Crowdsourcing for Operations Case Study

Lake County, Illinois Division of Transportation

U.S. Department of Transportation
Federal Highway Administration

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Introduction

Lake County is situated in the northeastern corner of Illinois with Chicago to its south. The Lake County Division of Transportation (LCDOT) operates the Program for Arterial Signal Synchronization and Travel Guidance (PASSAGE), an advanced traffic management system that allows operators to actively manage and monitor the roadway network from their traffic management center

PASSAGE integrates data from 400 traffic cameras, vehicle sensors, computer-aided dispatch, emergency responders, highway personnel, and 600 centrally connected State, municipal, and County-owned traffic signals. PASSAGE also provides information to travelers using dynamic message signs, Twitter, personalized email notifications, the PASSAGE app, and other channels.[1] LCDOT finds that free crowdsourced data is instrumental for proactive signal coordination and timing (SCAT).

Verifying Crowdsourced Data

Historically, LCDOT measured travel time along major signalized corridors using Bluetooth® detectors. LCDOT joined the Waze® Connected Citizens Program in July 2018 and learned that the Waze® free Traffic View tool offers real-time travel times at two-minute intervals.

LCDOT compared Waze® and Bluetooth® travel times; it observed that Bluetooth® travel time updates lag behind Waze® travel times, as shown in figure 1. The lag results from a low Bluetooth® hit rate (few complete trips) and lower Bluetooth® data transmission frequency.[2] Over the course of one hour, LCDOT receives 25 to 30 Waze® travel time updates, but only four Bluetooth® travel time updates.

Based on Waze® travel time high data quality, LCDOT incorporated its region's road network in the Waze® Traffic View tool using approximately 600 directional road segments. LCDOT now pulls real-time travel data from Waze® every two minutes for its road network.

LCDOT also compared Waze® alerts with observations from TMC-operated closed-circuit television cameras. For 1 in 10 instances, Waze® data provided LDCOT the earliest notification of an event on LCDOT roadways.

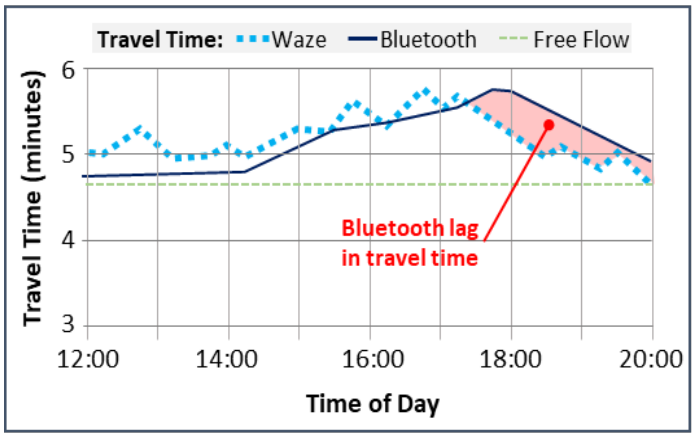

Figure 1. Chart. Bluetooth® and Waze® travel time comparison for a road segment in Lake County Division of Transportation roadways.
(Source: Adapted from LCDOT.[3])

Crowdsourcing for Traveler Information

LCDOT posted free crowdsourced travel times on portable changeable message signs (PCMS) in areas with the greatest travel time variability to assess whether the public viewed this data as accurate. In the past, the public quickly

[1] Lake County. *PASSAGE ITS Brochure*.
[2] Effinger, Justin. "Integration of Crowdsourced Data into Automated Traffic Signal Performance Measures." Adventures in Crowdsourcing Webinar. February 2020.
[3] Ibid.

informed LCDOT of inaccurate traveler information. Over the summer of 2019, the public did not submit a single comment indicating inaccurate travel times. LCDOT now routinely posts the crowdsourced travel times using PCMS.

LCDOT also posts travel times on its website and developed an alerting mechanism that enables citizens to receive email notifications for events occurring in specific county areas. LCDOT plans to enhance this feature to generate email alerts when travel times exceed a specified threshold.

Signal Coordination and Timing (SCAT)

The SCAT process is instrumental to improving corridor operations. The LCDOT SCAT process involves collecting field turning movement, using the Synchro® simulation to conduct traffic signal analyses, implementing and calibrating coordination timings, performing before and after travel time studies, and reporting the benefit/cost estimates from retiming. External consultants would typically conduct this process using one or two days of manual data collection.

In 2019, LCDOT procured a cloud-based automated traffic signal performance measures (ATSPM) system to generate real-time insights on signal performance. The Waze® travel time data, integrated with the ATSPM data, allowed the agency to perform the SCAT process in-house. Over a five-year contract period, LCDOT will offset the ATSPM system's cost by eliminating the need to hire contractors for SCAT studies. LCDOT can now conduct SCAT studies more frequently, yielding benefits for travelers while saving significant time and resources.

Using crowdsourced and ATSPM data, LCDOT can report corridor operational improvements to the Lake County Board, who publishes the developments in their newsletter to demonstrate the value of services delivered to Lake County residents. LCDOT allows other agencies in the region to add their traffic signals to LCDOT's ATSPM contract as a shared service, helping partner agencies save about $140,000 per year compared to purchasing a separate stand-alone system.

Signal Responsive Incident Management

While ATSPM data is helpful, its typical 20+ minute reporting lag makes Waze® data critical in detecting and formulating a response to fast-evolving incidents. For example, when a crash closed a major commute route in December 2019, LCDOT changed southbound signal timing just north of the incident minutes after the crash. The agency then continued to make southbound signal timing changes based on crowdsourced travel time data to improve southbound detour travel. Figure 2 illustrates the effectiveness of signal timing changes for southbound travel. In contrast, law enforcement directed detours for northbound traffic resulted in far greater travel times.

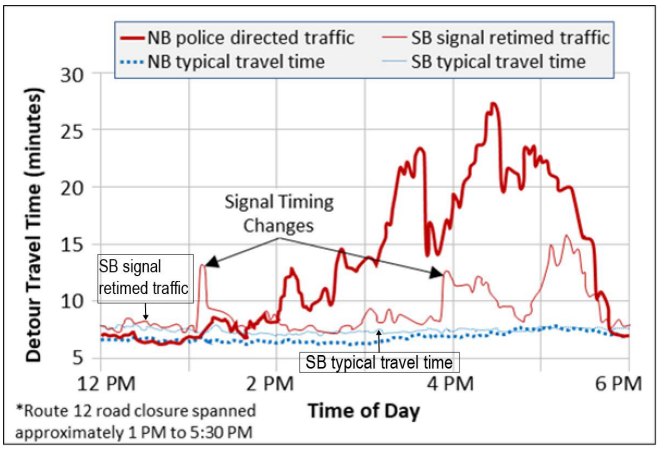

Figure 2. Chart. Crowdsourced data informs signal changes to improve detour travel times when a crash closes a route. (Source: Adapted from LCDOT.[4])

Expanding Crowdsourced Data Uses

Lake County refines its project prioritization methodology annually to include new data. The County introduced crowdsourced travel time data in 2020 to assist with project prioritization for the County's five-year program. The agency also is developing a PASSAGE system feature that will propose alternate signal coordination plans to TMC operators when corridor travel times increase due to adverse weather conditions. LCDOT continues to innovate and expand their use of free crowdsourced data to serve their citizens.

[4] Ibid.

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