GSAW 2018 Tutorial C:

Life Cycle Resilience Depends on Maintainability

Length: Half day

Overview:
The DoD Systems Engineering Research Center has developed an ontology for reasoning about system quality factors and their interactions. It identifies three primary sources of system resilience: Robustness (being unaffected by a disturbance); Adaptability (being able to diagnose a disturbance and adapt itself to be unaffected by the disturbance); and Maintainability (being organized to enable rapid and often improved abilities to be unaffected by a disturbance). Maintainability includes both Modifiability (ease and speed of modification) and Repairability (ease and speed of fixing defects or vulnerabilities).

For tightly-budgeted software system acquisitions, the major incentive is to keep within the acquisition budget, often missing opportunities to develop more maintainable systems and reduce total ownership costs. The DoD Systems Engineering Research Center research project on System Qualities Ontology, Tradespace and Affordability (SQOTA) has identified and developed three sources of Maintainability-enhancement tools to enable systems to be not only more Affordable in terms of total ownership costs, but also more Changeable and Dependable. Maintainability supports Changeability in terms of rapid adaptability to new opportunities and threats, and also supports Dependability in terms of Availability, in that reducing Mean Time to Repair (MTTR) for a system with a given Reliability in terms of Mean Time Between Failures (MTBF) improves Availability via the equation Availability = MTBF / (MTBF+MTTR). The three sources of improved Maintainability tools include two Opportunity Trees for identifying strategies for improving a system's Modifiability for enhancing the system's capabilities, and strategies for improving the system's Repairability for cost-effectively repairing its defects. Another source for software is a set of data analytics tools for identifying shortfalls in the software's Maintainability and sources of software technical debt, that projects can use during development to deliver more maintainable systems.

A third, more management-oriented tool is a Systems/Software Maintenance Readiness Framework (SMRF) for evaluating and improving a project's Maintainability planning, staffing, and preparation of technology for cost-effective maintenance. The presentation will summarize the nature, usage, and effects of these tools, including automated and human procedures for evaluating a software system's Maintainability and technical debt.

Course Outline:

- The three primary sources of system Resilience: Robustness, Adaptability, and Maintainability
- Future trends that will increase the current 75% of system life cycle costs devoted to system maintenance
- Maintainabilty Opportunity Trees for improving system Modifiability and Repairability
- Software data analytics capabilities for identifying technical debt and future maintainability problems
- The top-10 non-technical sources of technical debt, and how to avoid them
- A Systems and Software Maintainability Readiness Framework (SMRF) for assessing a development project's ability to deliver a highly maintainable system.

- A case study to be analyzed and discussed by the tutorial attendees

Instructor: Barry Boehm, University of Southern California

Biography:
Dr. Barry Boehm is a USC Distinguished Professor and the TRW Professor in the USC Computer Sciences, Industrial and Systems Engineering, and Astronautics Departments. He is also the Chief Scientist of the DoD-Stevens-USC Systems Engineering Research Center, and the founding Director of the USC Center for Systems and Software Engineering. He was director of DARPA-ISTO 1989-92, at TRW 1973-89, at Rand Corporation 1959-73, and at General Dynamics 1955-59. His contributions include the COCOMO family of cost models, the Spiral family of process models, and the Theory W (win-win) approach for creating and evolving successful systems. He is a Fellow of the primary professional societies in computing (ACM), aerospace (AIAA), electronics (IEEE), systems engineering (INCOSE), and Lean methods (LSS), and a member of the U.S. National Academy of Engineering.

Description of Intended Students and Prerequisites:
Some familiarity with system and software development and maintenance.

What can Attendees Expect to Learn:
Classes of resilience (robustness, adaptability, modifiability, repairability). How to avoid current major losses of system life cycle resilience due to neglect of maintainability (modifiability and repairability) during development.