Safety Pilot Model Deployment

Lessons Learned

Connected Vehicle Public Meeting
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Gathering Lessons Learned

• Purpose of Project
  • To capture the lessons learned from all phases of the Safety Pilot Model Deployment, from planning through closeout
  • To understand how the lessons could be applied in future deployments to assist in broader replication of successful pilot initiatives

• Process for Assessing Lessons Learned
  • Reviewed project documentation and background materials
  • Conducted extensive interviews with over 30 people, inventoried all captured observations
  • Identified and summarized critical lessons learned from observations
Program Management Processes

• Schedule and Risk Management
• Coordination and Communication
• Project Deliverables and Documentation
• Outreach Planning
Schedule and Risk Management

A constrained schedule requires focus on core mission and strong risk management.

What we did…

• Used a modular program structure, separated implementation of critical components from non-critical components
  • Waited to deploy ASDs, Trucks, Transit until after launch
• Developed decision gates between pre-model deployment and model deployment and after critical tests
• Compiled a comprehensive list of all potential project risks, narrowed to identify critical risks that could pose a severe impact to the program
  • Example: acceleration of device installs
  • Example: collection of data
  • Example: crashes of light vehicles by participants
Communication and Coordination

A comprehensive coordination management plan that involves all project partners encourages extensive communication and project transparency.

What we did…

• Conducted weekly internal face-to-face meetings with USDOT staff

• Held weekly conference calls with project partners to discuss specific topic areas (data, security, program management)

• Supported real-time, on-the-spot decisions in a constrained schedule environment using face-to-face working meetings with all project partners

  • Example: antenna installation locations for various vehicle types
Project Deliverables and Documentation

Prioritize development of critical documentation.

What we did…
• Heavily front-loaded contract deliverables
  • Example: ASD and VAD installation documents – devices not available to prototype install
• Resulted in multiple revisions to the planning documents

For Future Projects:
• Recognize as a research environment, not a production environment
  • Determine which documents are critical
• Keep a document repository, implement standards for version control
  • Update documentation after work is completed for future reference
Outreach Planning

Ensure there is a balance between outreach to industry, local media, and national media.

What we did...

• Initiated launch with a successful high-profile media event
• Stood up a technology showcase environment
• Hosted meetings for various national and international groups
• Attended conferences and promoted Safety Pilot at various events
• Provided demonstrations in a naturalistic environment

For Future Projects:

• Understand what incentives interest industry, academic, and other research organizations to experience the environment
• To maintain momentum, include additional scheduled events
Site Selection

- Site Criteria
- Driver Recruitment
- Infrastructure Support
Site Criteria

Selecting a single, “ideal” Model Deployment site is challenging; be prepared to make trade-offs.

What we did…

• Selected site based on critical elements to support project objectives:
  • Program management
  • Data collection
  • Experimental design

• Allowed for collection of data necessary to support analysis

For Future Projects:

• Expect very different experimental designs, be prepared to evaluate trade-offs

• As supplementary project components are considered, ensure that they fit existing criteria and don’t detract from critical items
Driver Recruitment

Understanding what motivates people to participate is key to a successful recruitment strategy.

What we did…
• For light vehicles needed to recruit 3,000 participants
• Initially offered $100, did not meet recruitment goal
• Increased to $200, allowed donation of compensation to schools, over 4,000 people signed up

For Future Projects:
• Individual monetary compensation alone may not be sufficient to attract participants
• Utilize other forms of incentives (emotional, community, etc) to attract participants, may vary by location
Infrastructure Support

Infrastructure support at the pilot site requires a strong local partner that is flexible and can adapt in a changing research environment.

What we did…

• Supported challenging installation of RSEs
• Incorporated research applications in place of existing traffic control applications
• Supported latest revision of internet protocol (IPv6) for communications from RSEs to back office

For Future Projects:

• Select a site where infrastructure partner will prioritize the research activities
Device Management and Testing

• Device Testing
• Replicating Field Issues
• Device Management Systems
Device Testing

In a research environment, need to balance maturity of devices against the project schedule.

What we did…

• Conducted multiple rounds of Vehicle Awareness Device Certification testing and device refreshes
• Conducted multiple rounds of device interoperability testing
• Device refreshes were required after deployment for a large quantity of devices

For Future Projects:

• Provide additional time for end-to-end system testing and refresh processes
• Conduct system testing early in the project with a small number of devices
Replicating Field Issues

Replicating device issues observed in the field in a laboratory environment is a challenge.

What we did…

• Encountered untested use cases in field – difficult to bench test all scenarios that devices may experience

• Data sharing for issue replication was challenging, raw BSM includes PII
  • Resulted in device suppliers trying to recreate issues observed in field in a bench environment

For Future Projects:

• Implement process to scrub PII from raw data to provide as much naturalistic data as possible to device suppliers
Device Management Systems

Comprehensive property and configuration management systems are critical to support detailed analysis of safety applications.

What we did…

• Encountered challenges tracking configurations for devices deployed in the field
  • Example: Initial batch of VADs had different configuration parameters
  • Example: PMD devices were randomizing unique ID

• Additional software tools was developed to allow the data from these systems to be incorporated in the analysis

For Future Projects:

• Provide relational databases that allows ability to construct a timeline for each device – critical for data analysis and tracking devices
Data Collection and Evaluation

- Data Collection and Processing
- Real-Time Monitoring
Data Collection and Processing

Verify the data requirements and processes prior to the start of data collection.

What we did…

• Some data requirements needed more detailed descriptions of intended use of the data, led to some misunderstanding of data needs
  • Example: Forward ranging radar

• End-to-end walkthrough of data collection and analysis processes were shortened in pre-model deployment

For Future Projects:

• Data requirements should include objectives for use of the data
• Specify performance requirements for data collection system, including data types and formats
• Request fully formatted data output samples 6 months prior to launch of field test
• Conduct a data collection pilot, including an end-to-end walkthrough of processes - test and validate end-to-end data acquisition, collection, and use
Real-Time Monitoring

Monitoring data in real-time allows for rapid risk response.

What we did...

• Utilized a traffic simulation model to forecast interactions under various recruitment scenarios

• Developed performance metrics and reports to track data collection of actual vs predicted interactions in real-time

• Executed risk response plans when interactions were not being met to ensure adequate amounts of data were collected to support analysis
  • Example: Hired VAD drivers
  • Example: Hired truck drivers
Decommissioning and Closeout

Develop plans in advance for site decommissioning.

What we did…

• Identified ownership of devices and vehicles among the project partners
• For USDOT owned equipment, developed plans for decommissioning
• Developed plans for conducting additional research

For Future Projects:

• Identify decommissioning strategy in the procurement phase of the project
• Develop criteria and plans for successful and unsuccessful project outcomes
  • Example: Successful outcomes leads to follow-on research and opportunities
  • Example: Unsuccessful outcomes - early termination
Questions

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