



# CDC UNIFIED PROCESS PRACTICE GUIDE



## REQUIREMENTS TRACEABILITY

### Document Purpose

The purpose of this document is to provide guidance on the project management practice of **Requirements Traceability** and to describe the practice overview, requirements, best practices, activities, and key terms related to these requirements. In addition, templates relevant to this practice are provided at the end of this guide.

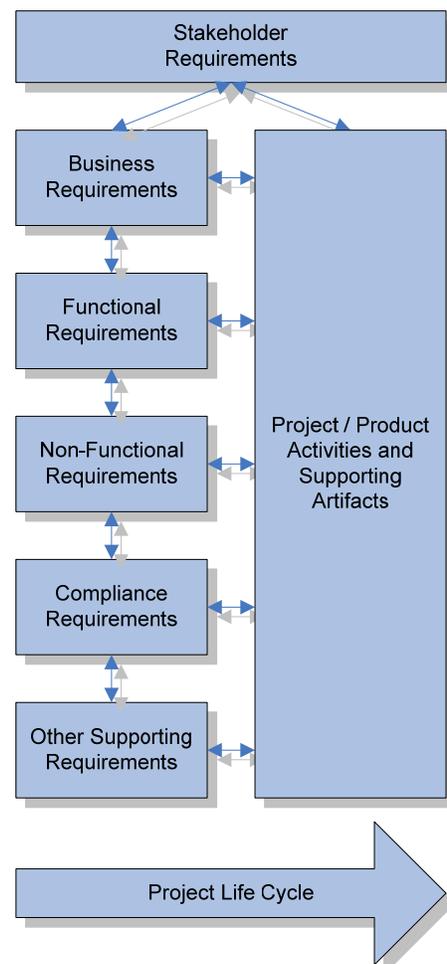
### Practice Overview

Requirements traceability is an activity that is one part of an overarching requirements management practice and extends from requirements definition through to implementation. Requirements tracing is used to ensure that each step of the product's development process is correct, conforms to the needs of prior and next steps, and conforms to the defined requirements. Requirements tracing is a technique that helps to ensure that the project delivers what stakeholders expect. If applied correctly requirements tracing is a practice that can greatly increase the quality and reliability of a project's final product while minimizing costly rework resulting from requirements errors.

Requirements tracing defines the ability to describe and follow the life of a requirement, in both a forward and backward direction, ideally through each step of the entire product's life cycle. This is done by documenting and tracking traceability relationships between requirements. A traceability relationship is a dependency relationship between project and/or product elements. Similar to the way a dynamic project schedule may react to a change in one task, a change to a requirement element may also have a rippling effect on other elements. A well documented traceability relationship clearly defines requirement dependencies and allows for analysis of how changes in requirements affect other requirements and the project as a whole.

Regardless of project type, the model used to trace requirements will be very similar. The basic structure, for a traceability strategy is relatively common for most projects in that it follows a hierarchy from higher-level needs through detailed requirements and then onto implementation. Project activities, such as product development, support requirements that support product features that then all trace to stakeholder needs. These actions provide the capability to track, or "trace", where within the product each requirements is satisfied and also verifies that each defined requirement has been addressed.

Requirements traceability can be considered the backbone of any project and helps ensure correct product delivery that meets the expectations of the client. When verifying project work, using a requirements traceability matrix verifies that the correct functionality is contained within each product module. Tracing requirements through the entire life cycle enables the project team to identify that "D.1.0.1.2.3" compliance requirement satisfies *BBB* non-functional requirement which enables "C.1.0.1.2" functional requirement that aligns thus satisfying "B.1.0.1" business requirements that align with "A.1.0" stakeholder requirements. This type of requirements tracing is illustrated in the image to the right. The tracking of requirements in this way should be performed throughout the project life cycle from scope planning, high-level requirements to detailed design,





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down through coding, testing, and implementation. It also verified that project work is supporting the overarching goal of meeting the client's needs. Accomplishing this activity is most often done through the use of an automated tool. However, if diligent, requirements traceability can be performed using a spreadsheet or relational database. When configured properly these tools should at a minimum provide:

- Unique ID identifying each requirement to be traced
- Bidirectional requirements linking, the ability to trace requirements both forward and backward through the project's life cycle
- Capture of allocation rationale, accountability, and validation
- Identification of inconsistencies
- Capabilities to view/trace links
- Verification of requirements
- History of requirement changes

However, there is no formal standard for exactly how a traceability relationship should be constructed, how it should be represented, what rules to apply to it, and what attributes it should exhibit. Just as each project is unique, the characteristics of each traceability relationship will also be unique. Regardless, it should be determined and agreed upon by all stakeholders early in the project's life cycle how requirements will be traced and managed through out the life of the project. Initially, three important questions need to be answered before embarking on any particular requirements traceability approach:

1. What needs to be traceable?
2. What linkages need to be made?
3. How, when, and who should establish and maintain the resulting database?

Regardless of how requirements tracing is implemented the practice of requirements tracing influences the *completeness*, *consistency*, and *traceability* of the requirements of a system and provides answers to questions such as the following:

- What mission need is addressed by a requirement?
- Where is a requirement implemented?
- Is this requirement necessary?
- How should this requirement be interpreted?
- What design decisions affect the implementation of a requirement?
- Are all requirements allocated?
- Why the design is implemented this way and what were the other alternatives?
- Is this design element necessary?
- Is the implementation compliant with the requirements?
- What acceptance test will be used to verify a requirement?
- Are we done?
- What is the impact of changing a requirement?

Requirements are then traced throughout the development of the product from scope, through high level requirements, detailed requirements, design, and coding. As coding completes, requirements continue to be traced through testing phases including user acceptance testing, ultimately demonstrating that the delivered solution conforms to the defined requirements and meets the needs of the client.

For example, requirement AAA might be identified during the scope management process. Requirement AAA is then decomposed into functional requirements. Each functional requirement is then defined within a design specification document and then coding work is performed. Proper requirements tracing would be able to identify and link the appropriate section(s) of the design specification document to the functional requirement and then to requirement AAA and then follow each requirement through testing and eventually product delivery.



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### Best Practices

The following are recommended best practice approaches to **Requirements Traceability**:

- **Iterative** – Requirements Traceability is an ongoing, iterative process conducted throughout the project lifecycle.
- **Centralize** – Requirement Traceability should be documented centrally using some type of log.
- **Document** – Each requirement should be recorded independently and its relationship to other requirements documented.
- **Review** – Regular reviews of requirements and the traceability log is good project management practice.

### Practice Activities

For software development projects the following practice activities are appropriate:

- **Define** – Define functional requirements based on technical assumptions and/or client needs.
- **Identify** – Identify and document an approach to tracing requirements through the life of the project.
- **Tools** – Purchase or develop a requirements traceability log.
- **Document** – Document and maintain requirements and traceability relationships.
- **Record** – When a requirement moves through the system lifecycle, record data used to track that requirement in the traceability log.
- **Communicate** – Regularly (at least weekly) update the traceability log with new information.
- **Communicate** – Regularly (at least weekly) communicate with stakeholders about the status of requirements.
- **Communicate** – Communicate to stakeholders that the requirement has been completed.

### Practice Attributes

This section provides a list of practice attributes to help project teams determine when and how **Requirements Traceability** impacts a project.

<b>Practice Owner</b>	CDC UP Project Office – NCPHI
<b>Criteria</b>	All projects regardless of type or size should document how requirements are tracked through the project’s life cycle.
<b>Estimated Level of Effort</b>	Moderate
<b>Prerequisites</b>	N/A
<b>Practice Dependencies</b>	N/A
<b>Practice Timing in Project Life Cycle</b>	Requirements Traceability is an activity that takes place throughout the entire system life cycle
<b>Templates/Tools</b>	Requirements Management Practices Guide, Requirements Management Plan Template, Requirements Definition Practices Guide, Requirements Definition Template, Requirements Definition Checklist, Requirements Traceability Template, Requirements Traceability Checklist
<b>Additional Information</b>	N/A

### Key Terms

Follow the link below to for definitions of project management terms and acronyms used in this document.  
<http://www2.cdc.gov/cdcup/library/other/help.htm>



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### Related Templates/Tools

Below is a list of template(s) related to this practice. Follow the link below to download the document(s).  
<http://www2.cdc.gov/cdcup/library/matrix/default.htm>

- Requirements Management Practices Guide
- Requirements Management Plan Template
- Requirements Definition Practices Guide
- Functional Requirements Definition Template
- Non-Functional Requirements Definition Template
- Requirements Definition Checklist
- Requirements Traceability Template
- Requirements Traceability Checklist