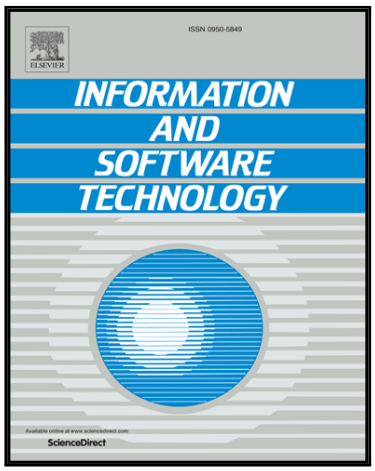

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A Software Quality Framework for Large-Scale Mission-Critical Systems Engineering

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Abstract

Context: In the industry of large-scale mission-critical systems, software is a pivotal asset and a key business driver. Production and maintenance costs of systems in domains like air/naval traffic control or homeland security are largely dependent on the quality of software, and there are numerous examples where poor software quality is blamed for major business failures. Because of the size, the complexity and the nature of systems and engineering processes in this industry, there is a strong need yet a slow shift toward innovation in software quality management.
Objective: We present SVEVIA, a framework for software quality assessment and strategic decisions support for large-scale mission-critical systems engineering, and its application in a three years long industry-academy cooperation.
Method: We started with the analysis of the industrial software quality management processes, and identified the key challenges toward a satisfying quality-cost-time trade-off. We defined new methods for product/process quality assessment, prediction, planning and optimization. We experimented them on the industrial partner systems and processes. They finally conflated in the SVEVIA framework.
Results: SVEVIA was integrated into the industrial process, and tested with hundreds of software (sub)systems. More than 20 millions of lines of code – deployed in about 20 sites in Italy and UK – have come under the new quality measurement and improvement chain. The framework proved its ability to support systematic management of software quality and key decisions for productivity improvement.
Conclusion: SVEVIA supports team leaders and managers coping with software quality in mission-critical industries, yielding figures and projections about quality and productivity trends for a prompt and informed decision-making.

Keywords: Software Quality; Decision Support Systems; mission-critical systems; Software Testing; Software Reliability; Automatic Static Analysis; Testing Resource Allocation; Defect Prediction; Fault Prediction.

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