Estimated Benefits of Crowd-Sourced Data from Social Media

ITS-Alaska Meeting
September 30, 2014
Project Team and Purpose

The Team

Purpose

- Develop a synthesis of how crowdsourced data from social media (i.e., content generated through end-user applications like Waze, Facebook, Twitter) are applied at TMCs
- Determine measures of effectiveness that express the value for applying crowdsourced data
What is Crowdsourcing

- Crowdsourcing refers to the practice of obtaining services or content by soliciting contributions from a large group of people.

- **Active Crowdsourcing**
  - People who are recruited or volunteer to contribute services or content
  - Example:
    - Waze – Drivers provide reports on incidents, police location
    - FixMyStreet – Citizens can report local issues (potholes, graffiti, etc)

- **Passive Crowdsourcing**
  - Data is acquired by analyzing the behavior of individuals (opt-in)
  - Reading and processing data from sensors
  - Examples:
    - Steetbump.org – collects data on pavement condition by reading sensor data from mobile devices
    - Inrix – Using vehicles as probes to collect location and speed data
Social Media

- Social Media use in state agencies continues to grow.
- Alaska DOT&PF uses social media to disseminate traveler information.
- Can agencies mine data from social media to generate useful information to help operations?
## Crowdsourcing, Social Media, and Traffic Operations

<table>
<thead>
<tr>
<th>TMC Operation</th>
<th>Traditional Data Source</th>
<th>Crowdsourced Data</th>
<th>Opportunity and Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incident Management</strong></td>
<td>▪ ITS field devices</td>
<td>▪ Probe data</td>
<td>▪ Faster detection, dispatch, and response</td>
</tr>
<tr>
<td></td>
<td>▪ Service patrols</td>
<td>▪ Mined social media</td>
<td>▪ Identification of extent of congestion impacts</td>
</tr>
<tr>
<td></td>
<td>▪ First responders</td>
<td>▪ Social media apps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 911 calls</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Freeway Management</strong></td>
<td>▪ Sensors</td>
<td>▪ Probe data</td>
<td>▪ Increase reliability</td>
</tr>
<tr>
<td></td>
<td>▪ Video</td>
<td>▪ Passive social media apps</td>
<td>▪ More accurate data</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Expanded coverage beyond agency device deployment</td>
</tr>
<tr>
<td><strong>Road Condition Reporting</strong></td>
<td>▪ Weather sensors</td>
<td>▪ Dedicated apps</td>
<td>▪ More accurate, comprehensive and economical traveler information</td>
</tr>
<tr>
<td></td>
<td>▪ Service patrols</td>
<td>▪ Active social media apps</td>
<td>▪ More accurate road and pavement condition information to inform response priorities</td>
</tr>
<tr>
<td></td>
<td>▪ Public safety/law enforcement</td>
<td>▪ Passive social media apps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Highway maintenance crews</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Citizen reporting</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Road Maintenance</strong></td>
<td>▪ Service patrols</td>
<td>▪ Dedicated apps</td>
<td>▪ Lower cost</td>
</tr>
<tr>
<td></td>
<td>▪ Phone calls</td>
<td>▪ Active social media apps</td>
<td>▪ Greater coverage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Passive social media apps</td>
<td>▪ More accurate location information</td>
</tr>
</tbody>
</table>
The Contractor shall support the ITS program by developing a synthesis of how crowdsourced data from social media are applied at Transportation Management Centers.

The Contractor shall determine measures of effectiveness that express the value for applying crowdsourced data.
Incorporating Crowdsourced Data into TMC Operations

- Citizen Calls
- ITS Field Devices
- Third-Party Data
- Data from Partners
- Service Patrols
- Crowdsourced Data

TMC Operations
- Manual Data Entry
- Data Integration
- ATMS/TIS Platform

- Traveler Information
- Incident Management
- Freeway Traffic Management
- Arterial Management
- Road Weather Management
- Planned Events
State of the Practice at TMCs

- **Experimentation with existing infrastructure to collect traveler information**
  - Leveraging 511 phone system and websites

- **Large involvement of third party data collection**
  - INRIX, HERE, BlueTOAD, WAZE, 911 CAD
  - Interest in Bluetooth technology for greater accuracy and volume

- **Strong use of social media for disseminating travel information**
  - Twitter, Facebook
  - Monitored by Communications staff

- **Data Collection Efforts**
  - Smartphone app (Utah)
  - Voice phone (Wyoming)
  - Integrating Waze Data (Florida)
  - Primarily road and weather conditions
Survey Results

<table>
<thead>
<tr>
<th>Service Category</th>
<th>Manual</th>
<th>Self-generated</th>
<th>Shared</th>
<th>Crowdsourced</th>
<th>Acquired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance Management</td>
<td>18</td>
<td>11</td>
<td>7</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Traveler Information</td>
<td>24</td>
<td>24</td>
<td>17</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Road Weather Management</td>
<td>21</td>
<td>16</td>
<td>15</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Managed Lanes</td>
<td>21</td>
<td>16</td>
<td>15</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Arterial Management</td>
<td>7</td>
<td>15</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATM/ICM</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Freeway Operations/Management</td>
<td>18</td>
<td>22</td>
<td>13</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Special Event Management</td>
<td>28</td>
<td>13</td>
<td>18</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Work Zone Management</td>
<td>24</td>
<td>13</td>
<td>12</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Surveillance and Incident Detection</td>
<td>24</td>
<td>24</td>
<td>17</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Emergency Management</td>
<td>25</td>
<td>17</td>
<td>21</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>
Perceived Issues with Existing Data Sources

<table>
<thead>
<tr>
<th>Data Source</th>
<th>No Barriers</th>
<th>Limited Coverage</th>
<th>Poor Quality</th>
<th>Too Costly</th>
<th>Tough Integration</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquired Data</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Shared Data</td>
<td>1</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Self Generated</td>
<td>1</td>
<td>19</td>
<td>5</td>
<td>19</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Manual Data</td>
<td>1</td>
<td>22</td>
<td>5</td>
<td>14</td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>
Perception of Data from Crowdsourcing and Social Media Data

- **Low Cost**: 15 (Most Benefit), 11 (Benefit), 4 (Less Benefit), 0 (Least Benefit)
- **Private Sector Innovation**: 7 (Most Benefit), 8 (More Benefit), 7 (Benefit), 4 (Less Benefit), 1 (Least Benefit)
- **Wider Coverage**: 22 (Most Benefit), 4 (More Benefit), 3 (Benefit), 0 (Less Benefit), 0 (Least Benefit)
- **Fill in Gaps**: 15 (Most Benefit), 11 (More Benefit), 2 (Benefit), 10 (Less Benefit)
- **Help meet mandates (1201)**: 9 (Most Benefit), 8 (More Benefit), 6 (Benefit), 4 (Less Benefit), 1 (Least Benefit)
TMC PFS Workshop

- Meeting took place July 23 & 24, 2014 with 25 participants representing state agencies, private sector, and academia

- Focus
  - Share experiences
  - Review SWOT model
  - Identify Institutional, Operational, and Technical issues
  - Identify Measures of Effectiveness

- Status: Minutes and revised model are out for review
Key Strengths and Weaknesses

### Strengths
- Expand coverage areas and fill in gaps in data
- Reduced latency
- Cost-effective approach compared to traditional sensor/data collection infrastructure
- Reaches younger travellers who do not use “traditional” media/information sources

### Weaknesses
- Difficult to mine social media for real-time operations
- Agency staff may not have skills to fuse and integrate data
- Trustworthiness of citizen reporting; trust levels are still evolving with some data models and technologies
- Data Accuracy
Key Opportunities and Threats

- **Opportunities**
  - Use expand social media presence and strengthen public engagement
  - Bring communications staff to support operations
  - Incentivizing citizens by gamification to increase participation
  - Foster more collaboration between public and private sectors

- **Threats**
  - Distracted Driving/Traveling concerns
  - Innovations driving marketplace; changing business models, new charging models
  - Institutional and operational barriers
  - Potential to damage agency reputation if not responsive due to lack of resources
  - Limited shelf life for CS data from social media (Connected/Autonomous Vehicles)
# Assessing Applicability

<table>
<thead>
<tr>
<th>TSM&amp;O Activity</th>
<th>Criticality</th>
<th>Citizen Reporting</th>
<th>Third-Party Data</th>
<th>Mined Social Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>(Involvement x perception)</td>
<td>Passive - Vehicle Probe Sensors</td>
<td>Specialized Apps</td>
<td>511 Website/IVR Feedback</td>
</tr>
<tr>
<td>Incident/Emergency Management</td>
<td>Highest</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Surveillance and Detection</td>
<td>Highest</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Workzone Management</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Special Event Management</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Freeway Operations</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
Measures of Effectiveness

- Cost Effectiveness/Return on Investment
- Increased Data Quality
- Increased Data Coverage
- Reduced Latency (Data Acquisition and Processing)
- Effect on Agency Reputation
- Level of Engagement with Public
Implementation Considerations

- **Institutional**
  - Training/Outreach
  - Need a Champion/Political Support
  - Funding

- **Operational**
  - ConOps/Planning Document
  - Stakeholders involvement across-boundaries
  - Bring PIO/Communications staff into TMC
  - IT involvement
  - Shift coverage–hours of operations for monitoring social media
  - Marketing Plan

- **Technical**
  - Identify tools/software that make it easier to manage social media
  - Create social media accounts
  - Be adaptable, acknowledge evolving technology
  - Ensure your systems are open and extensible
Conclusion

- Opportunity to leverage crowdsourcing applications and social media to improve TMC Operations
  - Integrate data from third-party sources
  - Deploy specialized apps
  - Get more out of social media

- Benefits
  - New sources of data
  - Greater coverage
  - Improved engagement with Citizens

- Signup for Alaska DOT&PF’s Twitter and Facebook