

## **Appendix D:**

### ***Sub-task 1.1 – P240S Stakeholder Needs, prepared by Professors David S. Kim and J. David Porter, Oregon State University, College of Engineering***

#### **Technology Development and System Integration for a Vehicle Miles Traveled Based Revenue Collection System Prototype**

##### **Customer Objectives/Needs**

In this project, prototype electronic revenue collection systems will be developed to address the following primary objectives/needs (●), and secondary objectives/needs (○) of the customers. Because the project is not the development of a consumer product, and also because the project seeks *knowledge* as a product, both project objectives and specific needs for system components are listed. The listing of customer objectives/needs<sup>1</sup> follows the structure presented in Ulrich and Eppinger [1995].

##### **Project Objectives**

- Demonstrate the feasibility of an electronic VMT-based revenue collection system.
  - Develop knowledge about the effectiveness of various alternative system concepts for an electronic VMT-based revenue collection system.
    - Hybrid (centralized – decentralized) vs. decentralized
  - Develop knowledge about the effectiveness of various alternative on-vehicle VMT collection devices that can be used as part of an electronic VMT-based revenue collection system.
    - One-way GPS/AVI
    - Two-way Odometer/AVI
  - Develop knowledge about the effectiveness of various alternative system concepts, and on-vehicle VMT collection devices that can be used as part of an electronic VMT-based revenue collection system with area pricing capabilities.
    - Hybrid one-way GPS/AVI
    - Decentralized two-way Odometer/AVI
  - Develop functional requirements for the alternative system concepts, which explain how the system components work as an integrated system.
    - Hybrid one-way GPS/AVI
    - Decentralized two-way Odometer/AVI
  - Develop technical specifications for the technologies used in the alternative system concepts, which can be used to purchase system components.
    - GPS/AVI (including the RF readers)
    - Odometer/AVI (including the RF readers)

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<sup>1</sup> Customer needs are also referred to as customer requirements.

- Database management system (DBMS)
- Fuel dispenser
- Point-of-sale system
- Develop knowledge about the tasks required for installing, configuring, and maintaining an electronic VMT-based revenue collection system.
- Conduct testing and evaluation to assess system performance.
  - Reliability,
  - Interoperability,
  - Durability / Tamper Resistance,
  - Security/Evasion potential,
  - Privacy,
  - Ease of enforcement/Auditable,
  - Accuracy (VMT collection within zones),
  - Ease of Use (from HB3946).
- Knowledge to enable possible merger of the two device configurations
- Develop knowledge about System costs:
  - For Pilot Testing
  - For eventual statewide adoption

### **Customer Needs for the System**

- The system developed will simulate a real implementation of an electronic VMT-based revenue collection system.
  - Develop working prototype systems that can be used for testing and demonstrations (includes all components of a system such as the RF readers, DBMS, etc.).
  - Use actual vehicles in the prototype system.
  - Use an actual fuel dispenser and point-of-sale system software as part of the system prototypes.
  - Simulate conditions encountered in a retail service station where fuel is purchased.
- The systems developed must not “track” drivers to a greater extent than existing payment systems (e.g., credit cards) permit.
  - Data transfer is short range.
  - Only minimal data is transferred.
  - Location data is only used to calculate VMT and then erased from memory.
  - Location data is never transmitted.
  - Location cannot be derived from the data transmitted.
- The systems developed do not require any additional actions on the part of drivers relative to what occurs today.
  - On-vehicle device operation is automatic.
  - Data transfer/fee calculation is automatic.
  - Data transfer is wireless.

- Fee collection occurs as part of fuel purchases.
- On-vehicle devices obtain power from the vehicle and do not need re-charging or battery changes.
- On-vehicle devices are reliable and durable.
- VMT collection within predefined geographic zones is accurate.
  - VMT collection operates accurately in Oregon weather, terrain, and urban conditions.
  - VMT data is accurate regardless of the predefined geographic zone and/or time of day it is collected in.
- On-vehicle devices can be installed in secure “out of sight” locations on vehicles.
  - The on-vehicle devices must be rugged enough to tolerate dirt, water, large temperature changes, harsh vibrations and shocks associated with vehicle engine compartments.
  - The on-vehicle devices must be relatively small and light to allow many possible mounting locations.
  - Data transfer must be possible through a vehicle's body.
- On-vehicle devices are easily accessible for replacement or maintenance purposes.
- The system and its components are secure and tamper resistant.
  - Enforcement is low cost and reliable.
  - The on-vehicle device is not visible to drivers.
  - The on-vehicle device is tamper resistant.
- The system indicates to the user the amount spent for fuel and the amount of VMT fee paid.
  - A receipt indicates the amounts paid for fuel and VMT fee.
  - The system shall be able to handle credit/debit card, cash and check transactions.
- The system can be phased in over time and accommodate out of state drivers.
  - The per gallon gas tax is maintained for vehicles not appropriately equipped (in-state and out-of-state vehicles).
  - The fuel tax is a credit that is subtracted from the VMT fee.
- Documented functional and technical specifications for the systems and system components.

#### **References**

Ulrich, K.T. and S.D. Eppinger, (1995), Product Design and Development, McGraw-Hill Inc.