Minnesota Mileage-Based User Fee Test Results

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What am I going to talk about

• Quickly cover the
  Who, What, Where, When, Why, and How

• The Results......
Statutory Direction

"$5,000,000 is for a pilot project to demonstrate technologies that will allow for the future replacement of the gas tax with a fuel-neutral mileage charge."
Miles Based User Fees: a Two-Part Research Effort

1. Technology Demonstration (Battelle, SAIC, Mixon Hill)
   - 500 volunteers from Wright County, MN for 13 months
   - Existing smart phone and cellular communications
   - “Opt-In” design with odometer readings

2. Policy Study (University of MN)
   - Engage key MN stakeholders
   - Identify and evaluate MBUF policy issues
Technical Approach

• System designed to use commercially available technology in order to:

  – Assess if a mobile application could be used to implement MBUF

  – Assess the viability of Connected Vehicle safety signing applications, especially for rural deployments

  – Demonstrate the ability to provide location and vehicle specific trip information
Samsung Captivate™ Smartphone

In-Vehicle Mounting Brackets

Vehicle Identification (VIDM) Module

Power Cables

Power Management Module
Main Menu

1. Right Turn Ahead
2. Construction Zone Notification
3. Left Turn Ahead
4. Speed Reduction Zone Notification
5. School Zone

Example “View Estimated Fees” page
High Level System Design Concept

Participant Web-Portal Home Page
Capabilities

• The system was designed to:
  – Use the phone’s onboard GPS capabilities to charge a mileage fee which could vary according to any time and location in North America
  – Display safety signage for 98 zones covering Wright County MN
    • 46 school, 17 curve, 7 construction, 28 speed reduction
    • 5 DSRC radios communicating with DSRC infrastructure, specifically CICAS intersections
  – Deliver travel time data for 3 predefined corridors in Northwest Twin Cities Metro Area
How did we Test the System

• So that was what was built

• Now let talk about
  – Who tested the system and
  – How they tested it......
Participant Demographics

- Focus on Wright County, MN
- Recruiter made over 15,000 telephone calls
- Recruited over 650 participants to fill the 500 slots
- Paid average of $320 per participant
- Good balance except low income & younger drivers

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<th>WRIGHT COUNTY</th>
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<tbody>
<tr>
<td>Male</td>
<td>46.4%</td>
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<table>
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<tr>
<td>56 – 65</td>
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<tr>
<td>66 +</td>
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<tr>
<th>INCOME</th>
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<tr>
<td>$75k +</td>
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Total: 500 (All Waves)
Study Design Overview

- MBUF concept was to use a odometer reading with a discount fee if technology was used.
  - $0.03/mile and $0.01/mile
  - Higher rate for Metro area during congestion times and Zero cost for miles driven outside of Minnesota
  - Monthly invoicing during testing period and final reconciliation at last odometer reading
  - 3 waves from September 2011 to November 2012
The Results

• We now know:
  • The Who, What, Where, Why, and the How the system was tested

• So lets talk about the results........
  – 2 Final Reports covering:
    • The operational experience from the Demonstration
    • The user experience from the Demonstration
Demonstration Data Analysis

• Data Sources
  • System collected data
    – # of trips, # of miles, length of trip
  • Participant Perceptions
    – Surveys, focus groups, and interviews
  • Service request and Stakeholder Interviews

• Data Collection (478 participants)
  • 660 million trip data points
  • 4 million miles collected within 500,000 trips
  • 1,411 survey response, 432 interviews, and 6 focus groups with 63 participants
Where did they drive?

- 800,000 snapshots per day for every 150 users
- November 2011
- 150 vehicles from Wave A
Example of Speed Profile Data for One Trip Through a Signage Zone

**Signage Zone 128**  
**Speed Zone**  
**Speed Limit = 40 mph**

US 12 - EB  
near Delano, MN

**Participant Travel Direction**

**Speed Profile - Signage Zone ID 128**

- **Signage Zone Entered; Signage Displayed; No Audible Alert (44mph)**
- **Signage Zone Exited; Speed = 34 mph**
- **Speed = 63 mph**
- **40 mph speed limit**
Travel Times and Safety Signs

- DOT now has more “Value information” that can be collected in mass.
- Travel time data processing in this format requires more development.
- 98% of drivers positively reacted (decreased speed) as a reaction to the in-vehicle audio/visual alerts.
- Safety Signage produced an overall average reduction in speed of 5.6 mph.
MBUF –
Miles collected by Categories

United States 3%

North America 0%

Twin Cities 13%

Minnesota 84%

Interstate 20%

NonInterstate 80%

PM 20%

AM 12%

OFF 68%

WEEKEND 22%

WEEKDAY 78%
Odometer vs MBUF miles collected

MBUF > Odometer

MBUF < Odometer

MBUF ±10% of Odometer
User Evaluation Conclusions

• Test participants used the technology, shared their data, and paid their bills.
  – Data security was much more important to users than data privacy (83% share rate)
  – Participants were accepting of modest monthly invoices that averaged $20 a month
    • 2,750 invoices collecting $32,000 in fees
    • 95.5% collection rate (using test operational parameters)
    • Approximately equal to gas tax collection rate
Operational Conclusions

• The Smartphone is a reasonable, viable technology to use for MBUF, but it has limits
  • 77 percent of the time, users chose to opt-in to the system, record their miles and receive the discounted rate of 1 cent per mile
  • Using the vehicle’s electrical system to detect the start of a trip did not work. Resulting in data loss rates of up to 35%
  • The ability to audit/post-process trip data is critical and vital.
  • There is room for continued field support optimization.
GPS Accuracy/Availability

• Perhaps the largest limiting factor the study
  – The quality of GPS signal is variable from phone-to-phone and is effected by physical location in vehicle
  – Phone used in the study are now considered very out of date (three versions of Samsung Galaxy™ have since been released.)
  – Advances in GPS technology have increased system accuracy from even three years ago.
System Administration

• Administering the system to respond to users’ needs was labor intensive
  • Participants reported a high level of satisfaction with the customer service
  • MnDOT does not regularly provide services to individual customers and but was required to in this scenario (4.5 calls/day plus billing, invoicing, odometer readings)

• Multi-agency interaction required.
Summary

• Conducted a successful test that satisfied the Legislative directive.
• The technology worked, but has it’s limits.
• Test participants used the system, shared their data, and paid their bills.
• Policy makers were engaged.
• System administration was labor intensive and focused on individual customers.
Next Steps

• Share MN test results
• Sponsor legislative proposal for keeping private data, private past August 12, 2013
• Observe other MBUF efforts especially in Oregon
• Lead Pooled Fund Project to continue to research the other MBUF concepts and related national issues
Minnesota Mileage Based User Fee Program

QUESTIONS or COMMENTS?
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Reports Available at:
http://www.dot.state.mn.us/mileagebaseduserfee/index.html