COMPLETE TRIP

ITS 4 US

Task 1.B Training:
User Needs Identification and Requirements Planning
March 2, 2021
Deborah Curtis
Highway Research Engineer
Office of Operations Research and Development
Agenda

- Brief Program Overview

- User Needs Identification & Requirements Planning
  - Deliverable Overview
  - User Needs Identification
  - Requirements Planning
  - Configuration Management

- Resources
  - Useful References
  - Stay Connected
Program Overview
Complete Trip - ITS4US Deployment Program

- A USDOT Multimodal Deployment effort, led by ITS JPO and supported by OST, FHWA and FTA
- Supports multiple large-scale replicable deployments to address the challenges of planning and executing all segments of a complete trip

**Vision**

Innovative and integrated complete trip deployments to support seamless travel for all users across all modes, regardless of location, income, or disability

Source: USDOT
Program Goals

- Spur high-impact integrated Complete Trip deployments nationwide
- Identify needs and challenges by populations
- Develop and deploy mobility solutions that meet user needs
- Measure impact of integrated deployments
- Identify replicable solutions and disseminate lessons learned
Complete Trip Phase 1 Awardees

- University of Washington
  OR, WA, MD
- California Association of Coordinated Transportation
  CA, OR, and WA
- Heart of Iowa Regional Transit Agency
  Dallas County, IA
- ICF
  Buffalo, NY
- Atlanta Regional Commission
  Gwinnett County, GA
Deployment Phases

**PHASE 1: Concept Development**
- Concept Development for Complete Trip Deployment
- Establish Cohort Roundtables

**PHASE 2: Design & Test**
- Design, Test and Deploy Complete Trip Solutions
- Evaluation Framework and Planning

**PHASE 3: Operate & Evaluate**
- Demonstrate Multiple Large-Scale Deployments
- Evaluate Deployments
- Share Data & Lessons Learned

**Operations Maintenance**
- Sustain operations for a minimum period of five years after the program is completed with no supplementary federal funds

**Deployment**
- Up to 12 months
- Up to 24 months
- Minimum of 18 months

**Post-Deployment**
- 5 years
User Needs Identification and Requirements Planning (UNIRP)
User Needs Identification and Requirements Planning (UNIRP) Document

Defines the processes that will be used to generate, coordinate, approve, and support the configuration control of user needs and system requirements. Forms the foundation of the Systems Engineering Management Plan (SEMP) that will be delivered later in Task 12.

**Deliverables**

1. Draft UNIRP Document – Kick-Off + 4 weeks (March 22\textsuperscript{nd})
2. Final UNIRP Document – Kick-Off + 7 weeks (April 12\textsuperscript{th})
## UNIRP Major Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Needs Identification</td>
<td>Process of how team will identify user needs.</td>
</tr>
<tr>
<td>Requirements Planning</td>
<td>Process of how team will identify system requirements.</td>
</tr>
<tr>
<td>Configuration Management</td>
<td>Process of how team will maintain configuration management.</td>
</tr>
</tbody>
</table>

Task 1B
# UNIRP Schedule

<table>
<thead>
<tr>
<th>Task 1A</th>
<th>Project Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1B</td>
<td>User Needs</td>
</tr>
<tr>
<td>Task 2</td>
<td>Concept of Operations</td>
</tr>
<tr>
<td>Task 3</td>
<td><strong>Data Management Plan</strong></td>
</tr>
<tr>
<td>Task 4</td>
<td>Safety Plan</td>
</tr>
<tr>
<td>Task 5</td>
<td>Performance Measurement</td>
</tr>
<tr>
<td>Task 6</td>
<td>System Requirements</td>
</tr>
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<td>Task 7</td>
<td>Tech Readiness</td>
</tr>
<tr>
<td>Task 8</td>
<td>Human Use Approval</td>
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<tr>
<td>Task 9</td>
<td>Training Plan</td>
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<tr>
<td>Task 10</td>
<td>Partnership</td>
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<tr>
<td>Task 11</td>
<td>Outreach Plan</td>
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<tr>
<td>Task 13</td>
<td>SEMP</td>
</tr>
<tr>
<td>Task 14</td>
<td>Ready Brief</td>
</tr>
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</table>

**Complete Trip**: ITS4US

**U.S. Department of Transportation**

**ITS Joint Program Office**
UNIRP Interdependencies

Inputs
- Data Needs
  - Task 2: ConOps
- Context Diagram
  - Task 2: ConOps

Data Management Plan
- Data Summary
- PII Information
- Systems
- Security
- Context Diagram
- Standards
- Metadata
- Data License

Outputs
- Data Definitions
  - Task 4: Safety Mgmt
  - Task 6: SyRS
  - Task 9: Training Plan
  - Task 13: ICTD Plan
  - Task 14: Dep. Briefing
User Needs Identification
Process for Identifying User Needs

Describe the **process** of how sites will identify user needs.

Creating the user needs will come at a later stage.

---

A Refresher: **What are user needs?**

User needs are statements that describe a user's desired action and what is required to make that action possible.
Introduction to User Needs

- Well written user needs use the following criteria:
  - **Uniquely Identifiable**: Each need must be uniquely identified (i.e., each need shall be assigned a unique number and title).
  - **Major Desired Capability (MDC)**: Each need shall express a major desired capability in the system, regardless of whether the capability exists in the current system or situation or is a gap.
  - **Solution Free**: Each need shall be solution free, thus giving designers flexibility and latitude to produce the best feasible solution.
  - **Capture Rationale**: Each need shall capture the rationale or intent as to why the capability is needed in the system.
2.6.2.1 Transferring from subway platform to shared use service boarding location transit users need to navigate from the subway platform to the shared services hailing location. A solution that helps the user navigate from the location where they disembark the subway train to the location where they can access a shared use service, will allow the user to change modes and continue their trip.
### Planning for Identifying User Needs

<table>
<thead>
<tr>
<th>METHOD</th>
<th>PROCESS DESCRIPTION</th>
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<tbody>
<tr>
<td>Previously Identified User Needs</td>
<td>Describe plans for validating user needs identified during the development of the ITS4US proposal.</td>
</tr>
<tr>
<td>Stakeholder Engagements</td>
<td>Discuss plans for engaging stakeholders to identify their unique user needs. Such as workshops, surveys or one-on-one stakeholder interviews.</td>
</tr>
<tr>
<td>Use Case Decomposition</td>
<td>Document how the project team plans to develop use cases for specific system functions or applications and how those can be deconstructed into user needs.</td>
</tr>
</tbody>
</table>

- Needs and use cases are closely related.
- Use cases are typically used to derive and validate user needs.
- Use cases and user needs development is an iterative process to help identify holes and gaps in the user needs until the system owner is satisfied.
Concept of Operations Development

- Provide a high-level overview of key ConOps dates and activities
  
  - User needs will be documented in ConOps which will be completed in Task 2

<table>
<thead>
<tr>
<th>ID</th>
<th>BAA Section</th>
<th>Task 2: Concept of Operations (ConOps)</th>
<th>Due Date</th>
<th>Format</th>
<th>Site Specific Date</th>
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<tr>
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<tr>
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</tbody>
</table>

*508 Compliant Deliverables
ConOps Walkthrough

- Describe the plans for the ConOps walkthrough
  - IEEE Standard 1028-2008
  - Walkthrough Plan
    - Number of days
    - Who will participate
    - Where it will be held
    - Approximate timeframe
  - Walkthrough Workbook
    - Format can be Word, PowerPoint (any format that can be edited during walkthrough)
Agile Development Considerations

- If planning to use Agile development during Phase 2, describe plans and backlog for your Agile software development process.

- Use Needs and Use Cases provide the bases for user stories used in the Agile development.

- Document and maintain configuration control of user stories in Phase 2.
Requirements Planning
Process for Identifying System Requirements

Describe the process of how sites will identify system requirements.

Creating the system requirements will come at a later stage.

A Refresher: What are system requirements?
System requirements are statements that describe the necessary functions of a system to make the realization of user needs possible.
Introduction to System Requirements

Criteria for well-formed system requirements:

- Necessary
- Concise
- Implementation-free
- Attainable
- Complete
- Consistent
- Traceable
- Unambiguous
- Verifiable
- Allocate-able
- Style-compliant
Building a System Requirement

- Requirements have a simple grammar:
  - Actor [The System]
  - Action [shall do/not do something to]
  - Target [the object of the action]
  - Constraint [how, how often, how many, how fast]
  - Localization [if, when, where]
  
  • Note: Not all requirements will have both localization and constraint portions.

Example:

The System shall generate event reports containing the following information on a scheduled interval.
Requirement Decomposition

- Categories of requirements that are common across many systems:
  - **Functional**: requirements that specify what functions the system must perform
  - **Physical**: requirements that specify the physical characteristics of a system/subsystem/component
  - **Performance**: requirements that specify how the system has to perform
  - **Security**: define what level of security would be necessary for specific parts of the system/subsystem/component
  - **Interface**: define any constraints on how the system/subsystem/component must communicate with other another system/subsystem/component
System Requirements Traceability

- Traceability between user needs and system requirements is critical to ensuring the fully developed system will meet its’ goals and objectives.

- Template of a Needs-to-Requirements Traceability Matrix (NRTM):

<table>
<thead>
<tr>
<th>User Need ID</th>
<th>User Need</th>
<th>Req ID</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
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<td>X.X.X.X</td>
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<tr>
<td>X.X.X.X.X</td>
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<td>X.X.X.X</td>
<td>&lt;Requirement 2&gt;</td>
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</table>
Planning for Requirements Development

- Provide a high-level overview of key Requirements dates and activities.
  - Actual development of requirements will be completed in Task 6.

<table>
<thead>
<tr>
<th>ID</th>
<th>BAA Section</th>
<th>Task 6: Deployment System Requirements (SyRS)</th>
<th>Due Date</th>
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<th>Site Specific Date</th>
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    - Format can be Word, PowerPoint (any format that can be edited during walkthrough)
Configuration Management
Process for Configuration Management

Describe the process of how sites will maintain configuration management.

Configuration Management will come at a later stage.

A Refresher: What is configuration management?
Configuration management is the process by which your team is going to manage change control.
Configuration Management Process

- **Initial User Needs and Requirements Development**
  - It is critical that this section describe how the user needs and requirements will be baselined. This could be when USDOT accepts the Final ConOps and Final SyRS.

- **Baselined User Needs and Requirements**
  - Will the project have a Configuration Control Board (CCB) that must approve all changes?
  - Will the CCB require a change package to vote on proposed changes?
  - What analysis is required in those change packages?
Source of User Needs and Requirements

- The **Authoritative source** is the source that other documents will be building against.
  - Typically the **ConOps** and **SyRS**,
  - Alternatively, could be a requirements management tool.

- If the ConOps and SyRS are the authoritative source, then state:
  - How often those documents will be updated.
  - Where the authoritative version of those documents can be found.
Resources
UNIRP Key References

IEEE Resources:


FHWA SE Resources:

- Systems Engineering for Intelligent Transportation Systems - provides an introduction to systems engineering and leads the reader step by step through the project life cycle and describes the systems engineering approach at each step.
- Systems Engineering Guidebook for Intelligent Transportation Systems - provides a more in-depth reference for ITS practitioners applying systems engineering to plan, implement, manage, and operate ITS.
- Applying Scrum Methods to ITS Projects – provides information for those interested in learning about Scrum Methods, one of the Agile Methodologies, and how to incorporate Scrum into ITS project development. Also includes links to Agile resources.
Stay Connected

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Visit the Complete Trip - ITS4US Deployment Program Website and FAQs:
https://its.dot.gov/its4us/
https://www.its.dot.gov/its4us/its4us_faq.htm
Any questions?