

Teaching Software Development Processes by Simulation: Quality Assurance as a Factor of Success

Andreas Bollin¹, Elke Hochmüller², Ladislav Samuelis³

¹⁾ *Universität Klagenfurt, Austria,* ²⁾ *Carinthia University of Applied Sciences, Austria,* ³⁾ *Technical University Košice, Slovakia*

*andi@isys.uni-klu.ac.at, E.Hochmueller@cuas.at,
Ladislav.Samuelis@tuke.sk*

Abstract

This half-day tutorial shows how a flexible simulation environment can link the various topic areas of software engineering in the same way they are interwoven in the daily work of practitioners. Based on the simulation goals, the participants act as project managers determining the simulated development process by adequate staffing and allocating software development as well as quality assurance tasks.

1. Objectives

The AMEISE (A Media Education Initiative for Software Engineering) approach focuses on the simulation of software project management processes. Based on Stuttgart University's SESAM (Software Engineering Simulation by Animated Models) [1], the AMEISE tool-set allows for repeatedly experiencing the complexity of software project management within a game-like simulation environment [2, 3, 4].

The tutorial participants have the opportunity to run an AMEISE simulation using the so-called quality assurance (QA) simulation model. Based on the description of the required project (simulation goals, available resources), the participants act as a project manager determining the simulated development process by adequate staffing and allocating software development as well as quality assurance tasks.

After the simulation process, the success of each project is being analyzed using the AMEISE self-assessment feature. Participants should get new perspectives within the area of software engineering education. In more detail, the objectives are:

- to become acquainted with AMEISE as a simulation environment,
- to experience “exercising” software engineering project management with AMEISE,
- to be able to evaluate the prospective usage of AMEISE for own educational purposes.

2. Relevance of the Tutorial

An experience-dominated subject like software project management cannot be learned by merely attending lectures [5, 6]. Additional labs, however, even with only modest real-life projects, call for substantial effort to be spent by the instructors as well as by the partaking students. With these issues in mind, we developed the concept for AMEISE, a simulation framework for practicing management of software engineering projects.

This tutorial addresses both academic instructors as well as practitioners giving them the opportunity to obtain first-hand experience with an environment applicable for teaching and learning software project management by simulation.

In accordance with the objectives of CSEE&T 2013, quality is emphasized from two points of view: First, process quality is promoted by allowing for experimenting with different process models and by stressing careful project planning. Second, the AMEISE environment allows for a qualified judgment on the effects of project decisions and the application of QA tasks on the quality of the software product resulted from each simulation run.

3. Presenters

The tutorial is held by up to three persons: Andreas Bollin from the University of Klagenfurt, Elke Hochmüller from the Carinthia University of Applied Sciences, and Ladislav Samuelis from the Technical University Košice.

Andreas Bollin received his Ph.D. and Venia Docendi from the University of Klagenfurt where he is currently active as Associate Professor at the Software Engineering Research Group. His research interests are project management and software engineering (with a focus on reverse engineering and formal methods). He is also active in the area of e-learning and new technologies to enhance various aspects of teaching computer science.

Elke Hochmüller received her Ph.D. from the University of Vienna and the Venia Docendi from the University of Klagenfurt, respectively. She was Assistant Professor at the Institute of Informatics-Systems at the University of Klagenfurt and is currently Full Professor in the Network Engineering and Communication Programme at the Carinthia University of Applied Sciences. Apart from more than 20 years of experience in software engineering education, her teaching and research activities focus on various software engineering topics, like requirements engineering and process modelling.

Ladislav Samuelis is Associate Professor at the Department of Computers and Informatics of the Technical University Košice, Slovakia. His research interests include automatic program synthesis and intelligent tutoring systems. He received his Ph.D. in the field of Informatics from the Technical University of Budapest.

4. Environment and Setting

The duration of the tutorial is 180 minutes and the maximal number of participants is limited to approx. 28 persons. The minimum number of participants is 4.

The tutorial consists of two presentation sessions and one online simulation session. The following course material is handed out at the beginning of the tutorial: (i) presentation slides, (ii) description of simulation goals, (iii) list of available resources (budget, time, developers), and (iv) a list of commands (employee management, task assignment, project control).

AMEISE is a client-server application. The server is running at the AMEISE service provider in Klagenfurt/Austria. Apart from a permanent internet connection, no special technical equipment is needed. With only a restricted or even without any internet connectivity, the AMEISE tutorial is organized in a scaled-down version (cf. Section 6).

5. Preparation

There are no particular prerequisites required to be able to follow the tutorial effectively. The tutorial starts with a short introduction (summary) of the most important terms; however, basic knowledge of phase-driven process models, software development activities (requirements specification, system design, module design, coding ...), QA activities (review, test), and resource and staff management are advantageous.

Depending on the number of participants, the simulation runs are done in groups of two or as single work. In order to be able to run the AMEISE simulator, we assume that most of the attendees are equipped with their own computer. The AMEISE client is a Java Swing application (prerequisites: internet access, JRE 6).

6. Tutorial Activities and Format

The tutorial consists of three sessions. It starts with a general introduction to software project management, the AMEISE system and the concepts behind it. In the second session, teams of two are formed and the tasks of the simulation model are discussed. The objective is to prepare a first (small) project plan and to apply it using the AMEISE simulation environment. The last session concludes with discussing the results that can be drawn from the simulation runs.

With only restricted internet connectivity available, the second session can be adjusted in such a way that the trainees are not accessing the AMEISE server in Klagenfurt/Austria. It is possible to install AMEISE locally on the presenters' laptops and to access these via a local network.

Without any internet connection available, the second session is down-scaled, with the trainees preparing their own schedule followed by a single simulation. Individual simulation runs are then only being supported by the post-event support.

7. Post-Event Support

Experience showed that a big share of the learning effect is due to the assessment report and the reflections phase at the end. Owing to time constraints (a simulation run normally lasts 2 ½ hours), it is possible that not all attendees will manage to finish their own simulation runs during the tutorial. In order to make the best of it, all the trainees will have the opportunity to finish their simulation runs (or to start new ones) within two weeks after the tutorial. All finished simulation runs will be evaluated, and each tutorial participant will get a PDF file containing his/her assessment report via email.

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