Referenz:	**MQA**
Thema:	**Model Quality Assurance in Multi-Disciplinary Engineering Environments**
LVA-Typ:	Praktikum, Bakk-/Masterarbeit
Start:	Ab sofort
Ende:	Nach Vereinbarung
Kontakt:	Dietmar Winkler (dietmar.winkler@tuwien.ac.at) Stefan Biffl (stefan.biffl@tuwien.ac.at)

Background

In *Multi-Disciplinary Engineering (MDE)* projects, software and systems engineering activities include members from several engineering disciplines, e.g., mechanical, electrical, and software engineering. In industry practice, individual disciplines apply discipline specific data models with limited interoperability capabilities. Thus, quality assurance activities in such a heterogeneous environment become challenging and can make engineering projects risky [2].

Quality Assurance (QA) in Software and Systems Engineering include important activities, such as Reviews, Inspection, and Testing, to enable the construction and delivery of high quality engineering products in an MDE environment. In context of this project, QA refers to methods and tools to check/assess selected quality aspects, e.g., completeness or consistency of different engineering artifacts. Reviews and inspections [1] follow defined process steps to support process execution embedded within project management activities. Figure 1 presents an overview of review/inspection process steps in Software Engineering [3].

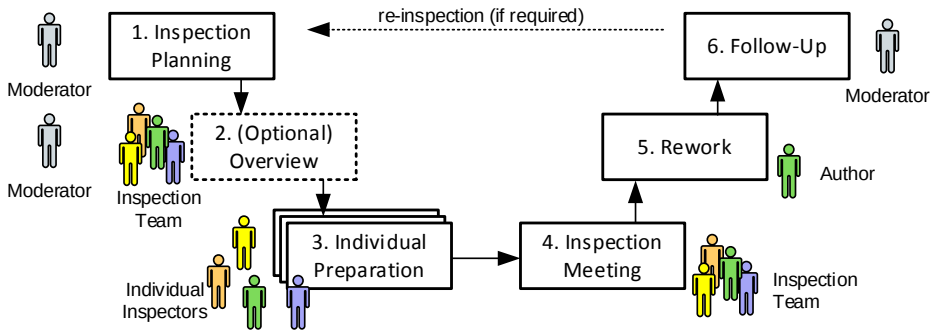

Figure 1: Review / Inspection Process Approach in Software Engineering [3].

Main steps of a review/inspection processes include:

- Organization and planning of QA activities, e.g., review team, scheduling, artifact scoping.
- Preparation of MQA, e.g., identification of key terms, annotations.
- Execution of individual review and inspection tasks, e.g., defect detection and reporting.
- Optional team meeting support, e.g., team discussions and defect aggregation.
- Reporting and traceability of defects, e.g., defect correction and follow-up.

Model-Driven Engineering (MDEng) aims at providing methods and approaches to support engineering processes by using models for requirements definition, code generation, model checking, or quality assurance in general [2]. However, there is limited process and tool support to support and improve model quality assurance. Thus, Model Quality Assurance (MQA) can provide mechanisms, processes, methods, and tools to support QA in MDE environments [5][6], e.g., for UML models [3].

Tasks

The goal of this project focus on supporting and improving quality assurance for models in a heterogeneous and distributed context. Main tasks include:

- Process Improvement: Definition and improvement of process support for integrated MQA based on established tools, e.g., *Gerrit*[1] (focus on Software Code Reviews) and *Defect Radar*[2] (focus on annotation of engineering plans in building automation).
- Concepts: Elaboration of solution concepts and concept evaluations for MQA support in MDE environments.
- Prototypes: Prototype implementation and evaluation of individual review and inspection tasks within a heterogeneous engineering environment.
- Prototypes: Prototype tool chain implementation and evaluation to enable seamless interaction between individual tools.
- Evaluation of MQA concepts and prototype implementations based on real-world industry data.

Depending on the course type (“LVA-Typ”) and individual research interest, subset of tasks can be defined and negotiated.

Expertise and Skills Needed

Based on different tasks, required expertise and skills may vary. With respect to the overall project, the following skill set is recommended:

- Model-driven engineering concepts.
- Quality assurance methodologies, e.g., Reviews, Inspection, Testing.
- Process improvement concepts and strategies.
- Java and the standard technology stack (e.g., Maven, Issue tracker, SCM).
- Interest in QA / MQA tooling and tool development.
- Experience in team work in distributed (software) engineering projects.

References

[1] Aurum A., Petersson H., Wohlin C.: “State-of-the-art: software inspections after 25 years”, In: Software Testing, Verification and Reliability, 12(3), pp. 133-154. 2002.

[2] Brambilla M., Cabot J., Wimmer M.: “Model-Driven Software Engineering in Practice”, In: Synthesis Lectures on Software Engineering, 2012.

[3] Genero M., Fernández-Saez A. M., Nelson H. J., Poels G., and Piattini M.: “Research review: a systematic literature review on the quality of UML models”, In: Journal of Database Management (JDM), 22(3), pp.46-70, 2011.

[4] Winkler D., Biffl S.: “Improving Quality Assurance in Automation Systems Development Projects”, In "Quality Assurance and Management", Book Chapter, Intec Publishing, ISBN 979-953-307-494-7, 2012

[5] Winkler D., Biffl S.: "Combining Inspection and the Failure Mode and Effect Analysis to support Engineering Process Improvement in Multi-Disciplinary Engineering Environments", In: Proceedings of the 23rd EuroAsiaSPI Conference, Graz, Austria, 2016. (to appear).

[6] Winkler D., F.J. Ekaputra, Biffl S.: "AutomationML Review Support in Multi-Disciplinary Engineering Environments", Proceedings of the 21st IEEE International Conference on Emerging Technologies and Factory Automation (ETFA), Berlin, Germany, 2016. (to appear).

[1] Gerrit Code Review: https://www.gerritcodereview.com/
[2] Defect Radar: https://www.defectradar.com/de