ITS4US UNIRP Training Session Transcript (03-02-21)

Deb Curtis

Welcome to the ITS4US Complete Trip Training for the user needs identification and requirements planning.

Deb Curtis

Next slide please.

Deb Curtis

My name is Deborah Curtis. I am a highway research engineer in the Office of Operations Research and Development for the last 30 year, and I will be your systems engineering federal lead for the ITS4US phase one effort. Next slide, please.

Deb Curtis

So, this is an agenda of our training session today. I have a few slides on the ITS4US Program and then we will jump right into the task 1B. User needs identification and requirements.

Deb Curtis

Next slide, please.

Deb Curtis

So, let us take a few minutes to review the program.

Deb Curtis

Although most of you are already familiar with it.

Deb Curtis

Next slide, please.

Deb Curtis

So, this is a high-level summary of the complete trip ITS4US program.

Deb Curtis

As you can see there are multiple partners involved with this initiative with the goal of deploying innovative and integrated trips to support mobility for all users with a particular focus on underserved communities.

Deb Curtis

So, as you can see here, this involves the lead ITS Joint Program Office from the US Department of Transportation, but also involves the Federal Highway Administration and the Federal Transit

Administration. We are looking to make these large-scale deployments that are replicable and address the challenges of planning.

Deb Curtis

And executing all segments of the complete trip.

Deb Curtis

We would like to target all users across all modes regardless of location, income, or disability.

Deb Curtis

Next slide, please.

Deb Curtis

So, we have 5 program goals.

Deb Curtis

And these program goals are spur high impact, integrated complete trip deployments nationwide, this first goal is to assist the transportation industry in tackling the difficult challenge of providing complete trips for all travelers nationwide by streamlining and expediting solution development.

Deb Curtis

Through pilot deployment.

Deb Curtis

Yes.

Deb Curtis

High impact, replicable integrated solutions developed by these pilot deployments.

Deb Curtis

Will reduce the cost of future deployments of these critical personal mobility enhancements.

Deb Curtis

The second goal is to identify needs and challenges by populations.

Deb Curtis

The needs and of the communities to support mobile mobility options for all travelers, regardless of location, income, or disability are important populations within each community have different needs and challenges for accessing transportation options to improve their quality of life.

Deb Curtis

The third goal is to develop and deploy mobility solutions that meet user needs.

Deb Curtis

This will allow us to take revolutionary steps to integrate advanced technologies, especially those that enable adaptive and assistive transportation technologies into the management and operations of the transportation network, including non-motorized modes.

Deb Curtis

Here we are.

Deb Curtis

Our goal is to engage key partners within the federal government.

Deb Curtis

The research community, stakeholder organizations, and private industry to support development of potential solutions for all travelers.

Deb Curtis

The fourth goal is to quantify and evaluate the impact of the integration of these advanced technologies strategies and applications.

Deb Curtis

The improvement of safety and mobility of all travelers, quantified impact support, communication of technology benefits to future deployers.

Deb Curtis

And decision makers.

Deb Curtis

And finally, the fifth goal is to determine which technologies, strategies, applications and institutional partnerships demonstrate the most potential to address identified barriers to providing complete trips to all travelers in a variety of communities and build environments.

Deb Curtis

This we also.

Deb Curtis

The goal is to disseminate the lessons learned from replicable solutions developed by the deployment sites to catalyze additional deployment.

Deb Curtis

The systems engineering process that we are going to talk about is critical to all of these goals.

Deb Curtis

Next slide, please.

Deb Curtis

The US Department of Transportation has awarded five teams with Phase One funding to support the development of their deployment concepts. These five deployment sites include the University of Washington, California Association of Coordinated Transportation, Heart of Iowa Regional Agency.

Deb Curtis

ICF International in Buffalo, NY, and the Atlanta Regional Commission. Next slide please.

Deb Curtis

There are three deployment phases, and one post deployment phase.

Deb Curtis

Participants are currently in the first phase concept development where they will develop their ideas to ensure future success in later phases.

Deb Curtis

They will test and evaluate their projects.

Deb Curtis

The deployments are expected to sustain operation for at least five years after the program is completed.

Deb Curtis

Next slide, please.

Deb Curtis

And with that quick overview, let us get started with the user needs identification, and requirements planning, or UNIRP document development.

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Next slide, please.

Deb Curtis

The key items to note are that the UNIRP covers processes that will be used to generate, coordinate, approve, and support configuration of user needs and system requirements.

Deb Curtis

The emphasis here is on the process.

Deb Curtis

The information provided in the final UNIRP forms the foundation for the task.

Deb Curtis

12 systems engineering management plan.

Deb Curtis

The UNIRP task has two deliverables. The draft UNIRP that is do four weeks after award on March 22nd and the final UNIRP that addresses all the USDOT comments that is 2 seven weeks after kickoff and is due on.

Deb Curtis

April the 12th.

Deb Curtis

As a reminder, for all documents being published, the final version must be 508 compliant. Next slide, please.

Deb Curtis

There are three major components in the UNIRP document.

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Each is about describing the process or the approach.

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So, for the first, you will describe your process for identifying user name.

Deb Curtis

It is.

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For the second, you will describe your process for identifying system requirements to include decomposing user needs into system requirements and traceability between the user needs and requirements throughout the development.

Deb Curtis

Deployments Development III will describe your process for how the team will maintain configuration management of user needs and requirements.

Deb Curtis

You are not identifying user needs here, only stating how you will do it.

Deb Curtis

The same with the system requirements and the configuration management.

Deb Curtis

Next slide please.

Deb Curtis

Here is the schedule for all the tasks and their deliverables within the user needs identification and requirements planning highlighted after the PM P This is the next deliverable that teams should begin working on.

Deb Curtis

Next slide, please.

Deb Curtis

This diagram shows how the UNIRP relates to other key deliverables within the project for inputs to the UNIRP, we have the planning processes for identifying user needs and system requirements and practices that will be used throughout the development for change managed.

Deb Curtis

Yeah.

Deb Curtis

We also have processes that need to account for criteria for well written user needs and well-formed requirements on the output side, we have the systems engineering processes that will be practiced in the development of the three key systems engineering deliverables.

Deb Curtis

The concept of operations.

Deb Curtis

The system requirements and the systems Engineering management plan.

Deb Curtis

Next slide, please.

Deb Curtis

The first name component.

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At the UNIRP is the user needs identification.

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Next slide please.

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The point I want to emphasize is that this document is a planning document to describe the process for identifying the user needs.

Deb Curtis

Not to develop the user needs themselves.

Deb Curtis

We are not developing user needs at this point we will do that as we do the ConOps in task 2.

Deb Curtis

So as a quick refresher, what are user needs user needs are statements that describe the users desired action and what is required to make that action possible.

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Next slide please.

Deb Curtis

User needs provide the foundation of all the subsequent systems engineering process.

Deb Curtis

This is system requirements and design elements that will all ultimately trace to one or more user needs.

Deb Curtis

Identifying and developing sound user needs is critical to the success of the overall program.

Deb Curtis

The key question to ask yourself is what is the problem I am trying to solve?

Deb Curtis

A well written using it has four criteria.

Deb Curtis

The first is unique identification.

Deb Curtis

Each user need should be uniquely identifiable so that it can be referred back to when we develop system requirements and that provides us with a unique identifier for traceability.

Deb Curtis

Hey.

Deb Curtis

The next is a major desired capability.

Deb Curtis

Regardless of whether the capability exists in the current system or is the situation gap, it needs to be identified.

Deb Curtis

3rd and very critically, a well written user need is solution.

Deb Curtis

Free now is not the time for us to decide what the solution is or how we are going to address the user need, but to allow the designers flexibility and latitude to produce the best feasible solution.

Deb Curtis

And Lastly, a well written user need captures the rationale.

Deb Curtis

We still need to document the intent.

Deb Curtis

Or why the?

Deb Curtis

Capability is needed in the current system.

Deb Curtis

Next slide, please.

Deb Curtis

So, with an example of a.

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Well written user. Need we see a unique numerical identifier. 2.6 point 2.1 that allows us to ensure that we are pointing to this exact and precise user need when we develop our system requirements. We also have.

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A descriptor that is uniquely identified that is transferring from subway platform to shared use service boarding location.

Deb Curtis

And then we go into the major desired capability.

Deb Curtis

Why do we?

Deb Curtis

What is it that we want to be able to do here and that is transit users need to navigate from the subway platform to the shared service hailing location?

Deb Curtis

That is, the capability that the users need from this particular example.

Deb Curtis

3rd, we capture the rationale, a solution that helps the user navigate from the location where they disembark the subway train to the location where they can access the shared use service will allow the user to change modes and continue their trip.

Deb Curtis

So, the rationale is by providing this.

Deb Curtis

Capability we are allowing them to continue their trip uninterrupted, but as you note here, there is no solution.

Deb Curtis

We don't state how that we will the user will navigate or what this system change will be that will facilitate this navigation.

Deb Curtis

Just that we need this to happen.

Deb Curtis

Next slide, please.

Deb Curtis

But important again, we are not developing the user needs.

Deb Curtis

That will come later in the ConOps and we will talk more about that in another training session, so.

Deb Curtis

We will talk about.

Deb Curtis

These three main approaches, even though there are other ways to identify user.

Deb Curtis

Means

Deb Curtis

This first section should discuss any user needs identified during the development of the ITS4US proposal. Do not start from scratch and waste which you have already done. This section should discuss using the proposal as a basis for developing well written user needs.

Deb Curtis

The second section should discuss plans for engaging stakeholders to identify their unique username.

Deb Curtis

This should cover the types of stakeholder engagement such as workshops, surveys, or one on one stakeholder interviews.

Deb Curtis

If this is possible.

Deb Curtis

This section can reference the stakeholder engagement sections of other documents as well, such as the project management plan.

Deb Curtis

Do not reinvent the wheel if you have already documented your stakeholder engagements in new project management plan, use them here.

Deb Curtis

Refer to them.

Deb Curtis

Here, if you are not expected to start use case decomposition at this point for the purposes of this task, simply explain how you intend to develop use cases.

Deb Curtis

In the template that was provided to you, there is a great use case example and as a reminder we do not expect you to complete your own decomposition table.

Deb Curtis

It is only there to help you think about how you will approach your process.

Deb Curtis

Next slide, please.

Deb Curtis

And one more time for emphasis.

Deb Curtis

You are not required to create your ConOps document for this task, please instead create a schedule and describe how you will approach completing your ConOps include site specific dates not award plus X weeks.

Deb Curtis

And to note that projects that are using Agile still need to develop documentation for all tasks, I can note their intention of using Agile in phase two in those documents.

Deb Curtis

Next slide please.

Deb Curtis

During the ConOps walkthrough, you are going to describe your plans for your walk through again, we are not expecting your team to develop the ConOps walkthrough plan until task 2 but describe your process for how you will go about doing it here.

Deb Curtis

In this section of the UNIRP, you are going to develop your planning process for your walkthrough plan, and you should see IEEE standard 1028 Dash 2008 for the required elements of the plan.

Deb Curtis

These include the number of days.

Deb Curtis

The Contacts walkthroughs could be more than one day, depending on the complexity of this system.

Deb Curtis

List who will participate, not individual people by names, but individuals, stakeholder groups, or organizations that you plan to invite to your walkthrough where the walkthrough will take place a physical location, or more likely, a virtual walkthrough.

Deb Curtis

And the approximate time frame.

Deb Curtis

When do you plan to schedule this prior to conducting the walk through a walkthrough workbook will be developed and provided to participants in advance of the walkthrough.

Deb Curtis

The walkthrough workbook will provide a consolidated list of the user needs and ConOps sections.

Deb Curtis

In a format for easier presentation during the walkthrough itself.

Deb Curtis

The workbook also includes space for note taking and red lines to the user needs and ConOps sections for the ConOps walk through a PowerPoint format is acceptable.

Deb Curtis

Next slide, please.

Deb Curtis

If your team plans to use agile development processes in phase two, the ConOps and the system requirements developed in Phase one will be used as a starting point for defining your agile backlog.

Deb Curtis

For the Agile software development, the use cases and user needs to find in phase one ConOps will provide the basis.

Deb Curtis

For the user stories used in the agile development, it is still a best practice to document and maintain configuration control of these user stories developed as part of these two Agile software developments.

Deb Curtis

Next slide, please.

Deb Curtis

The second main component of the UNIRP is requirements planning.

Deb Curtis

Next slide, please.

Deb Curtis

I want to emphasize again that we are not developing the system requirements at this point.

Deb Curtis

We are only asking you to describe the process for developing system requirements.

Deb Curtis

So, here is a quick refresher.

Deb Curtis

What are system requirements?

Deb Curtis

System requirements are statements that describe the necessary functions or capabilities of the system to make the realization of user needs possible.

Deb Curtis

Next, slide please.

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Similar to well written user needs, it is critical that system requirements are considered well formed.

Deb Curtis

See the UNIRP for additional information on these criteria.

Deb Curtis

Some of the considerations and requirements for well-formed system requirements or is the requirement and essential capability if removed or deleted, it may cause a deficiency that is unable to be fulfilled by other capabilities of the product or the process.

Deb Curtis

Its well written system requirement should be concise.

Deb Curtis

The requirement simply and clearly states only one user need when a requirement is concise, the statement does not require any explanations rationale?

Deb Curtis

Definitions.

Deb Curtis

Or descriptions of the system use.

Deb Curtis

It should be implementation free.

Deb Curtis

The requirement does not need to state how it must be satisfied.

Deb Curtis

The requirement states the desired result in function and performance terms, not in terms of the solution.

Deb Curtis

It should be attainable.

Deb Curtis

The requirement should be achievable at a definable cost.

Deb Curtis

Adequate analysis and trade studies show that the costs are within program cost constraints.

Deb Curtis

It should be complete.

Deb Curtis

The stated requirement can stand alone and does not need any further explanation.

Deb Curtis

Each requirement states everything required on the topic and it stands alone when separated from other requirements.

Deb Curtis

The requirements should be consistent.

Deb Curtis

The requirement does not contradict or duplicate other requirements.

Deb Curtis

Organizing requirements in accordance with the standard or template facilitates the identification of inconsistencies.

Deb Curtis

It is important to use consistent terminology throughout the requirements document, therefore maintaining a Glossary of program terms is 1 effective method for ensuring consistency.

Deb Curtis

The requirements should be traceable.

Deb Curtis

Each requirement is traceable to its source.

Deb Curtis

For example, a trade study, the ConOps scenarios, research results, etc.

Deb Curtis

And the requirement also needs to identify related requirements such as parents and children.

Deb Curtis

Requirements and requirements that might be impacted.

Deb Curtis

By changes made to this particular requirement.

Deb Curtis

A requirement should be unambiguous.

Deb Curtis

Each requirement has one interpretation for requirement to be unambiguous, the requirement must use language that leaves no doubt as to the intended descriptive or numeric value.

Deb Curtis

Use a common or well-defined words and phrases and avoid using known ambiguous phrases such as capable of a requirement should be verifiable.

Deb Curtis

Each requirement must be verifiable by inspection, analysis, test, or demonstration.

Deb Curtis

A requirement must be stated in measurable terms to be verifiable.

Deb Curtis

Allocatable requirements should be allocated to the appropriate component within the system hierarchy and or the appropriate organizational entities, for example, to develop procedures.

Deb Curtis

And a requirement needs to be style compliant.

Deb Curtis

A style compliant requirement has the following qualities.

Deb Curtis

Can client content simple sentence be correct?

Deb Curtis

Grammar and punctuation, positive statements, active voice.

Deb Curtis

Use of an appropriate directive verb, such as explains an appropriate.

Deb Curtis

The South compliant format, paragraph number, paragraph title, subject, relation value, capitalization, punctuation.

Deb Curtis

An additional explanatory information in a Glossary and we are going to talk more about these criteria on the next slide.

Deb Curtis

Next slide, please.

Deb Curtis

So, a good requirement will generally take the form of actor, action, target constraint, localization.

Deb Curtis

But note that not all requirements will have both localization and constraint portions.

Deb Curtis

So, for example, the system the actor shall generate.

Deb Curtis

The action event reports the target containing the following information.

Deb Curtis

A constraint on a scheduled interval localization.

Deb Curtis

Next slide, please.

Deb Curtis

In UNIRP you are tasked with describing plans for decomposing requirements into different categories or components. These five categories of requirements are common across many systems.

Deb Curtis

The first category is functional.

Deb Curtis

These are usually the most important requirements as they specify what functions the system must perform.

Deb Curtis

The requirements that specify how an application must work are usually considered functional requirements.

Deb Curtis

Physical requirements are those requirements that specify the physical characteristics of a system, subsystem, or component.

Deb Curtis

These would include the size of the component is it requires a specific color, or if it needs to need specific environmental conditions.

Deb Curtis

Performance requirements are those requirements that specify how the system has to perform.

Deb Curtis

This would include things like providing an alert within a specific time frame, specifying a specific data rate, or how accurate the data from the system subsystem or component must be.

Deb Curtis

Security requirements define what level of security would be necessary for specific parts of the system, subsystem, or component.

Deb Curtis

This would include any special data storage requirement for things like personally identifiable information, PII or financial transactions.

Deb Curtis

And finally, interface requirements to find any constraints on how the system, subsystem or component must communicate with other system, subsystem or components. As an example, if a part of the system is communicating with the signal controller, then you may want a requirement that communications with signal controllers shall use NTCP 1202 protocols.

Deb Curtis

Next slide, please.

Deb Curtis

I cannot stress enough the about the traceability between user needs and system requirements.

Deb Curtis

This tracing or mapping is critical to ensuring the fully developed system meets its goals and objectives.

Deb Curtis

The UNIRP describes plans for maintaining traceability and where it will be tracked.

Deb Curtis

Using systems engineering best practices, this is handled by a needs to requirements traceability matrix an RTM.

Deb Curtis

The system requirements template provides an NRTM in an appendix that is similar to the format or structure shown here on the slide. The expectation is that the teams will use a similar format or a compatible tool.

Deb Curtis

Next slide, please.

Deb Curtis

Again, you are not required to develop the system requirements document for this task. That is task six. Instead, create a schedule and describe how you will approach completing your requirements document.

Deb Curtis

Provide specific dates, not award plus X dates.

Deb Curtis

Next slide, please.

Deb Curtis

So, we are planning for your requirements walkthrough.

Deb Curtis

We are again not expecting your team to develop the system requirements walkthrough plan until tasks in this section of the UNIRP include how you will develop the walkthrough plan. See IEEE standard 1028, Dash 2008 for the required elements of the plan.

Deb Curtis

Similar to your ConOps walkthrough plan, this will include the number of days and requirements.

Deb Curtis

Walkthroughs could be two to four days depending on the complexity of the system list.

Deb Curtis

Who will participate?

Deb Curtis

Again, not individuals, but stakeholder groups.

Deb Curtis

Where the walkthrough will take place, physical or a virtual and approximate time frame of when this will take place.

Deb Curtis

Prior to conducting the walkthrough again, a walkthrough workbook will be developed and provided to participants in advance of the actual walkthrough.

Deb Curtis

The walkthrough workbook will provide all system requirements in a format easier for easier presentation during the walk through, it fell.

Deb Curtis

The workbook also include space for note taking.

Deb Curtis

And red lines to the user needs and coming up sections.

Deb Curtis

Next slide, please.

Deb Curtis

The third main component at the UNIRP is configuration management.

Deb Curtis

Next slide, please.

Deb Curtis

Again, I want to emphasize that we are not establishing the project configuration management at this point.

Deb Curtis

We are only asking you to describe the process for how you will maintain configuration management or how your team is going to manage change control.

Deb Curtis

Configuration management or user needs and system requirements is critical to reducing the risk of cost and schedule delay.

Deb Curtis

Since all requirements and design traced to the user needs changing, a user need without the proper analysis can result in a total rework of sections of the system. Which would increase your cost and incur delay.

Deb Curtis

Next slide, please.

Deb Curtis

During the initial development of user needs and requirements, they will change frequently, so it may benefit the team to have two processes, one for initial development and one for baseline needs and requirements.

Deb Curtis

The initial user needs and requirements development process should include how the different developers of user needs and requirements will collaborate.

Deb Curtis

For example, will you use a requirements management tool?

Deb Curtis

Would you manage user needs and requirements in a word or Excel document within Microsoft Teams or SharePoint?

Deb Curtis

Or other methods. It is critical that this section describe how the user needs and requirements will be baselined. This could be when USDOT accepts the final concept of operations. A final system requirements. Then after you have baselined your user needs and requirements, a second process may be necessary.

Deb Curtis

Will the project have a configuration Control Board that must approve all changes?

Deb Curtis

Will the Configuration Control Board require a change package to vote on proposed changes?

Deb Curtis

What analysis is required in those final change packages?

Deb Curtis

Next slide, please.

Deb Curtis

It is also important to document the authoritative source.

Deb Curtis

The authoritative source is the source that other documents will be building against.

Deb Curtis

Typically this is the ConOps and the system requirements, but Alternatively this could be a requirements management tool if the comments and system requirements.

Deb Curtis

Or the authoritative source.

Deb Curtis

Then describe how often those documents will be updated and where the authoritative version of those documents can be found.

Deb Curtis

Next slide, please.

Deb Curtis

There are many resources available that can be useful to your team.

Deb Curtis

Next slide, please.

Deb Curtis

This site provides some key references to help with the writing of your, UNIRP.

Deb Curtis

There are two groups of resources.

Deb Curtis

The first is the IEEE resources list that consists of standards that provide guidance about systems engineering.

Deb Curtis

Documents such as the ConOps System, requirements, specification, etc. that may be useful in developing your UNIRP.

Deb Curtis

These standards, however, must be purchased.

Deb Curtis

The second group of resources is the Federal Highway Administration Systems Engineering Resources that is FHWA developed documents that provide guidance and information about systems engineering principles and approaches.

Deb Curtis

Next slide, please.

Deb Curtis

We want you to.

Deb Curtis

Stay connected and contact us if your site has any questions.

Deb Curtis

Please make sure that if you reach out to Elina Zlotchenko, the program manager or myself, your systems engineering federal lead that you also copy your site lead and your core.

Deb Curtis

You can also visit the complete Trips website which has information and FAQ available to you.

Deb Curtis

And with that.

Deb Curtis

This concludes our presentation on the UNIRP.

Deb Curtis

If you have any questions, please feel free to reach out to us through email.

Deb Curtis

Again, copying your site lead and your core and we will be happy to get back to you.

Deb Curtis

Thank you very much.