

UTC Spotlight

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Smartphone App Uses Personalized Incentives to Nudge Commuter Behavior Changes in Washington DC and Baltimore

The National Center for Strategic Transportation Policies, Investments and Decisions (NTC) at the University of Maryland has developed a smartphone app that can be personalized for individual users to provide real-time multimodal traveler information. The “incenTrip” technology has now been deployed in the Washington D.C. and Baltimore region. incenTrip leverages the latest big data, machine learning, and computing technologies to optimize and personalize traveler incentives to promote multimodal and shared mobility, off-peak travel, and smart routing/driving for reduced congestion, energy use and emissions in the most cost-effective way.

During the technology development phase, UTC Program grant funding provided the initial seed monies for the proof-of-concept project, with subsequent funding support from the Federal Highway Administration's Exploratory Advanced Research (EAR) Program and the USDOE's Advanced Research Project Agency – Energy (ARPE-E). The UTC Program funding also played a critical role in assisting the project team in technology transfer. In the current deployment phase, incenTrip has received support from the Commuter Connections Program at the Metropolitan Washington Council of Governments, and Maryland Department of Transportation, and traveler incentive funding from more than a dozen state and local partners.

Technology Innovation

incenTrip employs a front-end smartphone app interface to engage travelers and deliver real-time traveler information and incentives. These incentives are personalized for each trip based on each traveler's individual preference (machine-learned from past behavior and choices) and real-time multimodal travel conditions (predicted from a metropolitan-wide transportation system simulation model). Travelers earn reward points if they choose travel mode, departure time, or route options that not only save themselves time and money, but also produce even greater system benefits. For instance, a peak-hour rideshare trip would receive more reward points than an off-peak rideshare trip due to its greater congestion reduction benefits. If a traveler consistently drives to work during the most congested hour and on the most congested routes, incenTrip would gradually increase the monetary incentive to entice the traveler to try alternative modes, departure time, and routes — and may later reduce the incentive after the same traveler has already changed into a new, desirable travel pattern (e.g., transit for all commute trips). The reward points can be redeemed for gift cards, credits for transit trips and rideshare trips, etc. The back-end technology for incenTrip includes: (1) a transportation behavior and dynamic traffic simulation model system for the entire Washington D.C. and Baltimore region, covering 5,744 square miles, 8.2 million people, and 34 million

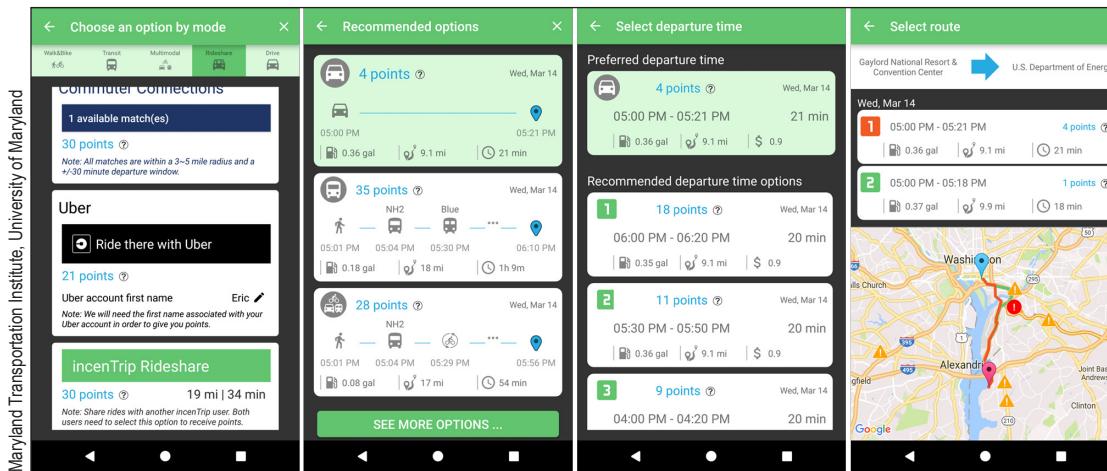


Figure 1. The incenTrip smartphone app nudges travelers to change travel behavior with personalized and real-time incentive points for maximum incentive cost-effectiveness.

trips each day; (2) a unique machine-learning and rule-based travel behavior model for each incenTrip app user; and (3) an incentive optimizer that dynamically allocates incentive points to each individual user trip. For agency partners that provide incentive funding, incenTrip provides a customized performance dashboard with daily updates on program benefits in terms of reduction in congestion, vehicle hours traveled, vehicle miles traveled, energy use, and emissions, as well as more detailed statistics on user and user trip counts, actual travel behavior changes, incentive benefits by socio-demographical groups and trip location.



Figure 2. For technology deployment, incenTrip offers agency partners a customized performance dashboard that tracks the real-world impact of each dollar from the incentive program.

Technology Deployment and Commercialization

In May 2018, the incenTrip iOS and Android apps were published online, signaling the transition from technology development to technology deployment. The NTC encouraged the research team to participate in the National Science Foundation (NSF) I-Corps program, which helped prepare the team to extend their focus beyond the university laboratory and seek economic and societal benefits through technology commercialization. As part of the I-Corps program, the project team interviewed more than 50 potential technology clients in both the public and private-sectors, drafted and evaluated several alternative business models with help from resident entrepreneurs, and determined that collaboration with transportation agencies for congestion reduction and sustainability benefits would be the technology deployment priority. Subsequent outreach activities, open house events, and media placements including a feature article in the August 18, 2018 edition of the Washington Post have helped the incenTrip app gain support from both app users and agencies in the Washington D.C. and Baltimore region.

Successful operations of the incenTrip technology and demonstration of system benefits in real-world pilot deployment have led to increased confidence and trust from collaborating agencies. In December 2018, the Transportation Planning Board (metropolitan planning organization for the Washington D.C. metropolitan area, part of the Metropolitan Washington Council of Governments, MWCOG) approved its Visualize 2045 long-range plan's aspirational initiatives that includes an "enhanced mobile application to integrate gamification and rewards" as a major new travel demand management initiative. Subsequently, the MWCOG Commuter Connections Program announced incenTrip to more than 30,000 commuter account holders in its existing travel demand management program and added incenTrip program funding to its annual fiscal budget. In February 2019, the Maryland Department of Transportation funded the expansion of the incenTrip app service area to the entire commute shed for all travelers who commute to the State of Maryland for work as part of the Commuter Choice Maryland Program.



Figure 3. incenTrip is currently deployed in the Washington D.C. and Baltimore region for congestion reduction, with support from a number of state and local agency partners.

Encouraged by the National UTC and other sponsors such as ARPA-E, the research team has established a startup company, Future Mobility Labs, to commercialize the incenTrip technology and pursue greater social and economic benefits from technology deployment in more regions across the nation.

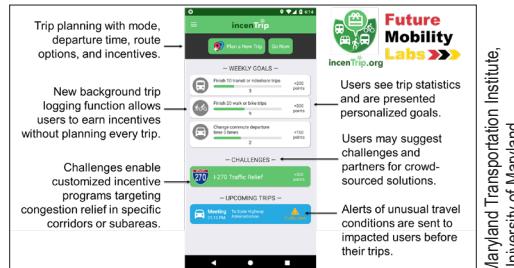


Figure 5. A startup company, Future Mobility Labs, has been established by the research team to commercialize incenTrip, continue technology development, and make real-world impact.

About This Project

The National Center for Strategic Transportation Policies, Investments and Decisions (NTC) is a MAP-21 National UTC and part of the Maryland Transportation Institute (MTI) at the University of Maryland (UMD). The Center theme is "Strategic Transportation Policies, Investments and Decisions for Economic Competitiveness," with the following focus areas: Congestion reduction with multimodal strategies; Freight efficiency and reliability; and National-level transportation economics and policy analysis. Building on the largest transportation big data and data analytics operations in the nation at UMD, the NTC and MTI also emphasize data-driven solutions that are innovative, impactful, and implementation-ready. Contact: lei@umd.edu, (301) 405-2881, <http://mti.umd.edu>.

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