Requirements Traceability – When and How does it Deliver more than it Costs?

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Abstract

Finding the right traceability process that delivers effective and efficient traceability can be difficult. This panel explores traceability challenges and solutions for finding the right techniques and process to deliver cost-effective traceability within an organization.

1. Introduction

The usefulness of requirements traceability to support critical activities such as requirements validation, regression test case selection, compliance verification, and impact analysis is well recognized by software engineers. However, traditional traceability methods that require the manual construction and maintenance of requirements trace matrices (RTM) have proven to be notoriously difficult to effectively implement in industry [1]. This panel asks the questions of "What is the right kind of cost-effective traceability for this project?" and "How much traceability is enough?" Panelists include Dr. Jeremy Dick from Integrate Systems Engineering, Dr. Jane Huffman Hayes from the University of Kentucky, Dr. Tim Menzies from West Virginia University who also serves as liaison to the NASA software independent verification and validation facility, and Dr. Andrea Zisman, long-time traceability researcher from City University, London.

2. Traceability Challenges

Dr. Andrea Zisman summarizes the current state of traceability practice by stating that "There seem to be no arguments concerning the potential value that traceability can add to the development of software systems. However, traceability is rarely utilized as its cost is perceived to exceed its benefits." She notes that the "high cost of traceability results from the difficulty of automatically generating traceability relations with clear and precise semantics; the heterogeneity and large number of artifacts that are created during the development of software systems; and the lack of correctness and completeness of traceability relations."

Dr. Jane Huffman Hayes, founding member of the Center of Excellence in Traceability [2], states that "even with the advent of the 'perfect' tracing tool capable of generating traceability between artifact levels 'on demand' at the press of a button" the real questions about how to implement effective traceability practices remain unanswered. She notes that "these answers must come from the stakeholders" and that we need "a way for stakeholders to approach such questions."

Jeremy Dick sees "effective tool support for traceability as an absolute key to making traceability cost effective." He advocates "approaches in which traceability is maintained automatically while the user gets on with the work." For example a developer might say "'I am working on satisfying this user requirement', and from then on anything the user touches is traced to that requirement." Dr. Dick promotes re-use, stating that "the investment made in traceability pays back every time you reuse 'chunks' of development."

3. Future Solutions

Dr. Tim Menzies comments that "Criticizing the need for traceability research seems to be like arguing against oxygen" but counters that research dollars need to be spent wisely and that all research, including traceability research, must be fully justified by a cost-benefits analysis. Clearly, the traceability issues facing industry are extremely challenging, yet the payoff for developing cost-effective methods is great. To address this need, academic researchers, government, and industry, have partnered together to create the Center of Excellence for Traceability [2]. The center provides a forum for ongoing discussion and delivery of traceability solutions.

References

[1] O. Gotel, and A. Finkelstein, "An Analysis of the Requirements Traceability Problem," *1st International Conference on Requirements Engineering.,* 1994, pp. 94-101

[2] The Center of Excellence for Traceability, http://www.traceabilitycenter.org