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1. End-to-End Requirement Traceability Through Contribution Structures and Requirements Traceability Matrices

Abstract

Requirements traceability is the ability to follow the life of a requirement, in both forward and backward direction, i.e. from its origin, to its refinement and inclusion in the requirement specification document, and from there to its subsequent deployment in coding, testing and validation [1]. Requirement traceability is often divided into Pre-Requirement Traceability and post-requirement traceability. Pre-Requirement Traceability is concerned with requirement's life before its inclusion in the requirement specification, while post-requirement traceability is concerned with the requirement's life after its inclusion in the requirement specification.

Traceability tools and techniques often use frameworks that are stronger in the post-requirement traceability area [31, 33, 39]. Pre-Requirement Traceability is typically not covered because it is difficult to trace the origin of requirements to the individuals who initiate, authenticate and document the user requirements. This research indicates that the performance of these tools can be significantly improved by including Pre-Requirement Traceability in their traceability frameworks. This inclusion would solve many of the problems associated with these tools and techniques such as difficulty to trace the information necessary for requirements management and requirements change management.

Contribution structures specify relationships between the user requirements and their initiators [1, 4]. Traceability matrix is a structure often used by tools and techniques covering post-requirement traceability [4]. Thesis of this research is that the integration of contribution structures with the traceability matrix extends the traceability to both the pre- and post-requirement traceability phases and provides for end to end coverage. This integration becomes possible when elements of a contribution structure are mapped to the elements of a requirement traceability matrix. **These elements are defined together in a collection of relations. Entity types and relationship types can be used for modeling real world data. Entity types and relationship types of this suggested integrated requirement traceability matrix is represented as relational model notations. The entity relationship diagram can also be converted into relation database.** Use of contribution structures in conjunction with requirement traceability matrix helps in identifying relevant information about source of user requirements, documenting in a reusable form to suit the needs of end users and enabling them to define their requirements.

End-to-end coverage provided by the above integration has several benefits such as identifying relevant information about source of user requirement, to provide requirements' specification in a reusable form, rapid retrieval and presentation of information that is traced according to user definable criteria, emphasis on open communication improved visibility, clarity of detail and ownership of requirement, and ability to directly document information obtained in its original form and at the time its generated.