Changing Driver Behavior to Improve Road Safety

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Professor, MIT EECS
Chief Scientist, Cambridge Mobile Telematics
Our mission

Make the world’s roads and drivers safer

**Connect**
Connect 1B+ vehicles through mobile, IoT, cars, and partnerships

**Innovate**
Use AI to generate insights from telematics data

**Shared Value**
Make driving safer and more sustainable for consumers and organizations
Rising crash rates & costs

1.35 million
Road deaths
50% of Covid

50 million
Road injuries

$1.3 trillion
Loss costs
Traffic fatalities are the highest they’ve been in 16 years

42,915 US traffic fatalities

11% increase in 2021
Road risk is the highest it’s been since 2007

1.3 fatalities per 100M miles

21% increase in 2020
Pedestrian deaths are the highest in 40 years
What is Telematics?

Using data from vehicles to measure and understand driving

**Measure Driving**
Evaluate driver risk based on factors like harsh braking and distracted phone use

**Improve Driving**
Provide drivers with feedback to help them improve

**Understand Road Usage**
Help insurers, cities, and others understand road usage and risk
CMT’s DriveWell® Fusion Platform

**Data Sources**

- IoT sensors
- Phone sensors
- Connected car sensors
- Video
- Fleet devices

**Insights Delivered**

- Risk scoring
- Crash assistance
- Claims automation
- Behavior change

Transform in AI-driven platform

~1 trillion sensor time series points per day

24 petabytes of data

*Does not include data from video sources.*
Smartphones
Capture driving behaviors with the DriveWell SDK, no hardware required

- **Accelerometer**: Identifies phone position with axis-based motion sensing.
- **Gyroscope**: Works with accelerometer to determine position of phone.
- **Magnetometer**: Measures magnetic fields.
- **GPS**: Identifies phone location with multiple satellites.
- **Barometer**: Measures air pressure.
- **Proximity sensor**: Determines the proximity of the phone to nearby objects.
- **Ambient Light**: Measures the amount of light near the phone.
## Advanced Risk

The next generation of telematics variables for a proprietary advantage

<table>
<thead>
<tr>
<th>Standard Telematics</th>
<th>Advanced Distraction</th>
<th>Intrinsic Risk</th>
<th>Extrinsic Risk</th>
</tr>
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<tbody>
<tr>
<td>Phone Distraction</td>
<td>Phone Screen Interaction</td>
<td>Contextual Speeding</td>
<td>Solar Glare</td>
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<tr>
<td>Speeding</td>
<td>Call State Events: Handheld/Handsfree</td>
<td>Time in Speed Bands</td>
<td>Dawn/Dusk</td>
</tr>
<tr>
<td>Cornering</td>
<td>Context Switching</td>
<td>Complex Maneuvers: U-turns/3 Point Turns</td>
<td>Time of Day</td>
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<tr>
<td>Acceleration</td>
<td>Phone Mount Detector</td>
<td></td>
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<td>Braking</td>
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Three Studies of Driving Behavior

Changing behavior (CEEPR / UPenn)
Importance of engagement
Impact of laws & enforcement
Three Studies of Driving Behavior

Changing behavior (CEEPR / UPenn)
Importance of engagement
Impact of laws & enforcement
TRB24: The effect of providing driving feedback
Collaboration with MIT CEEPR
The effect of feedback on driver behavior

Control group
~370 users
Incentivized recruitment; $50
Knew driving was monitored
App didn’t provide feedback or interactivity

Treatment group
~325 users
Incentivized recruitment; $50
1 month without feedback or interactivity
Starting at “day 0”, several months with feedback
  Behavior score, trip maps and events, leaderboards
  No push messaging
Driving feedback directly affects safety

1. UBI drivers have fewer events than control when feedback is turned on
2. Feedback decreases hard brakes per hour by ~15%
3. This hard brake reduction is persistent throughout the study
Smartphone-based nudges to reduce cellphone use while driving
Collaboration with UPenn
Trial 2: Five trial arms, 1,700 users

<table>
<thead>
<tr>
<th></th>
<th>Education</th>
<th>Phone Mount</th>
<th>Commitment Plus Habit Tips</th>
<th>Gamification Plus Competition</th>
<th>Prize Money</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arm 1</td>
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<tr>
<td>Arm 2</td>
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<tr>
<td>Arm 3</td>
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<tr>
<td>Arm 4</td>
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<tr>
<td>Arm 5</td>
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</table>

- The Phone Mount intervention was discovered in interviews during Trial 1 and piloted in per-trial testing before Trial 2.
Gamification and money create lasting change

Gamification was effective (14% reduction compared to education only), but the strongest effect came with the addition of prize money (25% reduction compared to education only).

The effects were sustained during the post-intervention period.

Figure 11. Plot of differences in adjusted mean hand-held use between each of the four trial 2 intervention arms and control, for both the intervention and postintervention periods, with 95 percent confidence intervals.

Source: FHWA.
Three Studies of Driving Behavior

Changing behavior (CEEPR / UPenn)

Importance of engagement

Impact of laws & enforcement
The importance of engagement in changing driving behavior
Peer reviewed TRB24
CMT powers a range of telematics programs to help insurers select risk & acquire/retain customers
## App Engagement

### Engagement Label

<table>
<thead>
<tr>
<th>Engagement Label</th>
<th>App Sessions in a Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unengaged</td>
<td>0 Sessions</td>
</tr>
<tr>
<td>Minimally Engaged</td>
<td>1-5 Sessions</td>
</tr>
<tr>
<td>Less Engaged</td>
<td>5-10 Sessions</td>
</tr>
<tr>
<td>Moderately Engaged</td>
<td>10-20 Sessions</td>
</tr>
<tr>
<td>Highly Engaged</td>
<td>20+ Sessions</td>
</tr>
</tbody>
</table>
Driver improvement is correlated with app engagement

Study of 100K US White Label drivers with a first trip between 7/1/21 - 7/1/22. Only consider drivers who recorded a trip in Month 4

For each driver consider: App engagement + behavior change from month 1 and month 3 after first trip. Focus on initial low scoring users (<70 in Month 1)
Engaged users are less distracted and improve

50th Percentile Shift Month 1 to 3, Initial Low Scorers

Unengaged:
- 0 Sessions
- 1-5 Sessions
- 5-10 Sessions
- 10-20 Sessions
- 20+ Sessions

Highly engaged:
- Median month 1 distraction is 29 seconds per drive hour for highly engaged users
- Median month 1 distraction is 101 seconds per drive hour for unengaged users

Highly engaged users start with 71% fewer distraction seconds per drive hour compared to unengaged drivers
Engaged users are less distracted and improve

50th Percentile Shift Month 1 to 3, Initial Low Scorers

Unengaged:
- 0 Sessions
- 1-5 Sessions
- 5-10 Sessions
- 10-20 Sessions
- 20+ Sessions

Highly engaged:
- Median Month 1 distraction is 29 seconds per drive hour for highly engaged users
- Median Month 3 distraction is 23 seconds per drive hour for highly engaged users

Highly engaged drivers are the least distracted & reduce distraction by 20%
Less engaged/unengaged users regress. Results shown for initial low scorers but trend holds for all users
Highly engaged users start safer and improve most:

- Distraction: -20%
- Hard Braking: -9%
- Speeding: -27%
Improvements we see with highly engaged drivers would significantly reduce Bodily Injury Claims

<table>
<thead>
<tr>
<th></th>
<th>Initial Low Scoring Drivers (&lt;70)</th>
<th>Initial Midrange Scoring Drivers (70-90)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction improvement</td>
<td>20%</td>
<td>14%</td>
</tr>
<tr>
<td>for highly engaged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard Braking improvement</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>for highly engaged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated Bodily Injury</td>
<td>-5.5%</td>
<td>-4.5%</td>
</tr>
<tr>
<td>Claims (CMT Premium Score)</td>
<td></td>
<td></td>
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Changing behavior (CEEPR / UPenn)

Importance of engagement

Impact of laws & enforcement
Hands-free performance reporting

**Ohio Handheld Ban Has Reduced Distracted Driving by Over 8%**
New data from Cambridge Mobile Telematics reveals a significant drop in phone motion distraction since April 4, 2023 in the Buckeye State

**Nearly two months after new hands-free law, distracted driving remains lower in Ohio**
New data from Cambridge Mobile Telematics shows initial gains from law have continued

**Alabama Hands-Free Law Reduces Distracted Driving 2.4%**
New data from Cambridge Mobile Telematics shows a 3-second drop in the first month, but results are already fading

**Michigan Hands-Free Law Has Prevented 650 Crashes & Two Fatalities**
New data from Cambridge Mobile Telematics shows an 11.2% drop in phone motion distraction since June 30, 2023
Alabama distraction up 0.3% since law

Phone motion distraction per hour in Alabama

- **Crashes prevented**: 70
- **Lives saved**: -
- **Economic damage avoided**: $1.6 million

Phone handling is a secondary violation

Alabama hands-free law begins June 16, 2023
Michigan distraction down 12.7% since law

- Crashes prevented: 1,600
- Lives saved: 4
- Economic damage avoided: $38 million

Phone motion distraction per hour in Michigan

Michigan hands-free law begins June 30, 2023
OH Safety Corridors

To focus resources in high traffic, high risk areas.
Signed to inform drivers and subject to heightened enforcement activities
Corridors SUM-77 and DEL-71 subject to 24/7 heightened enforcement from 10/5/23 - 12/31/23
The national alert sent distracted driving skyrocketing

Change in phone motion distraction

2:00 PM  2:10 PM  2:20 PM  2:30 PM  2:40 PM  2:50 PM
Check out our latest “State of US Road Risk Report”, released yesterday!


Thank you

Let’s make the world’s roads & drivers safer together