Dietmar Pfahl: **An Integrated Approach to Simulation-Based Learning in Support of Strategic and Project Management in Software Organisations**

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Kurzfassung:

Industrial software development is a highly complex, dynamic task, which is not only determined by the choice of the right technologies but also – to a large degree – by the knowledge and skills of the people involved. The success of software organisations depends on its ability to facilitate continuous improvement of products and processes (strategic level) and on the effectiveness and efficiency of product development (project level). On both levels management takes the key role. The focus of this PhD research is on simulation-based learning to support both strategic and project management in software organisations.

The main contribution of the research work lies in the design, application and validation of a framework for Integrated Measurement, Modelling, and Simulation (IMMoS). The IMMoS framework supports managers to cope with the dynamic complexity of software development by providing guidance on building and using quantitative simulation models as a source for learning and improvement.

Simulation models are valuable tools for managers because they help them understand the effects of new technologies and policies on the performance of software development processes. Based on simulations, managers can explore and analyse potential improvements before implementation and empirical evaluation of the related process changes in a pilot project. In addition, quantitative simulation models can be used to support planning and control tasks.

The core element of IMMoS is the simulation modelling method System Dynamics (SD), which integrates quantitative (black-box) and explanatory (white-box) modelling in a natural way. The novelty of IMMoS is twofold. Firstly, it enhances existing guidance for SD model development by adding a component that enforces goal-orientation, and by providing a refined process model with detailed description of activities, products, and roles involved in SD modelling and simulation. Secondly, it describes how to integrate SD modelling with established static black-box and white-box modelling methods, i.e. goal-oriented measurement and descriptive process modelling.

IMMoS has been successfully applied in industrial software organisations. The effectiveness and efficiency of IMMoS is supported with empirical evidence from two industrial case studies and one controlled experiment.