reward. A valid response by a user to a Flextime notification results in an entry into a lottery for a prize drawing to be held at the end of the month.

During the month, each time the user responds to a notification by altering their commute, they are entered into the drawing. A \$100 raffle drawing is held each month. The winner receives either direct payment, gift certificates/cards, or debit cards. If no notifications are sent throughout a month, no prize drawing occurs.

The Commuter Connections program managers chose to conduct a pilot or “soft launch”

of the Flextime Rewards program so that they could analyze the initial results, get feedback from participants, make the program more robust, and then use marketing funds to increase participation. During the 2019 fiscal year, an upgrade to the system will include geolocation services to automatically detect whether or not a user is delaying their trip. During the pilot period, the program managers are seeking to gather feedback on ease of use and understandability. One of the early lessons learned is that the program needs to make it easy for participants to log their trips and to continue to obtain feedback from channels such as the system’s call center so that program managers can increase the effectiveness of the program.

For more information, see Commuter Connections Flextime Rewards Program webpage at <https://www.commuterconnections.org/commuters/flextime-rewards-program/>.



Source: Ridofranc, iStock/Getty Images Plus.

INSTANT (INFOSYS-STANFORD TRAFFIC) PROGRAM: A “NUDGE SYSTEM” IN BANGALORE, INDIA

INCENTIVE SUMMARY

TYPE: **STUDY**

CURRENTLY: **INACTIVE**

STARTED IN: **2008**

INCENTIVE(S) APPLIED:

- ▶ **Shuttle service.**
- ▶ **Weekly drawings.**
- ▶ **Point-based rewards.**

The INSTANT experiment, conducted from 2008-2009 in Bangalore, India, served as an early exploration of the incentives concept. INSTANT rewarded commuters who chose to travel at less congested periods as a means of alleviating peak period congestion. The philosophy behind this experiment contrasts with strategies related to “self-routing,” in which travelers are encouraged to simply use different routes at the same time that they normally begin their trip rather than varying their trip time.

Gridlock had become a concern among executives at Infosys, a large digital services and consulting firm that employs around 20,000 people in Bangalore, India.

Like many booming Indian information technology (IT) companies, the Bangalore campus of the firm is located about 9 miles south of the city center. The IT boom in Bangalore resulted in a population explosion from 4.13 million in 1991 to nearly double that in 2007, which in turn caused the city to sprawl over nearly 750 square miles. (Merugu et al., 2009) Every morning, nearly three quarters of the Infosys employees commute through the congested city to reach the company’s offices. Of the nearly 15,000 Infosys commuters, around 9,000 commuted by buses chartered by Infosys. The company was able to maintain extensive and detailed data on these commutes, such as commuting times and bus occupancy levels. A study of this data revealed that commuters who left for work after 7:30 a.m. had commute times that were about 1.5–2 times longer than those who left before 7:30 a.m.

One solution for potentially beating this congestion nightmare was a “nudge engine” that would encourage Infosys employees to come in early and beat the morning rush. A nudge engine is a program that uses mobile, cloud, and social networking technologies to sense individual behaviors; for example, the number of times employees swipe their identification badges at work. The tool then “nudges” these individuals to change those behaviors through the use of friendly competitions and incentives.

The primary incentive for the INSTANT experiment, developed by Professor Balaji Prabhakar of Stanford University’s Electrical Engineering and Computer Science Department, was an algorithm-driven lottery. The algorithm had three components: credit allocation, weekly reward drawings, and credit deduction.

For the experiment, commuters using Infosys buses earned credits based on their time of arrival, with those arriving earliest receiving the most credits, and those arriving later earning fewer credits until a certain time after which they accrue no credits. The more credits a commuter

earned, the higher the amount of prize money they could win and the greater the chance that they could win a prize at all. At the end of each week, the algorithm divided the commuters into different levels based on the quantity of credits they had earned; those who had fewer credits were in lower levels, and the drawings were for lower amounts. Those who had higher numbers of credits were in higher levels with the potential for larger winnings. Rewards varied in value from the equivalent of about \$10 for those who had accrued fewer credits to about \$240 for those who had accrued a greater number of credits. This potential to win a greater reward was designed to incentivize commuters to accrue more credits each week.

After each drawing, the algorithm deducted credits on a sliding scale for both the winners and non-winners to ensure that commuters would continue to arrive early to rebuild their credit balances. This was also to ensure that winners would have to build up their credit balance over a few weeks before being able to win again, thus giving others a chance to win larger prizes.

The INSTANT experiment was considered to be very successful. During the course of the experiment, the pickup times for about 60 buses had to be advanced between 15 and 30 minutes as a result of commuter demand for earlier arrival of their buses, and several buses were shifted from arrival after 9:30 a.m. to before 8:30 a.m. **At the conclusion of the 6-month experimental period, the number of Infosys commuters arriving before 8:30 a.m. had doubled, and the average morning commute time per person had dropped to 54 minutes from around 71 minutes before the scheme was launched. This resulted in a net savings of about 2600 person-hours per day.** (Merugu et al., 2009)

For more information, see “An Incentive Mechanism for Decongesting the Roads: A Pilot Program in Bangalore” by D. Merugu, B. S. Prabhakar, N. S. Rama at: <https://www.gsb.stanford.edu/faculty-research/publications/incentive-mechanism-decongesting-roads-pilot-program-bangalore>.



Source: shylendrahoonde, iStock, Getty Images Plus

STANFORD UNIVERSITY'S CONGESTION AND PARKING RELIEF INCENTIVES (CAPRI) STUDY

INCENTIVE SUMMARY

TYPE: **STUDY**

CURRENTLY: **INACTIVE**

STARTED IN: **2012**

INCENTIVE(S) APPLIED:

- ▶ **Point-based rewards.**
- ▶ **Raffle rewards.**
- ▶ **Online resources.**

One of the largest employers in the San Francisco Bay Area, Stanford University, signed a General Use Permit with the County of Santa Clara that requires the university to manage its transportation impacts under a “no net new commute trips” standard: The amount of traffic during peak hours must not increase by more than 1 percent during the morning and afternoon peak hours (based on traffic count data from 2000). By 2012, while existing measures had been effective in reducing the total number of commuters who drive alone, they did not directly address peak-hour commuters, whose numbers were increasing.

In an effort to address this imbalance, the university, with a \$3 million grant from the Federal Highway Administration Value Pricing Pilot Program, launched the Congestion and Parking Relief Incentives (CAPRI) program, which ran from April 2012 through September 2014. Its goal was focused on shifting driver commutes away from peak hours, but was expanded in 2013 to incentivize walking and bicycling commutes. The approach behind the project is based on the understanding that “congestion is a 10 percent phenomenon.” (Abadi et al.) In other words, **a small reduction in demand can lead to a significant drop in congestion. By targeting peak period commutes, a corresponding decrease in peak period congestion around the university could be achieved.**

In addition, rather than penalizing undesirable behavior, such as increasing the cost of transit during peak periods, the CAPRI project approach was designed to incentivize decongestion by using “carrots” to influence driver behavior. This methodology leverages game theory, in which games with low stakes see players become more risk-seeking, resulting in greater user responsiveness achieved by paying out random “chunky” rewards rather than small, deterministic payments. CAPRI built on the incentives first proposed in the previously introduced INSTANT (Merugu et al., 2009) program, as well as Steptacular (Gomes et al., 2012) and Insinc (Pluntke and Prabhakar, 2013) programs in terms of both behavioral interventions as well as technological elements.

In April 2012, Stanford University parking permit holders who parked inside the “congestion cordon” were invited to participate in the program. Those who enrolled were given passive radio-frequency identification tags to place on their windshield. Entries and exits were tracked by sensing devices at 10 main access points on the Stanford campus



Source: Zhu et al. 2014.

Figure 4. Screenshot. Chutes-and-ladders game for redeeming cash reward in CAPRI.

during the 7–10 a.m. and 4–7 p.m. periods each weekday, with peak-hours defined as 8–9 a.m. and 5–6 p.m. For each automobile detected by the sensors during the off-peak shoulder hours (i.e., 7–8 a.m. and 9–10 a.m., and 4–5 p.m. and 6–7 p.m.), the participant was awarded 10 points.

Additionally, CAPRI assigned each participant a “boost day,” or a day on which their off-peak trip earned them 30 points. Beginning in May 2013, the project was expanded to incentivize walkers and bicyclists by awarding them between 10 and 25 points, depending on the length of their commutes. Walking and biking activity was monitored using the “My Beats” smartphone app developed for this project.

Participants were incentivized by receiving points for commutes during off-peak periods and non-motorized commutes. These points could be redeemed in one of two ways:

1. Deterministically, by trading 100 points for \$1 (or a full week’s worth of off-peak trip points).
2. Randomly, by playing a “chutes-and-ladders” type game using their points on the CAPRI website.

The game gave cash rewards ranging from \$1–\$50. The follow-on study of the project found that 87.3 percent of the participants used the random rewards option, validating the theory behind the project. (Zhu et al., 2014) Notably, since participants were allowed to change the manner of redeeming rewards, 13.2 percent of the participants ended up switching from the deterministic option to the random option at some point during the program. (Zhu et al., 2014)

CAPRI also tapped into basic human traits such as the desire to improve one’s social status, the desire to connect with friends, and the desire to feel understood to increase the popularity, engagement, and behavior shift among the participants. This was accomplished through a rewards system that encouraged the desired behaviors and made them fun:

- ▶ **Status system.** Participants began at the bronze level and were able to advance through silver, gold, and platinum levels based on the number of off-peak shoulder hour trips they made on a weekly basis. At the silver, gold, and platinum levels, failure to make the number of off-peak shoulder hour trips required for that status level resulted in a degrading of the status by one level. Recognizing that status is only worth something if it is associated with a privilege, CAPRI gave participants with higher status higher odds of winning rewards in the game, and higher-valued rewards were only available at the higher status levels. For example, a \$50 reward was only available at the Platinum level.
- ▶ **Friends.** Leveraging the popularity of social media, CAPRI participants were allowed to invite friends who were eligible to participate in CAPRI to join the program as well as to connect with their friends on the CAPRI portal. Participants could see their friends’ recent updates, including status upgrades, any cash awards won, etc. This feature provided a basis for social influence to spread.



Figure 5. Screenshot. Interface for “My Beats” smartphone app for this CAPRI.

Source: Abadi et al., n.d.

- ▶ **Magic Box.** Based on a participant’s tracked preference for commuting off-peak, this incentive offered weekly personalized opportunities to gain additional points through a tab in a commuter’s portal called “Magic Box.” For example, filling out an optional survey might garner the user an additional 200 bonus points.
- ▶ **Trendjacking.** Because Stanford University participates in numerous high-profile sporting events, CAPRI offered tickets to some of these events and used them to incentivize behavior shift or increase enrollment.

Participants

Over the 30-month study period, 4,057 Stanford affiliates completed the registration process; this includes 3,082 car commuters and 975 biking/walking commuters. These car commuters comprised about 30 percent of the 10,290 car commuters in Stanford who were ever eligible to participate. (Zhu et al., 2014)

Outcomes

A post-project study identified the following results of the CAPRI program:

- ▶ CAPRI users avoided peak hours. For CAPRI participants, the peak-hour trip ratio is only 30.1 percent in the morning and 32.4 percent in the evening, which is a 21.2 percent and a 13.1 percent reduction, respectively, from the Stanford-wide traffic. (Zhu et al., 2014)
- ▶ CAPRI users responded to incentives. The commute density for CAPRI participants peaks adjacent to (but just outside) the peak hours. Furthermore, CAPRI users preferred commuting during the hour before the peak hour as compared to the hour after the peak hour. (Zhu et al., 2014)
- ▶ CAPRI rewards had a direct effect on participants’ commute time. Results of the study show that participants will shift their commute time away from peak hours when receiving rewards in the recent past. (Zhu et al., 2014)
 - Early commuters who have friends winning rewards in the past week travel around 1.5 minutes earlier. Early commuters also advance their commutes by an additional minute on their boost days to ensure receiving bonus award points.
 - Late users who won rewards in the past week shift about 3 minutes later in morning and afternoon (non-peak) commutes.

Since the conclusion of the CAPRI program, Stanford University developed and is currently hosting a “Commute Club” through its Parking & Transportation Services program. This program offers a variety of incentives to the more than 10,000 members who commute to and from the university. Incentives include up to \$300 a year in “Clean Air Cash” or carpool credit for not purchasing a long-term parking permit; free carpools and vanpools, along with reserved parking for carpool vehicles; Zipcar driving credit of up to \$102 per year; free folding bicycle rental for 1 week along with subsidized purchase of folding bicycles; and the opportunity to win other prizes through regular drawings.¹

For more information, see <https://prabhakargroup.stanford.edu/research/societal-networks/capri-project>.

¹ See <https://transportation.stanford.edu/commute-club> for more information.

SPITSMIJDEN (“PEAK AVOIDANCE”)

INCENTIVE SUMMARY

TYPE: **STUDY SERIES**

CURRENTLY: **ACTIVE**

STARTED IN: **2006**

INCENTIVE(S) APPLIED:

- ▶ **Monetary rewards.**
- ▶ **Online resources.**

In the Netherlands, several iterations of what have been called the “Spitsmijden” (or peak avoidance) experiments have been conducted since 2006 to examine the concept of rewarding drivers for driving during off-peak hours rather than at the height of typically congested periods. Three of the earliest projects are described below, although other peak avoidance projects have also been completed recently in the Netherlands. These projects included different types of rewards (e.g., monetary, lottery, gifts, free bikes, etc.), variance in the length of time during which rewards are given, and a reduction of the rewards after a period of time.

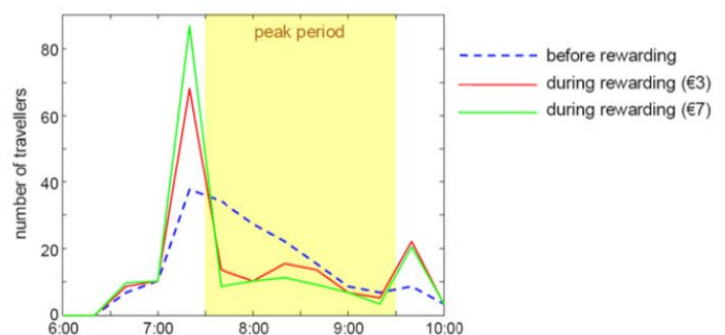
Zoetermeer

The goal of the first experiment in Zoetermeer in 2016 was simply to investigate the behavioral responses of travelers when incentivized by a potential reward. **With only 340 participants, the experiment was not intended to solve congestion problems, but rather to validate the hypothesis that rewards could be used to alter driver behavior.**

Two different reward types were identified, and participants could choose their preferred reward. The first group opted for a monetary reward (232 participants), which offered €3 to €7 (about \$3.78 to about \$8.82 in 2006 U.S. dollars) per day for avoiding using a car during the morning peak between 7:30 and 9:30 a.m.. The second group opted to use a smartphone with global positioning system (GPS) that could also provide real-time traffic information (108 participants). These participants were rewarded by being able to keep the smartphone if they avoided the morning peak sufficiently throughout the 10 week period. During the study, participants could not change their route in order to earn a reward, so the only alternatives available were to use different departure times, different travel modes, or choosing not to travel.

Researchers (Bliemer et al., 2015) found that:

- ▶ Among those earning a €3 (about \$3.78 in 2006 dollars) reward, 46 percent fewer trips were made by car during the morning peak, 35 percent of all trips made by car were outside peak hours, and 10 percent shifted to other modes. Approximately 67 people, or about 20 percent of the participants, did not use a car during morning peak when offered a €3 reward.



Source: Bliemer, Dicke-Ogenia, & Ettema, 2010.

Figure 6. Graph. Number of detected travelers from Zoetermeer during morning peak.

- ▶ Among those earning a €7 (about \$8.82 in 2006 dollars) reward, 61 percent fewer trips were made by car during the morning peak, and 44 percent of all trips made by car were outside the peak hours, and 14 percent shifted to other modes. Approximately 88 people, or just over 25 percent of the participants, did not use a car during morning peak when offered a €7 reward. (Bliemer et al., 2015)

Following the positive results, the Dutch Ministry of Transport decided to execute two additional projects in 2007 and 2008 with the goal of influencing traffic conditions during the planned maintenance and renewal of two major bridges, Hollandse Brug east of Amsterdam and Moerdijk Brug south of Rotterdam.

Hollandse Brug (Hollandse Bridge)

For the Hollandse Brug construction zone the goal was to reduce the number of vehicles using the bridge by 1,000 to 1,500 during the 6 a.m. to 10 a.m. morning peak. In addition to the peak avoidance monetary reward, the Ministry of Transport also offered free public transportation and vanpools. Additional measures included alternate route guidance, including dynamic route information panels with travel times for alternative routes and for travel by ferry.

A total of 2,975 participants were recruited for the 12-month project period, with half of participants being recruited prior to the project, and half being recruited after the first 6 month period to increase participation. Participants were offered a reward of €4 (about \$5.48 in 2007 U.S. dollars) for avoiding the morning peak period (6:00 a.m. to 10:00 a.m.) by car. Participants could earn an additional €2 (about \$2.74 in 2007 U.S. dollars) if they did not travel by car on the bridge all day. Participants of the peak avoidance project traveled an average of 2.1 times per week on the bridge during the peak periods. During the rewarding period, this number decreased to 1.3 times per week, which is a 40 percent decrease in the number of trips. (Bliemer et al., 2015) Of this 40 percent:

- ▶ Eighteen percent opted to travel outside peak hours.
- ▶ Nine percent chose an alternate route.
- ▶ Six percent chose an alternate mode of transportation.

In sum, the incentive program resulted in a reduction of approximately 1,250 car trips per week for the first half of the year; this is equivalent to a reduction of 250 cars per morning peak, which is 1.5 percent of the total flow. (Bliemer et al., 2015) During the second half of the year, this reduction rose to 425 cars per morning peak, about 2.6 percent of the total flow, but still significantly less than the 1,000 to 1,500 vehicle reduction goal.

Moerdijk Brug (Moerdijk Bridge)

The Moerdijk Brug project conducted from April to July of 2008 aimed to avoid significant increases in the congestion on southbound lanes due to road work during the evening peak period (3 p.m. to 7 p.m.). In total 2,703 people participated. For this experiment, participants could earn €4 per day (about \$5.88 in 2008 U.S. dollars) or a maximum of €20 per week (about \$29.40 in 2008

U.S. dollars). Out of all participants, 66 percent of the travelers indicated that they changed their behavior. Of the 1,784 participants who did change their behavior (Bliemer et al., 2015):

- ▶ Twenty-eight percent chose alternate routes.
- ▶ Fifteen percent changed their departure time.
- ▶ Six percent worked from home more often.
- ▶ Five percent carpooled or used an alternate mode.

Among those who changed their departure time, 37 percent chose to depart later and 19 percent chose to depart earlier. On average, people departed 95 minutes earlier or 87 minutes later.

Follow-on Experiments

Since 2009, several additional experiments in the same vein—with the same rules of participation regarding eligibility, travel modes, and reimbursement—have been conducted, with the most recent being the Spitsmijden A2 Nederweert-Eindhoven project in 2017. With more than 2,000 participants (SmartWays, 2018), the Spitzmijden A2 initiative was responsible for a total of 145,571 rush hour avoidances and 746 fewer cars on the road during peak traffic each day, significantly more than the goal of 680 fewer vehicles per day. (Rijkswaterstaat, 2018) Three-quarters of participants indicated that they got used to their new way of traveling and will continue to choose to avoid driving during peak traffic. Together, they continue to realize 650 rush hour avoidances per day.

The financing for the peak avoidance research projects in the Netherlands has changed since the early Spitsmijden projects were conducted. Businesses are typically now providing the rewards instead of the government directly financing the projects.

A 2017 report commissioned by the Municipality of Amsterdam (Stemerding and Mateboer, 2017) points to the general success of these efforts to date and suggests the city continue to identify opportunities to incentivize peak period travel reductions by focusing on:

- ▶ Changing the travel behavior of students.
- ▶ Working with large businesses to institute flexible work hours, working from home, and changes in shift start and end times (for hourly workers).
- ▶ Targeting employees among smaller employers within the city center for future incentive initiatives.

For more information, see *Rewarding for Avoiding the Peak Period: A Synthesis of Three Studies in the Netherlands* by Bliemer, Michiel, Matthijs Dicke-Ogenia, and Dick Ettema. Available at: https://www.researchgate.net/publication/265060921_REWARDING_FOR_AVOIDING_THE_PEAK_PERIOD_A_SYNTHESIS_OF_THREE_STUDIES_IN_THE_NETHERLANDS.

BAY AREA RAPID TRANSIT (BART) PERKS

INCENTIVE SUMMARY

TYPE: **STUDY**

CURRENTLY: **INACTIVE**

STARTED IN: **2016**

INCENTIVE(S) APPLIED:

- ▶ **Point-based rewards.**
- ▶ **Raffle rewards.**

The San Francisco Bay Area Rapid Transit (BART) system has seen a rapid increase in ridership thanks to population and job growth in the area. From 2004 to 2016 alone, the system saw a 40 percent increase in overall ridership and a 75 percent increase in ridership in the Transbay corridor connecting the San Francisco financial district to the East Bay cities through the underwater Transbay Tube. BART's maximum train car load target is 117 riders, but train car loads of about 140 riders are seen during rush hour.

In 2016, BART and the San Francisco County Transportation Authority (SFCTA) rolled out the BART

Perks program, aimed at nudging a small percentage of peak hour, peak direction Transbay Tube riders to hours before or after the peak rush.

BART Perks was a 6-month test program that provided incentives to riders to shift travel time from the peak morning rush hour to the shoulder hours occurring before and after the peak—specifically, riders were encouraged to travel during 6:30 a.m. - 7:30 a.m. and 8:30 - 9:30 a.m.. The program had nearly 18,000 participants out of the approximately 26,000 riders who travel during peak hour. (SFCTA et al., 2018) Of those surveyed who did not participate, lack of schedule flexibility was the most cited barrier to participation.

Participants enrolled in the program through a mobile-friendly website and provided their Clipper Card ID number, allowing BART and SFCTA to provide awards based on frequency, timing, and length of trips, as well as to observe trends and effectiveness of the program. BART and SFCTA monitored rider trends in the 6 months leading up to the program period and 4 months after the program ended.

During the BART Perks program period, Transbay peak hour travel demand decreased 10.9 percent, while the overall BART system travel demand decreased by 9.6 percent. (SFCTA et al., 2018) Participants were more likely to travel during one of the bonus hours if it was close to their typical departure time and their schedule wouldn't be altered greatly. Transbay travelers were less likely to shift into the bonus hours, perhaps due to many of those participants already traveling outside the peak hour, and many long distance commuters shifted more than other commuters, typically opting for the hour before peak rush. Two-thirds of participants shifted their travel time to bonus hours at least twice per week.

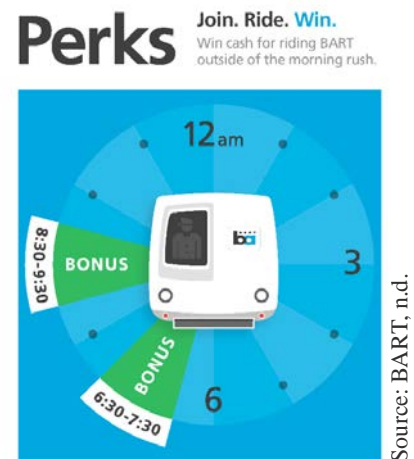


Figure 7. Screenshot. Promotional flyer for BART Perks.

Shifting a trip to the bonus hours rewarded participants with points that they could use on the BART Perks reward generator. The points were played in a “chutes and ladders” type game, where participants could win from zero to \$100. On average, participants earned about \$2 per month.

Upon completion of the 6-month program period, BART saw continued effects on travel behavior: 35 percent of peak hour trips cut during the program continued to happen outside of the peak hour in the four months following the program. Program participants were satisfied overall with BART Perks, with many participants stating their desire for higher levels of rewards, better rewards, or more opportunities to earn rewards, perhaps during a longer bonus period.

This program demonstrated a successful effort to shift departure times from peak hours. In the future, the Perks program would consider working more closely with employers to learn about barriers to shifting employee start times, therefore allowing later departure times from transit riders. While many participants felt comfortable arriving at work earlier, many did not feel that arriving at work late was an option. The BART Perks program model could also serve as a tool to achieve multiple objectives for a transit agency in the future. While this particular program was aimed at shifting morning rush travel demand, a Perks-type program could be used to reward frequent riders or encourage travel in lower ridership times of the day or week.

For more information, see *Lessons from Perks: Evaluation Findings from the BART Perks Test Program* at: https://www.sfcta.org/sites/default/files/content/Planning/BART_Travel_Smart/Lessons%20From%20Perks%20-%20Eval%20Report.pdf.



Source: Joe Potato, iStock Editorial/Getty Images Plus

4 APPLYING INCENTIVES TO SHIFT MODE OF TRAVEL

Computing platforms are becoming a game changer when it comes to developing innovative incentive programs that encourage travelers to shift their mode of travel. Smartphone apps and internet-based initiatives are making it easier for travelers to identify a range of alternative modes of transportation, helping them reduce single-occupancy vehicle trips while meeting their transportation and lifestyle needs. This is resulting in reduced congestion, reduced pollution, and a more comfortable commute.

INCENTIVIZING MODE SHIFT OPTIONS THROUGH SMARTPHONE APPLICATIONS

INCENTIVE SUMMARY

TYPE: MAINSTREAMED

CURRENTLY: ACTIVE

STARTED IN: 2017

INCENTIVE(S) APPLIED:

- ▶ Online resources.
- ▶ Point-based rewards.
- ▶ Daily parking.
- ▶ Free transit.

Several initiatives in the United States have employed smartphone applications to encourage different transportation demand management activities. Users, employers, or transit groups use these applications to help match them with carpool rides, find parking, document shifting travel times, or find alternate options such as public transit, bicycling, or walking routes.

Tools for Commuters

One such app-based Mobility-as-a-Service tool is the Mobility Options Discovery and Engagement (MODE) solution, which is offered by the private company Metropia. MODE is **intended to facilitate the use of public transportation and to eliminate the need for**

users to spend time researching mobility options. It does this by incentivizing users to select transportation modes other than single-occupancy vehicles during congested conditions.

Launched in 2017, the Adaptive Mobility with Reliability and Efficiency (AMORE) project—conducted through a partnership of the Regional Transportation Authority (RTA) of Pima County, Metropia, and RubyRide²—is the field deployment of the Metropia MODE framework and

² RubyRide is a subscription-based personalized driver service. The monthly fee for this service includes unlimited trips inside the subscriber's community zone, but fee trips are also available. The service offers advance scheduling for recurring trips and first mile/last mile services to connect users to transit, making it an option for commuters who do not own a vehicle and who may not live within walking or bicycling distance of transit lines.

approach in Tucson, AZ. Funded through the Federal Transit Administration’s Mobility on Demand Sandbox grant program, the project is currently exploring and enhancing public access to mobility options for individuals needing or wishing to reduce their use of single-occupancy vehicles. It does this by integrating multiple emerging mobility services and technologies. Users can request multiple types of mobility services via the Metropia app, from transit-hailing to carpooling, facilitating service delivery to users. The project goals include supplementing the existing fixed-route transit system; demonstrating a more on-demand, efficient, transit-hailing service; improving overall multimodal system reliability and efficiency; and increasing ridership. In addition, the project is expected to:

- ▶ Establish a financially sustainable mobility ecosystem based on a points system to which users can subscribe. Within this system, points can be purchased, earned, and transferred among families and friends through a range of activities to meet individuals’ and families’ mobility needs. The idea is to enable employers, local businesses, and other stakeholders to participate and contribute to an enhanced mobility options pool by offering rewards to those who exhibit more desirable behavior (i.e., fewer single-occupancy trips using personal vehicles).
- ▶ Introduce the transit-hailing service (with RubyRide as the service provider) as an option for commuting, activities around town, or first-mile/last-mile service for transit operations.
- ▶ Integrate carpooling (via the Metropia app’s DUO feature) with transit-hailing and existing transit services in order to offer more robust mobility options for individuals with various commuting needs, and make the system more adaptive and capable of meeting peak-hour demand surge.

RTA and Metropia anticipate that data sharing with RTA and other transportation agencies will help provide insight into transit ridership, demand for transit and transportation services, regional travel patterns, and more. The project has several anticipated outcomes, including:

- ▶ Increased access to various affordable mobility options for residents with limited access to a personal vehicle. Achieving this outcome could translate to improved access to employment, greater transportation equity, and better quality of life for residents.
- ▶ More cost-effective system-level benefits and higher quality of service will allow for the exploration and extension of public-private partnerships in future years to further augment the services offered.

Tools for Employers

Metropia’s platform is one of several platforms that are in use in the United States to incentivize mode shifts through smartphone applications. Similarly, Luum offers an enterprise-grade commute management platform that employers can use to provide benefits and incentives to employees to promote behavior change. This can benefit employers through better utilization of real estate and facilities, streamlined administrative workflows, attraction and retention of talent, and reduction of greenhouse gas emissions. Through Luum’s online platform, employers can engage with employees to optimize their daily commute and offer targeted incentives based on

specific company commuter program goal behaviors, such as maximizing the use of shuttle, transit, or carpool/vanpool services, and allowing employees to compete against coworkers in leaderboards and rewards pools.

Luum's software aggregates data for the employer through integration with human resources, payroll, parking, shuttles, and third-party mobility providers. Through Luum, employers can make a range of alternative commute modes available, deliver customizable and personalized commute benefits to employees, better understand employee commute activities and preferences, and motivate behavioral change. **Luum is designed to enable a commuter benefits program manager to administer transit subsidies and transit cards, form and manage carpools and vanpools, administer daily parking charges, manage a parking waitlist and parking applications, and offer a guaranteed ride home via transportation network companies. Using Luum, an administrator can send targeted communications via email to different groups of commuters (e.g., everyone who is registered in a vanpool or assigned to park in a specific garage). This helps the employer target information and incentives to the right people.** Luum partners with third-party mobility service providers in order to offer its clients linked accounts and to synchronize commute data, which is used to track trip mode and distance.

In 2016, Luum worked with Delta Dental of Washington (DDWA) to implement an enhanced commute program that would mitigate the impacts of the company's relocation from a suburban location north of Seattle to the city center. To give employees the ability to decide how best to commute to work on a daily basis and to meet the parking constraints of their new office, DDWA opted to implement a series of solutions (Luum, 2017):

- ▶ **My Commute Hub:** A one-stop-shop with tools and resources to support employee commute choices.
- ▶ **Daily Parking:** All employees have the option to drive when needed. Employees are only charged for the days they choose to drive and the charges are automatically deducted from their paycheck.
- ▶ **Daily Bonus:** Employees receive a bonus for each day they commute by any mode other than driving alone, including telecommuting.
- ▶ **Reduced Rideshare Parking:** Free parking for vanpools and split parking charges for carpools discourage single-occupancy vehicles.
- ▶ **Fully Subsidized ORCA (One Regional Card for All) Cards:** Passes provided by DDWA cover transit and vanpool fees. ORCA cards are fare payment cards accepted in the Seattle region on buses, ferries, or trains.

Since starting its MyCommute program, DDWA has achieved the following (Luum, 2017):

- ▶ A 60 percent reduction in the drive-alone rate, down to 15 percent post-move.
- ▶ A 100 percent participation rate in the MyCommute program.
- ▶ Four new vanpools.
- ▶ Retention of 100 percent of employees after moving from the old office to the new office.

Using these application-based systems encourages behavior change from the users, while allowing streamlined incentive processes and easier data tracking.

For more information on Luum, see: <https://www.luum.com/>, and for more information on Metropia, see: <http://www.metropia.com/>.

INCENTIVE SERVICES TO REDUCE ENVIRONMENTAL IMPACTS OF TRIPS

INCENTIVE SUMMARY

TYPE: MAINSTREAMED

CURRENTLY: ACTIVE

STARTED IN: 2003

INCENTIVE(S) APPLIED:

▶ Point-based rewards.

An example of an incentive service that works with State and local agencies to encourage travelers to select modal options that have a lower environmental impact is NuRide (soon to be renamed Agile Mile, Inc.).

NuRide is a **rewards program for commuters who take “greener trips;” e.g., walk, bike, telecommute, carpool, or take the train, subway, bus, or work a compressed schedule.** The NuRide programs in the United States are offered through State and local governments and metropolitan planning organizations, and are free of cost to those who sign up. One of

NuRide’s principle activities is persuading businesses to sponsor the incentive program and provide the incentives so that the programs are sustainable, ongoing, and donated at no cost to the local or State governments.

The primary focus of the service is on removing vehicles from the roadway as a means of reducing emissions and improving the environment. It does this by encouraging non-motorized modes and car/vanpooling. Users who sign up receive points for each green trip they record via an online portal. Points can be redeemed for coupons for restaurants and retail shops, services, movie tickets, etc.

Established in 2003, NuRide has built a presence in nine States. The participant portal provides a dashboard of activity results in each area where the system is deployed. For example, in the Commonwealth of Massachusetts, NuRide exceeded 25,000 participating commuters in 2014, after only 4 years in the State, and nearly doubled that number by 2018. Since its launch in 2010, NuRide indicates that participants in the State have saved more than 175 million miles of driving, more than 8 million gallons of gasoline, nearly \$97 million in travel-related costs, and nearly 79,000 tons of emissions. (NuRide, 2018) In San Antonio, TX, where the service launched in 2008, \$1.1 million in rewards have been redeemed, nearly half a million walking trips have been taken rather than driven, 1.6 million transit trips have been made, and 4.5 million rides have been shared as of June 2018. (NuRide, 2018)

In addition, during the 2008 to 2010 period, NuRide sponsored the Houston Commuter Challenge, in which 13,000 commuters reduced the number of vehicles on roadways by carpooling, vanpooling, biking, walking, telecommuting, and riding transit. Participants saved close to \$5 million in commuting costs by not driving while earning more than \$340,000 in rewards from private industry and product sponsors. Employers throughout the region supported the event by encouraging their employees to participate. In addition to reducing 15 million miles of driving, the Commuter Challenge also produced the following results: 927,498 car trips saved, one million gallons of gas saved, and 10,701 tons of emissions prevented. (Houston Style Magazine, 2010)

For more information on NuRide, see: <https://nuride.com/>.

EUROPEAN EMPOWER PROJECT TO REDUCE USE OF CONVENTIONALLY FUELED VEHICLES

INCENTIVE SUMMARY

TYPE: **STUDY**

CURRENTLY: **ACTIVE**

STARTED IN: **2016**

INCENTIVE(S) APPLIED:

- ▶ **Point-based rewards.**
- ▶ **Discounts.**
- ▶ **Online community.**
- ▶ **Games.**

Funded by the European Commission's Horizon2020 program, the purpose of the EMPOWER Project is to reduce use of conventionally fueled vehicles in European cities as a means of achieving a combination of more efficient urban traffic flows reduced carbon dioxide (CO₂) emissions and improved air quality—a byproduct of reduced CO₂ emissions and oil consumption from fewer vehicles idling in congested traffic conditions.

The project is exploring the use of personalized positive incentives such as information, points, discounts, rewards, community support, challenges, small giveaways, larger competition prizes, travel discounts, individual and group competitions, and

games as a means of encouraging people to engage in positive behavioral change, including shifting travel to off-peak hours, using car sharing, and exploring ways to avoid traveling altogether (e.g., telecommuting).

The project, which kicked off in 2016, combines empirical research with practical implementation in four “Living Lab Cities” (Gothenburg, Sweden; Helsinki, Finland; Enschede, Netherlands; and Manchester, UK) and seven Take-Up Cities and Communities. Following the roll out to the Living Lab Cities, it will then be expanded to the seven additional locations.

Each Living Lab city has established a Living Lab Plan, which is designed to provide an overview of the implementation process. Each plan begins with an analysis of the characteristics of the local transportation system and its usage patterns followed by the establishment of a structure for the local experimentation activities and the characteristics of the work to be carried out. The experiments are testing a wide range of potential services; for example, working with transit operators to encourage infrequent users to take more journeys via bus or rail, encouraging the use of electric vehicles by offering parking discounts, and making public transportation more accessible to less mobile people.

The results of the EMPOWER project will answer questions such as, “What are the best designs for positive incentives to encourage people to consider other travel options?” and “How can we establish lasting travel behavior changes, not through external rewards, but through addressing intrinsic needs, such as the need to belong to a group or the need to do good?” The project is also examining new business models that help maintain the incentives after the project concludes.

The EMPOWER dissemination strategy (Meeuwissen et al., 2015) consists of two pillars:

1. The **content** of the project.
2. The **partners** of the project.

The content of the project and its results will be incorporated into the EMPOWER toolkit.³ The first iteration of the toolkit was released in May 2018 and includes:

- ▶ A database of positive incentives.
- ▶ Mobility services to deliver incentives.
- ▶ Organizational/business models.
- ▶ An enhanced evaluation method to enable cities to monitor the benefits and impacts of introducing positive incentives schemes.

The tool includes details on how to use the information and communication technology (ICT) tools developed through the EMPOWER Project to stimulate shifts to “greener” modes of travel for citizens. The ICT tools, developed by EMPOWER, are free to download.

This toolkit will support the launch of the Living Labs during phase 1, serving both to validate the theories behind this project as well as to collect information on the impacts of the tools in the real-world deployment environment.

The results of the phase 1 implementations will be used to refine the toolkit during phase 2. Phase 3 will see the final evolution of the toolkit as it will once again be enhanced via implementation by the Follower and Take-up Cities and Organizations.

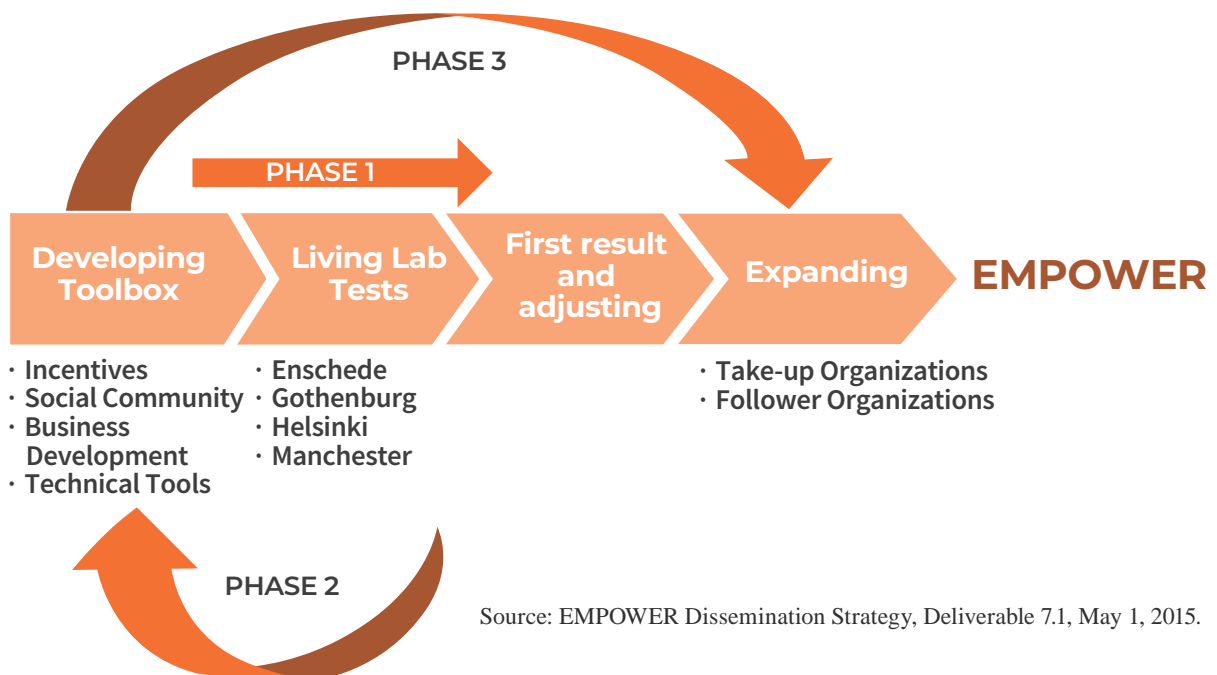


Figure 8. Chart. The three phases of the EMPOWER implementation.

³ The EMPOWER toolkit is available at: <https://empowertoolkit.eu/>.

The project partners are the second pillar of the initiative. Each partner has a different knowledge base, role, and network. The partner organizations will disseminate the toolkit throughout communities within Europe, but also outside Europe, mainly via project partner WSI-EMBARQ (a non-governmental civil society organization that focuses on practical applications for sustainable urban transportation and development based on a combination of global research and on-the-ground experience) and UN-Habitat (the United Nations program whose mission is to promote socially and environmentally sustainable human settlements development and the achievement of adequate shelter for all).

As of June 2018, the 60 Follower Cities and Organizations are also using the toolkit to support local and regional sustainable transportation activities across the globe.

For more information on the EMPOWER project, see: <http://empowerproject.eu/>.

“ONE-LESS-CAR” DEMONSTRATION STUDY, SEATTLE DEPARTMENT OF TRANSPORTATION

INCENTIVE SUMMARY

TYPE: **STUDY/MAINSTREAMED PROGRAM**

CURRENTLY: **INACTIVE**

STARTED IN: **2000**

INCENTIVE(S) APPLIED:

- ▶ **Cash rewards.**
- ▶ **Store credits.**

The City of Seattle, Washington’s Transportation Operations Program promotes driving less and incorporating transit, biking, and walking into residents’ daily lives. Starting in 2000, and continuing through 2002, the program, referred to as the “Way to Go” program, sponsored a new challenge: “One Less Car.” The goal of this program was for families to park one of the family cars—or sell it—and use other environmentally friendly ways to get around.

In order to be eligible for the study, participants could not have more cars than drivers in their household.

Households had to live inside city limits. In total, 86

households participated in the study for a period of 6 to 9 weeks, ranging from households with children, to singles, to empty-nesters. This helped ensure that the study could fit a variety of travel patterns. Participants also had to be willing to keep a detailed journal to track their transportation habits and to submit those journals every week.

Each year of the study, participants started the first few weeks with all of the cars in the household, keeping track of how often and how far the vehicles were driven. This information provided a baseline. For the rest of the study period, the extra car was parked. Odometer readings were recorded on all parked cars and verified throughout the study period.

Participants received an average stipend of \$80 each week, which served as both compensation for recording their data as well as an economic incentive simulating the savings they would have if they did not own the car given up during the study. In the third year of the study, the stipend was adjusted to more closely match each family’s actual operating costs for their second vehicles. An average of \$80 each week was still reported, although some families received more or less depending on their driving habits. This proved to be an especially powerful incentive.

At the end of the study, participants reduced their drive-alone car miles by 27 percent, and the use of alternate modes of transportation increased: bicycle mileage increased by 38 percent, transit use mileage increased by 25 percent, carpooling increased by 23 percent, and walking mileage increased by 30 percent. (Lee et al., 2013) Vehicle miles traveled decreased during the study period, but the actual number of miles traveled remained essentially the same, meaning that people were still taking trips and getting where they were going, but they were not using personal vehicles for these trips. Families had found alternative ways to meet mobility needs without the use of an extra car.

With these changes in transportation, participants were able to decrease their actual car costs and educate themselves about the full variety of travel options available to them. At the time of the study, it was estimated that it cost an average of \$4200 annually to operate a second car, while only \$1300 to use alternative transportation modes, such as buses and biking. (Moore, 2004) In this particular study, it was estimated that families saved an average of \$70 per week; the participants spent \$10 each week on alternative travel modes but received an \$80 stipend.

Upon conclusion of the study, 26 percent of the participant households sold their extra car, and in some cases, sold all of their cars. A follow-up survey conducted 6 months later in the 2001 and 2002 studies indicated that **more than 80 percent of households reduced the extra car's usage.** (Moore, 2004)

After the study ended, the One-Less-Car Challenge evolved into an annual challenge for Seattle residents. While the weekly stipends disappeared, the challenge offered incentive and discounts for participants. For cutting down drive-alone time for two months, participants could earn up to \$60 in commuter cash and be given the opportunity to join the Zipcar car-sharing service for a first year rate of \$25. If participants sold their car, they could receive \$200 worth of bus passes or outdoor gear from a national merchant, a free Cascade Bike Club membership, a free bike organization membership, \$100 off a subscription to a local organic community supported agriculture (CSA) provider, and the opportunity to join a car sharing service with the first year free and with a \$100 credit. (Seattle Department of Transportation, 2009)

The One-Less-Car Challenge was discontinued in 2013, but the City of Seattle has several ongoing programs to encourage the use of transportation options and discourage unnecessary single-occupancy trips.

For more information, see the City of Seattle, Department of Transportation's Transportation Options website at: <https://www.seattle.gov/transportation/projects-and-programs/programs/transportation-options-program>.

SHIFTING TO TRANSIT: BOULDER, COLORADO NEIGHBORHOOD ECO-PASS PROGRAM

INCENTIVE SUMMARY

TYPE: MAINSTREAMED PROGRAM

CURRENTLY: ACTIVE

STARTED IN: 1997

INCENTIVE(S) APPLIED:

- ▶ Transit discounts.
- ▶ Satisfaction from contributing to environmental improvement as part of a social network (neighborhood).

In Denver, Colorado, the Regional Transportation District (RTD) offers Eco-Pass, a transit pass program for the greater Denver area that aims to increase transit use and reduce single-occupancy vehicle (SOV) travel. One spin-off of this program is the Neighborhood Eco (NECO) Pass initiative. The NECO Pass is a yearly transit pass option that is available to all neighborhoods in the RTD service area, although it is primarily used by neighborhoods in the City of Boulder because of the subsidies provided by the city. The lower price and convenience of a NECO Pass compared to traditional bus tickets is intended to incentivize residents to shift their mode of travel to transit.

The NECO Pass Program started in 1997 and has grown to include 45 neighborhoods and more than 6,500 households. Residents who participate and receive a NECO Pass see considerable savings. The cost of monthly transit passes can range from \$1,100 to nearly \$1,900 per year per person, whereas the NECO Pass typically costs around \$100-200 annually per household. (City of Boulder, 2018) In addition, the cost of the NECO Pass is for the entire household, regardless of how many people are living in the house. One caveat for the program is that every household in the designated neighborhood must purchase the NECO Pass, so it is in the best interest of users to garner the participation of all households in order to lower the cost per household. First-time participating neighborhoods are also eligible for a 50 percent subsidy from the City of Boulder as well as follow-on reduced subsidies towards the annual NECO Pass costs. The subsidies from the City of Boulder are funded through a transportation sales tax.⁴

The partnership between RTD and the City of Boulder to offer residents the opportunity to obtain a NECO Pass has been successful and supports the city's transportation demand management (TDM) goals. Neighborhoods that participate in the program have reported a dramatic increase in transit use. Those that have a NECO Pass drive less, which then contributes to less congestion and pollution in the community.



Figure 9. Photo. The NECO Pass is offered by RTC and the City of Boulder as an incentive for residents to shift their mode of travel to transit.

Source: City of Boulder, Colorado.

4 Crump, Allison. "City of Boulder's NECO Pass Program." Telephone interview. May 1, 2018.

NECO Pass supports the City of Boulder's TDM goals, including:

- Improved access and mobility for the community
- Increased parking availability at peak times
- Decreased congestion, emissions, and air pollution

The City of Boulder periodically evaluates the overall effectiveness of its programs to reduce SOV travel. According to the report *Modal Shift in the Boulder Valley: 1990 to 2015*, SOV trips have declined by 7.7 percent since 1990. (National Research Center, Inc., 2016) The report also states that while the proportion of trips made on transit remained virtually unchanged nationally (1.8 percent in 1990; 1.9 percent in 2009), Boulder experienced a 2.1 percent increase in public transit use (1.6 percent in 1990; 3.7 percent in 2012).

In addition to the NECO Pass, similar transit pass incentives are available for businesses and colleges. The city has learned that if transit access is made more accessible and affordable, usage will increase. To be eligible to become a participating neighborhood within the NECO Pass program, the neighborhood must be located within the RTD service area, which includes all of Boulder, Broomfield, Denver and Jefferson Counties, parts of Adams, Arapahoe and Douglas Counties, and a small portion of Weld County.

For more information on NECO Pass, see: <https://bouldercolorado.gov/goboulder/neighborhood-eco-pass>.

BELLA MOSSA IN BOLOGNA, ITALY

INCENTIVE SUMMARY

TYPE: **STUDY**

CURRENTLY: **ONGOING**

STARTED IN: **2017**

INCENTIVE(S) APPLIED:

- ▶ **Games.**
- ▶ **Point-based rewards.**

In 2017, an innovative approach to promote environmentally sustainable (non-motorized or transit-based) transportation and reduce single-occupancy vehicle trips was launched in Bologna, Italy. Bella Mossa, which means “good move” in English, is run by Bologna’s transport agency, SRM, and uses a system of **gamification and rewards** to encourage people to choose environmentally friendly transportation modes such as walking, bicycling, or transit.

The Bella Mossa program, funded in part through the European EMPOWER Project (see related story on

page 28), supports urban sustainability and mobility while promoting a better quality of life for the citizens of Bologna. According to Giuseppe Liguori, SRM’s Project Manager, “There are almost 60 cars for every 100 inhabitants here in Bologna. We want to decrease this kind of ownership of cars, but we also want to decrease the use of private motorized vehicles.”⁵

SRM collaborated with the BetterPoints Behavior Change Management System in order to offer a global positioning system (GPS)-based smartphone application. BetterPoints is a behavior change technology company in the United Kingdom that builds tools to help motivate people to make positive behavior changes. The application used by SRM can track users’ sustainable trips and then provide various rewards and incentives for their choices. The program has been a successful public-private partnership, with 85 businesses, restaurants, stores, and other commercial partners offering discounts and prizes to participants. Participants may also opt to donate their points to charities in lieu of cashing in for themselves.

CARBON IMPACT



728 TONS
of CO₂ have been
saved due to the
Bella Mossa Initiative

“A lot of people are talking about this campaign and we are very satisfied with the level of engagement. It is really a big success.”

Giuseppe Liguori
SRM’s Project Manager

During the initial 6-month launch of the Bella Mossa program (April 2017 to October 2017), 15,000 people actively participated in the incentive program, which resulted in an estimated 3.7 million kilometers (2.3 million miles) of sustainable travel and 900,000 sustainable trips. (Amadori, Liguori, and Bristow, 2017) Bella Mossa also offered a corporate challenge which involved nearly 40 business teams, comprising 1,800 employees, and found that the corporate challenge

participants earned double the amount of points compared to the average person participating in the program. **These results have led the program’s administrators to consider the “team competition” component to be a strong contributor for influencing people’s behavior.**

5 Liguori, Giuseppe, SRM. “Bella Mossa Program.” Telephone interview. May 4, 2018 and email communication.

Overall, the participants provided favorable reviews of this initial introduction of Bella Mossa. For example:

- ▶ Eighty-four percent of participants would participate in another Bella Mossa challenge.
- ▶ Seventy-seven percent of participants said Bella Mossa motivated them to walk more.
- ▶ Seventy-three percent of participants reduced their car usage.
- ▶ Sixty-three percent of participants said that their opinion of public transport improved after participating in Bella Mossa. (Amadori, Liguori, and Bristow, 2017)

The City of Bologna was awarded a CIVITAS⁶ Award in the “Bold Measure” category for its 2017 deployment of Bella Mossa. This European award is given each year to the most innovative and successful initiatives relating to sustainable mobility.

Due to its success and popularity, the city of Bologna and SRM launched the second edition of Bella Mossa, which ran from April through September 2018. Along with maintaining the basic rules and operation of the 2017 initiative, where individuals and company teams can participate, compete, and gain rewards, the 2018 initiative also included a shorter, 2-month School Challenge in which primary schools in the metropolitan city of Bologna were able to participate and compete for educational materials and school equipment. Preliminary results of the School Challenge show that 1,250 parents were involved from 93 different schools, resulting in savings of 3.8 tons of CO₂ on 18,000 kilometers travelled by parents and students.⁷ One out of five trips were made by “Pedibus,” which is a group of students walking together to school. SRM is currently planning a new edition of the challenge for next year.

For additional information on the program and the results, contact Giuseppe Liguori, SRM - Reti e Mobilità at giuseppe.liguori@srbologna.it.



Source: Amadori, M., G. Liguori, and C. Bristow.

Figure 10. Chart. Bella Mossa by the numbers.

⁶ CIVITAS (City VITALity and Sustainability) is a network of cities for cities dedicated to cleaner, better transport in Europe and beyond. For additional information, see <http://civitas.eu/about>.

⁷ Email communication with Giuseppe Liguori, SRM on October 2, 2018.

FLEXPASS PROGRAM, UNIVERSITY OF CALIFORNIA, BERKELEY

INCENTIVE SUMMARY

TYPE: MAINSTREAMED

CURRENTLY: STUDY

STARTED IN: 2015

INCENTIVE(S) APPLIED:

▶ **Cash rewards.**

To help alleviate parking demand on the University of California, Berkeley (UC Berkeley) campus, a parking incentive program was created by the University's Parking and Transportation Office. In this program, called FlexPass, participants are offered incentives for parking less and taking other modes of transportation. In 2015, UC Berkeley, in partnership with FHWA, studied this value pricing project before rolling out the FlexPass program to measure the program's effectiveness.

The study targeted current Central Campus C Permit holders and Faculty/Staff F Permit holders who together make up the majority of regular campus parking. To be eligible for the study, participants had to have already purchased an F or C permit for the entire 2015 spring semester, which was \$95 and \$131 per month, respectively. Participants were randomly assigned to a treatment group or a control group. Those in the treatment group traded their original permit tags to new ones for the study.

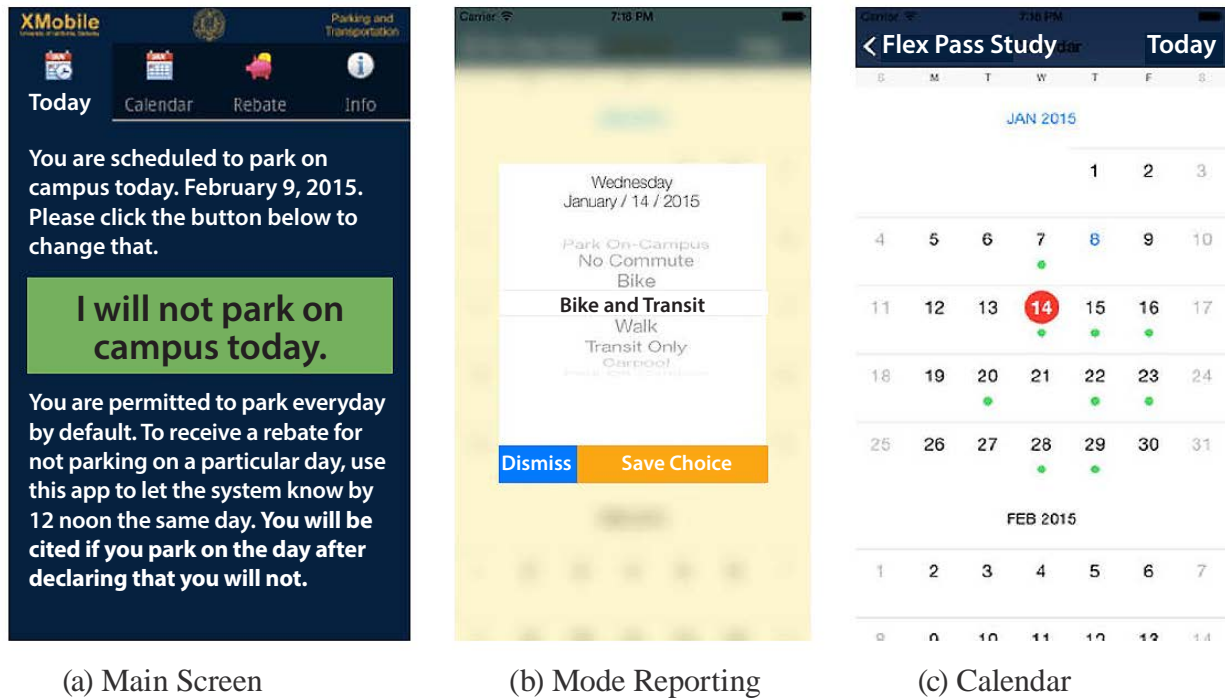
There were 4,272 C and F permit holders at UC Berkeley that semester who were contacted about this study, and of those, 392 completed the sign-up process. (Tang et al., 2015)

Throughout the study period, participants recorded their daily parking choices on working days (Monday through Friday) via the FlexPass application, available on both iPhone and Android platforms. The application defaulted to "Parked on Campus" each day, but users could change the choice to "not parked" up until noon the day of. At that time, decisions became final and were synchronized with the Parking and Transportation Office's systems. If users had indicated they were not parking by noon, but vehicles were found parked on campus, users were given parking citations.

If users indicated they would not park, they had to also indicate whether they would be coming to campus at all, and if so, what modes of transportation they would be using instead. Participants in the treatment group were eligible for refunds based on their permit types and number of days they parked on campus in a given month. The maximum rebate was \$95 for F permit holders and \$131 for C permit holders—meaning participants could be fully subsidized their parking costs.

By the end of the 3-month study period, \$4,256 was paid out to the 158 valid participants in the treatment group, equating to an average of \$26.94 per participant. The highest rebate for an individual was \$285, while most others remained under \$20. (Tang et al., 2015)

The treatment group members who saw refunds as a result of their decisions had a 4.2 percent demand reduction in parking over the study period, or 2.23 days. Parking demand on the UC Berkeley campus is fairly inelastic, although knowing a reduction is seen in just the treatment group, researchers believe providing these incentives to all users will result in additional demand reductions once the program is rolled out. (Tang et al., 2015) **The study showed that the FlexPass would create a potential for freeing parking resources from a portion of campus via these incentives.**



Source: Tang et al.

Figure 11. Screenshots. FlexPass smartphone application interface.

For more information, see *A Casual Analysis of FlexPass: Incentives for Reducing Parking Demand* by Tang, Dounan, Ziheng Lin, and Raja Sengupta. Available at: <https://trid.trb.org/view/1394492>.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY'S ACCESS MIT PROGRAM

INCENTIVE SUMMARY

TYPE: **MAINSTREAMED**

CURRENTLY: **ACTIVE**

STARTED IN: **2016**

INCENTIVE(S) APPLIED:

- ▶ **Free transit access.**
- ▶ **Daily parking pricing.**
- ▶ **Commuter rail subsidy.**
- ▶ **Online resources.**

In 2006, the Massachusetts Institute of Technology (MIT) launched an institute-wide energy initiative to address challenges relating to energy demand and mitigating environmental impacts. (Moniz and Armstrong, 2007) Since the establishment of the MIT Energy Initiative, students and faculty have become increasingly interested over the years in traveler behavior motivations and various incentives that could potentially influence people to make different modal choices. With the increasing cost of building parking garages and low return on these structural investments, MIT administration officials sought solutions that could potentially convince people to move from driving and parking on campus to other modes, such as transit. MIT secured a grant from FHWA relating to value-pricing,

which allowed researchers to put more effort into studying and developing a successful program that could influence traveler behavior and further support environmental sustainability.

In the summer of 2016, MIT launched Access MIT, a significant travel demand management program for their faculty and staff that includes a five-pronged approach to reduce parking demand on campus and change commuter behavior. The program includes:

1. Free, unlimited transit access via electronic chips embedded in the employee identification cards.
2. A shift from annual parking contracts to daily parking pricing, with a maximum expense capped at the annual parking rate.
3. Increased commuter rail subsidy from 50 to 60 percent.
4. Subsidized parking of 50 percent at the transit stations.
5. AccessMyCommute, an online commuter dashboard that allows commuters to compare travel modes, analyze their carbon footprint, and earn points/rewards by using public transportation, carpooling, walking, or biking to work.

The Access MIT program set out to reduce parking demand by 10 percent per year, reduce congestion, increase campus sustainability, and reduce single-occupancy vehicle trips to campus. The program has been in place nearly 2 years, and the researchers are evaluating its performance, successes, and any lessons learned. Preliminary findings show that annual registration for permission to park on a daily basis has decreased by 15 percent and overall parking transactions

have gone down by 10 percent. **By reducing the parking transactions, MIT has been able to defer additional parking garage construction. In fact, a 400-space parking garage was recently demolished to build a dormitory, and 17 percent of the group that used that parking lot ultimately decided not to renew their permit.**⁸

MIT has been pleased with the overall results of the program and has plans to continue. Researchers have found that free transit, daily parking, and free parking at the transit stations had the most influence on traveler behaviors. MIT's next direction for the program will be looking into potential options for the commuters who have no other option than to drive. One solution the university is considering is casual carpooling incentives.

For additional information on MIT's program, go to: <https://sustainability.mit.edu/access-mit>.

8 Attanucci, John. "Access MIT Program." Telephone interview. May 1, 2018.

5 APPLYING INCENTIVES TO ELIMINATE TRIPS

Incentivizing travelers to avoid taking a trip helps to reduce demand on congested roads and transit systems. Most of the incentive programs reviewed for this primer focused on changing time or mode of travel as a way to offer alternatives to travelers rather than ask travelers to avoid taking a trip. The study featured in this section rewarded participants for reducing their vehicle miles traveled.

FLORIDA IDRIVELESS RESEARCH PROGRAM

INCENTIVE SUMMARY

TYPE: **STUDY**

CURRENTLY: **INACTIVE**

STARTED IN: **2013**

INCENTIVE(S) APPLIED:

- ▶ **Cash rewards.**

After looking into different financial incentives offered for transportation demand management and how to improve upon these offers, the Florida DOT (FDOT) and the Center for Urban Transportation Research (CUTR) at the University of South Florida developed a controlled, quasi-experimental initiative called “Idriveless.” The program was designed to provide financial rewards to people who reduced their vehicle miles traveled (VMT). FDOT measured VMT every 2 weeks throughout the study period, and participants were compensated based on the number of miles they reduced.

Incentives were structured based on how many VMT participants were able to cut from their baseline trips. Once participants were able to reduce 20 VMT, they received a \$5 payment. The incentive structure was increased by \$5 for every additional 20 miles reduced, with a maximum payout of \$40 at 160 VMT or more reduced. An additional \$20 was added to the 10th week of the study to retain participants in the study and complete the exit interview in a timely manner. The maximum payout for those who eliminated 160 or more VMT and completed the survey was \$200. Participants were recruited initially based on positive responses to an interest survey. Additional recruitment was performed through a database of registered vehicle owners in Florida – nearly 50,000 registered vehicle owners in Miami-Dade, Broward, Hillsborough, and Duval counties were contacted by email. Seventy-eight participants were enrolled in the study, with a minimum of

20 participants in each study group, including the control group. By the end of the 10th week, the end of the study, 61 participants were still participating in the study. (Lee et al., 2013)

To evaluate the incentive structures in this study, different schemes were adopted, and participants were randomly assigned to each scheme. Group A was a traditional incentive scheme, providing cash rewards after participants completed and reported their saved VMT. Group B was assigned a new incentive scheme, which was designed to provide the incentive in advance of VMT savings based on a pre-committed VMT reduction. If a participant in Group B was unable to meet the pre-committed VMT reduction, they were required to return the incentive. This scheme was designed based on the “prospect theory” and the “loss aversion effect,” where people have a tendency to prefer avoiding losses than to acquiring gains. Group C was the control group.

Throughout the study, participants in Group A, those with a reactionary incentive payout, maintained nearly 10 percent or higher VMT reduction each week. Group B, with the pre-incentive payout, achieved significant VMT savings in the first 6 weeks of the program, but reduced VMT reduction during the rest of the study period. Approximately 50 percent of both Groups A and B participants were able to save VMT during the study—so much so that a significant amount of VMT was saved in both groups beyond that for which the participants were compensated. The control group, Group C, showed an average of zero percent change in VMT from the baseline. With such a small sample size, the researchers did not reach firm conclusions on whether up-front or reactionary payments would produce more behavior change. (Lee et al., 2013)

During the exit interviews, participants were asked to identify their primary strategies for saving VMT during the time period. A majority of respondents claimed to have a strategy, and the most common responses included reducing number of trips or trip chaining, carpooling, taking public transportation, biking or walking to work, and telecommuting. (Lee et al., 2013)

For more information, see: http://www.fdot.gov/research/completed_proj/summary_pto/fdot-bdk85-977-41-sum.pdf.

6 SUMMARY

The incentive studies and programs to influence traveler behavior highlighted in this primer show several effective, emerging practices. Organizations interested in creating an incentive-based program to reduce congestion and better manage demand on the roads and rails can use this primer to access some of the lessons learned and ongoing work in this area. Concepts from behavioral economic theory can inform the development of programs to more effectively modify traveler behavior than standard approaches.

The nonprofit Rocky Mountain Institute issued a 2018 report entitled *Mapping Incentives to Change: How Comutifi's Commuter Score Can Influence Sustainable Commuting*, which highlights the application of behavioral economic concepts to developing a successful incentive program. (Keeton et al., 2018) The report identified five best practices for using behavioral economics to encourage change:

- ▶ **Choice Architecture:** Use the way in which options are presented to influence choice. Set reference points that serve as goals that participants can use to compare their performance against and work toward. Incentivize both small and large shifts in behavior using a tiered structure of rewards.
- ▶ **Round Number Clustering:** In general, individuals are inclined toward round numbers (e.g., 0s, 5s, 10s, etc.), especially in terms of performance scores or accomplishments. The Rocky Mountain Institute recommends increasing rewards or payouts every 5 or 10 points.
- ▶ **Time (Temporal) Discounting:** One established behavioral theory is that rewards that are given in the future are perceived as being less valuable than those that are received now. To promote participation in the program, give out rewards earlier in the program.
- ▶ **Social Norms:** Peer influence and what is considered appropriate behavior can persuade individuals to make changes or stay in a program. Use this concept to encourage participants to make a public commitment to change and make it possible for them to see how others are doing in comparison to their own performance.
- ▶ **Status Quo Bias:** People generally show a preference towards how things are. They resist changing habits and overvalue what they currently have. To counteract this bias, programs should demonstrate that the alternatives represent a three-fold increase in their current travel choices.

The EMPOWER Project categorized positive incentives in the form of information, rewards, and feedback. Information consists of campaigns and educational information that can influence travelers to shift their travel behavior. (EMPOWER, 2018b) EMPOWER researchers provided some useful tips on how to use information to effect change:

- ▶ Campaigns to raise awareness:
 - Are more effective within a neighborhood.
 - Are most successful with newcomers to a city, especially for public transportation.
 - Can best be organized with local stakeholders.
 - Do more than education alone.
 - Are useful for starting behavioral change, but cannot stand alone and should be followed up by other interventions to sustain that change.
- ▶ Travel information:
 - Could include apps that provide multi-modal travel information and that may raise awareness of viable alternatives to automobiles that otherwise may not have been considered.
 - For active transport, route planners may show healthy routes for walkers and bikers avoiding locations with high concentrations of harmful particles.
- ▶ Informational content:
 - Should stress the benefits of bicycling and walking, not only in global terms such as air cleanliness and climate improvement, but also relative to improving the livability of local neighborhoods and the individual's general health.

In a review of previous studies on the use of positive incentive schemes to shift travelers to other modes, times, or residential locations, the EMPOWER group reviewed 33 studies from 12 countries (Australia, Belgium, Canada, Denmark, Germany, Italy, Japan, New Zealand, Sweden, the Netherlands, UK, and the United States). (Hof et al., 2017) They found that the effects of the incentives were mixed. Studies that reported a significant change in travel behavior were primarily based on self-reporting surveys as opposed to objective measurements. Studies that provided free transportation cards (transit passes, etc.) were more effective in changing behavior. The effectiveness of the incentive appeared to depend on the match between the intervention and the target group.

Based on this information, the reviewers noted that gifts, rewards, points, and discounts can have a strong but short-term effect on travel behavior, but often people tend to return to their old travel habits when the programs are discontinued. They recommended additional research into how these external motivations could change behavior in the long-term.

The review team recommends customizing incentives or the incentive scheme to individual or target group needs and to consider using programs that allow for social comparison and support.

Researchers partnering with EMPOWER shared several points of advice at a 2017 workshop for “Designing Positive Incentives: Practical Insights and Sharing Knowledge with the EMPOWER Project.” (Hof et al., 2017)

For travel behavior change programs with rewards, points, or discounts, they recommend:

- ▶ Providing a reward each time the desired behavior occurs when the individual is learning the behavior and only part of the time for those who are regularly performing the behavior.
- ▶ Offering a “chain of rewards” such that there are immediate rewards as well as delayed ones.
- ▶ Trying different reward schedules to find out what works best for the target groups.

When using challenges, goals, and personal commitments to incentivize behavior change, the researchers advised allowing participants create their own goals (instead of using only assigned goals or challenges); include frequency, context, and duration in the goal statement; and allow people the ability to make the goals public.

7 RESOURCES

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