Evaluation of HeadLight: An E-Construction Inspection Technology

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Outline

- Background
- Objectives
- Scope
- Methodology
- Results
- Conclusions
- Acknowledgements
Background

- Project delivery (Current)
  - Resource intensive
  - Valuable information
  - Heavily paper based

- Project delivery (future)
  - Leverage existing technologies
  - Accumulated project intelligence = asset intelligence
Traditional Workflow

- Material recorded in physical form
- Transcribed into SiteManager / SiteManager Materials
- DWRs generated
- All occurring at the end of the workday after travel back to office
- Delay in data availability
HeadLight Workflow

- Material recorded in HeadLight directly via mobile device
- Observations recorded throughout the day
- Data available nearly instantaneously
- Increase in the types of data captured
- DWRs generated
Why Do the Study?

- Move Louisiana forward in state-of-the-art inspection procedures
- Potential for more timely submission of daily working reports (DWRs)
- Possibly lower the number of claims through more thorough inspection
- All leading to potential savings for the Department
Why Do the Study?

- Reduced risk
- Accelerated delivery
- Increased accountability
- Increased efficiency
Objectives

- Understand impacts on DOTD for leveraging mobile project inspection
  - Time spent on field inspection
  - Quality and quantity of inspection data
  - Timeliness of submission of daily diary documentation
  - Leading indicators for improving claims abatement
  - Asset management

- Added Materials Module in lieu of asset management objectives
Scope

- Pilot HeadLight on 12-18 projects across the state
  - Location
  - Size
  - Complexity
- Up to 200 field inspectors
- Added Materials Module
- Over 50 projects statewide piloted with 180 people
Methodology – Materials

- Identified gaps
  - Material sample tracking
  - Test results
  - Sampling plans
Methodology – Evaluation Metrics and Methods

- **Productivity**
  - Timeliness of DWR submission
  - Perception of efficiency

- **Data quality**
  - Volume
  - Variety
  - Availability
  - Timeliness of inspection data
Results

- 12 projects included per method
  - Traditional
  - HeadLight
- Evaluated per inspector and per project
Equipment
Observations
Documentation
Documentation

- Improper spacing
- Fill hole for fuel tank
- Soft subgrade
- Removal of concrete drive
Results - Productivity

![Bar chart showing productivity comparison between traditional and HeadLight methods.](image-url)
Results - Productivity

- Reduction spent completing DWRs while in the field is significant
  - 450 people
  - 1 hour per day
  - 2,250 hours per 5-day work week
  - ~117,000 hours per year
# Results – Perception of Time Savings

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using HeadLight has allowed me to spend more time in the field compared to my previous inspection process</td>
<td>2.50%</td>
<td>2.50%</td>
<td>30.00%</td>
<td>37.50%</td>
<td>27.50%</td>
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<tr>
<td>Number of Responses from Field Personnel</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Using HeadLight has increased my overall efficiency in inspection and data collection</td>
<td>0.00%</td>
<td>15.38%</td>
<td>17.95%</td>
<td>41.03%</td>
<td>25.64%</td>
</tr>
<tr>
<td>Number of Responses from Field Personnel</td>
<td>0</td>
<td>6</td>
<td>7</td>
<td>16</td>
<td>10</td>
</tr>
</tbody>
</table>
Results – Data Quality
Results – Data Quality (DWRs)
## Results – Observation Types

<table>
<thead>
<tr>
<th>New Observation Types</th>
<th>Total Count of Observations Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date/Time Stamp</td>
<td>81,367</td>
</tr>
<tr>
<td>Location Data</td>
<td>81,367</td>
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<tr>
<td>Image</td>
<td>5,957</td>
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<tr>
<td>Weather</td>
<td>6,734</td>
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<tr>
<td>Video</td>
<td>253</td>
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<tr>
<td>Start/Stop Work</td>
<td>198</td>
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<tr>
<td>Temperature</td>
<td>46</td>
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<tr>
<td>Audio</td>
<td>10</td>
</tr>
<tr>
<td>File</td>
<td>9</td>
</tr>
<tr>
<td>Density Measurement</td>
<td>6</td>
</tr>
</tbody>
</table>
Results – Data Availability (DWR Submission)
Results – Materials Module

- Sample tracking
  - Create, track, and manage within HeadLight
  - Similar to UPS, Amazon, etc. via QR code

- Test results
  - Entered directly into HeadLight
  - Not all forms have been created

- Sample plan
  - Standardized workflow
  - Assigns standards tests per bid line items
Results – Materials Module
Results – Observed Value

- Improved coordination and decision making
- Thorough documentation of deficiencies and corrections
- Standardization of inspection process
- Retained HeadLight data as a training resource
- Centrality, security, and searchability
- Business process impacts
- Technology considerations
Conclusions

- Increased productivity (exceeding 117,000 hours per year)
- Larger and more diverse volume of data collected
- More complete and consistent data
- Improved DWR timeliness (up to 66 and up to 82 percent for 24 hour and 72 hour submission timeframes)
- Increased accessibility and searchability
- Increased communication
- Future training materials
- Future data leveraging with big data analytics
Recommendations

- Adopt HeadLight
  - In-Progress!

- Consider impact on following functions:
  - Management of force account work
  - Contract management
  - Emergency management
  - Construction audit
  - Asset management

- Investigate impact on quantity and size of change orders and claims
Acknowledgements

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- Pavia Systems Team
- Training – Terri Helus (Pavia)
Questions