Crowdsourcing for Operations
PSRC Regional Traffic Operations Committee

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Source: Pixabay, Unsplash and FHWA
How often is the “ask the audience” life line correct in the game show “Who Wants to be a Millionaire”?

A: 95% of the time
B: 50% of the time
C: 30% of the time
D: 75% of the time

Source: Idea SV, El Salvador Milonario
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What Exactly is Crowdsourcing?

Crowdsourcing is the practice of addressing a need or problem by enlisting the services of a large number of people via technologies. Crowdsourcing:

✓ Addresses a need or problem outside of an organization’s resources or means.

✓ Leverages the collective wisdom and unique insights of a crowd by distributing the workload across a large group.

✓ Uses technology and new forms of communication and interaction to document, share, and reflect on the world.
Transportation Systems Management and Operations (TSMO)

- Optimizing use of existing facilities.
- Maximizing performance of the system.
- Buying the most mobility for the least cost.
- Treating capacity as an asset to manage.
- Getting you there – people and goods.
- Targeted solutions to congestion causes.
- Complement to capacity projects.
- Approaches to match demand to supply.

Effective operations is built on a foundation of monitoring current conditions.
Real-Time Monitoring: A Weakness in the Foundation of Operations

There are 4 primary limitations in our typical approach to real-time monitoring:

1. Big gaps in geographic coverage.
2. Lags in timeliness of information.
3. Cost to build-out and maintain field equipment.

These limitations reduce the ability to efficiently and (cost) effectively operate the system.
Crowdsourcing: A Potential Solution

When integrated with an agency’s existing efforts, crowdsourcing helps agencies:

- Expand geographic coverage and resolution.
- Reduce information time lags for improved real-time situational awareness.
- Reduce dependence on and cost associated with roadside sensors and systems.
- Overcome jurisdictional stovepipes.
- Implement proactive operations strategies.

Crowdsourcing is a proven lower-cost solution to improving safety and operations.
Types of Crowdsourced Data

- **Probe** – Speed and travel time.
- **Event** – Crashes, stalled vehicles, potholes, snow, rain, etc.
- **Travel Behavior** – Where, when, how (mode used) people travel.
- **Social media** – Capture sentiment on road and agency performance.
- **Vehicular** – Heavy braking, wiper on/off, temperature, and more from connected vehicles.
- **Mobile Infrastructure / Internet of Things** – For example, work zone cones sharing location, surrounding speed.

Source: Pixabay
Common Sources of Crowdsourced Data

• Vehicle probe/integrated data provider examples
  – INRIX, HERE, TOM TOM, AirSage, CellInt, Google, and others.
  – Provides real-time and archived speed and travel time.

• Mobile application examples
  – Waze Connected Cities Partnership.
  – State-developed apps (DelDOT, Utah DOT, WYDOT).
  – 311 apps – for broader city functions including road maintenance.

• Trip data provider examples
  – INRIX Trips, StreetLight, others.

• Social Media examples
  – Mainly Twitter and Facebook.
  – CoCoRah, crowdsourced precipitation data.
Existing and Potential Crowdsourcing Applications in Transportation

Other possible applications include freight management, work zone management, and performance assessment and reporting.
Operations Application Area Highlights

- Most common applications of Crowdsourced data are for traveler information and incident management.
- Agencies are now expanding its use across application areas such as maintenance, road weather and work zone management.

Source: Unsplash, FHWA, and Pixabay
City of Austin – Signalized Corridor Prioritization

**Background:** Historically signals were retimed on 3-year rotation with results measured using “floating vehicle” travel time runs.

- Bluetooth on 53% of corridors; many with only 2 sensors.
- Cameras and/or radar on 18% of corridors.

**Goal:** Shift to a data-driven, needs-based schedule with a more cost-effective method for measuring impact.

**Action:** Purchased crowdsourced probe data from third party.

**Outcome:** More efficient allocation of resources for signal retiming based on need, and improvements in corridor performance.

*Source: City of Austin*
KYTC – Incident Detection & After Action Reviews

**Goal:** Kentucky Transportation Cabinet (KYTC) needed more timely incident detection across more roadways

**Action:** Created email alerts for use by TOC staff using combination of HERE and Waze data

**Effort:** Staff of 3 in-house, no dedicated staff

**Outcome:** Alerts clarify presence of events earlier than speed-based detection
- Alerts enable TOC staff to craft a quicker response
- TOC processes were improved to expedite/improve traveler information
- Integrated visualization supports a more effective after action review
Louisville Metro – Assessing Signal Retiming Effectiveness

**Background:** Shared real-time road closures data through apps like Waze, Google, and Apple Maps.

**Goal/Action:** Built a tool that allows Metro employees to quickly and easily conduct traffic studies, on-demand.

**Outcome:** Applied Microsoft Power BI with Waze database. Within 5 minutes, showed effects of signal retiming on corridor:

- 30% drop in the overall congestion.
- 38% drop in PM Peak congestion.

**Other uses:**

- Enhanced pothole reports (beyond 311)
- Detect faulty signals
- The Waze Analytics Relational-database Platform (WARP) replicates $50K traffic studies for free and on-demand.

Source: City of Louisville
Indiana DOT – Delta Speed Table

- Indiana DOT purchases live probe data. Does not use ‘blended' data, in which real-time data gaps are filled with historic data using proprietary methods.

- Indiana DOT pulls nearly 4000 segments every 60 seconds.
  = 240K data pulls per hour per segment.
  = 5.7 million data pulls per day.
  = 2.1 billion records per year.

- Segment lengths are typically ½ mile but some are a mile long.

- Identifies in real-time Segments with significant speed change – an effective indicator of incidents.

Source: Indiana DOT Delta Speed Tool
Lake County PASSAGE System Integrates Crowdsourced Data with Automated Traffic Signal Performance Measures

Monitor over 600 road segments in Waze, 750 traffic signals (600 connected), and filtered CAD data through PASSAGE System to:

- More quickly detect incidents on arterials
- Perform signal coordination and timing studies more frequently and at lower cost, more responsive to Board member requests
Delaware DOT App for reporting maintenance issues in real-time

A single source for all things traffic related.

• Travelers can report roadway issues from potholes to non-functioning signal lights.

• DelDOT shares the report to District-level maintenance crews.

• Traveler can obtain real-time information and track the movement of snow plows.

• They can also access other DOT services including transit information, advisories, and DMV information.

Source: Delaware DOT
Crowdsourcing Benefits Operations and Beyond

Crowdsourcing benefits operations:

- Expands and improves real-time monitoring.
- More targeted and timely response to incidents and hotspots.
- Quicker, lower cost, before-after studies.
- Better strategic and programmatic operational improvements.

Benefits beyond operations:

- Promotes legitimization and acceptance of public decisions.
- Improves transparency and efficiency of public expenditures.
- Promotes a sense of community and greater citizen satisfaction.

Source: Unsplash
What is “Every Day Counts” (EDC)?

• State-based model to identify and rapidly deploy proven but underutilized innovations to:
  ▪ Shorten the project delivery process,
  ▪ Improve environmental sustainability,
  ▪ Enhance roadway safety, and
  ▪ Reduce congestion.

• EDC rounds: 4 rounds, each 2-years, 40+ innovations to date.

• 5th Round (2019-2020) - 10 innovations, many synergies:

For more information: https://www.fhwa.dot.gov/innovation/
FAST Act, Sec.1444
FHWA EDC-5 Crowdsourcing Innovation Goal

To increase the number of agencies that use crowdsourcing to better operate the transportation system through new, cost-effective, and proactive operational strategies and applications.

30+ States are pursuing Crowdsourcing for Operations.

Source: FHWA
Crowdsourcing Support Opportunities

Support can come through:

- Webinars.
- Workshops.
- Peer exchanges.
- On-site and virtual technical assistance.
- Training materials/training.
- Case studies.
- Fact sheets.
- Marketing materials.

- Resources posted at EDC-5 Crowdsourcing website: https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/crowdsourcing.cfm

- FHWA EDC-5 Adventures in Crowdsourcing Webinar Series hosted by NOCoE: https://transportationops.org/edc5
For more information on the EDC5 Crowdsourcing for Operations Program, contact

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For more information on the EDC Program

www.fhwa.dot.gov/innovation/everydaycounts/  
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