University of Zurich[UZH]

Department of Informatics

JKU
JOHANNES KEPLER UNIVERSITY LINZ

Master's Thesis

Institute of Systems Engineering and Automation, JKU Linz
in cooperation with the Requirements Engineering Research Group, UZH Zurich

Topic / Working Title

Industrial Evaluation of the SPREBA Method to Software Product Line Requirements Engineering

Content

SPREBA[1] is an ongoing research project at the University of Zurich which explores the potential and benefits of integrated model-based requirements description and variability modeling with aspects. The SPREBA method supports specifying all relevant views of requirements in a single integrated diagram. It further provides tool support for refactoring such a requirements model to account for variability that is omnipresent in product lines and evolving software products. A major current focus in the project lies on empirically evaluating the benefits and limitations of applying this new method in a software-developing company and measuring the effects and thus the method's potential to improve upon the current state of the art and practice in requirements engineering for software product lines.

In this master's thesis the requirements engineering of an existing or evolving software product line at a company will be investigated using the ADORA/SPREBA method for software product line requirements modeling [Stoiber, Glinz 2009]. The research student will work at the company and the research method to be used will canonical action research [Davison et al. 2004]. Concrete hypotheses on the utility and impact of the explored method on the studied product line will be formulated and refined together with supervisors. The design and execution of the empirical research shall discuss and adhere to the principles and criteria of canonical action research. The quality of the research design and the validity of the results shall be assessed as well, e.g. according to [Yin 2009]. Within the company the following engineering tasks will be performed:

- A high-level requirements specification of existing and planned software artifacts will be created [Stoiber, Glinz 2009], a so-called reference model. This gives an overview of all major and relevant software artifacts to be dealt with when developing a systematic software product line.
- A detailed variability analysis using the Feature Unweaving method [Jehle 2010] is performed. This allows an easy identification and documentation of variable features by refactoring the requirements model with tool support.
- A set of current and planned product specifications of the investigated product line will be negotiated and derived from this refactored model-based product line specification [Stoiber, Glinz 2010]. This allows an incremental specialization of the product line model by consecutively binding variability decisions and will finally yield concrete and consistent product specifications from the product line model with only little effort. It is possible to further refactor and adapt the variability specification if new or changed requirements appear in this process, which shall be addressed, evaluated and performed by the research student as well.

[1] see http://www.research-projects.uzh.ch/p12003.htm

The performed work should be documented. Based on this accumulated data and the collected experiences from all involved stakeholders a systematic evaluation of the initially stated hypotheses shall be performed.

Both the industrial as well as the academic stakeholders will profit from the results of this thesis:
- The participating company will benefit from a comprehensive requirements specification and variability model. This modeling will provide a basis to improve the development efficiency, the software quality and the management and evolution of the studied product portfolio.
- The participating universities will benefit from gaining a comprehensive case study of the ADORA /SPREBA method with an industrial software product line. The results will be a significant contribution to the empirical validation pursued in the SPREBA project and will be valuable input for the further development and refinement of the studied methods.

Industry Case on "Customization of ERP-Systems" with InsideAX GmbH

The industry case to be studied is an evolving software product line of a mobile solution for the ERP-System Microsoft Dynamics AX 2009, on a .NET basis. The software will be developed by InsideAX GmbH. The anticipated variability of the planned system includes for instance support for different processes (e.g. delivery, consignment, warehousing) and for divers communication technologies (e.g. synchronous with web services, asynchronous with batch processing).

How to proceed

- Literature study of the concepts to be evaluated (SPREBA, ADORA) and familiarization with the ADORA modeling tool (approx. 7.5%)
- Detailed empirical research design and formulation of hypotheses to be evaluated (approx. 10%)
- Familiarization with the studied software product line; study of all existing requirements documents and specifications (approx. 7.5%)
- Requirements modeling with ADORA based on existing requirements documents and elicitation interviews; reviews and refinements (approx. 20%)
- Variability modeling with feature unweaving; identify and specify commonality and variable features in the requirements model; reviews and refinements together with stakeholders (approx. 15%)
- Derive product specifications for all current and planned products of the product line; refine the requirements and variability model wherever necessary (approx. 10%)
- Quantitatively and qualitatively evaluate and assess all your results (approx. 10%)
- Thesis writing (approx. 20%)

This listing is a suggestion of how to proceed. Tasks do not have to be performed exactly in this order; for some tasks it may be favorable to perform them in parallel.

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Literature

Davison, R. M., Martinsons, M. G., Kock, N. Principles of canonical action research. *Information Systems Journal.* 2004.

Jehle, M. Feature Unweaving: Semi-Automated Aspect Extraction in Product Line Requirements Engineering. Master's Thesis. University of Zurich. January 2010.

Stoiber, R., Glinz, M. "Modeling and Managing Tacit Product Line Requirements Knowledge". In *Proceedings of MaRK'09.* IEEE CS. Atlanta, USA, 2009.

Stoiber, R., Glinz, M. Supporting Stepwise, Incremental Product Derivation in Product Line Requirements Engineering. In *Proceedings of VaMoS'10.* ICB Research Report. Linz, Austria, 2010.

Yin, R. K. *Case Study Research: Design and Methods.* Sage Publications, Inc. 2009.

Literature research and review are also part of the thesis work. The references listed above may serve as basic starting literature.

Workload

~ 6 months full-time, 30 ECTS

Workplace

The student will work at both the University of Linz and at InsideAX GmbH in Linz. Meetings with advisors in Zurich will be held online or by arrangement.

Advisors

Reinhard Stoiber, *UZH Zürich (main advisor)*
Markus Nöbauer, *InsideAX GmbH Linz*

Co-Advisors

Dr. Norbert Seyff, *UZH Zürich*
Dr. Samuel Fricker, *UZH Zürich*

Examiner

Prof. Dr. Paul Grünbacher, *JKU Linz*

Co-Examiner

Prof. Dr. Martin Glinz, *UZH Zürich*