Success Factors for Empirical Studies in Industry-Academia Collaboration: A Reflection

1st Int'l Workshop on Conducting Empirical Studies in Industry

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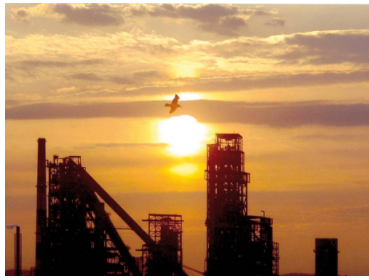
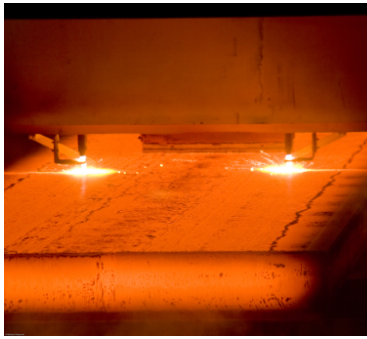
Research Context and Industrial Partner

Christian Doppler Forschungsgesellschaft

- Christian Doppler Laboratory for Automated Software Engineering
  - Long-term collaboration between academia and industry (2006-2013)
  - Research themes derived from problems faced by companies
  - Public-private partnership model
  - Knowledge exchange in both directions

- We conducted several empirical studies with Siemens VAI Metals Technologies
  - Leading engineering company for metallurgical plants
  - 8.600 employees
  - Joint research on product line engineering





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Motivation and Goals

1. Summarize and compare the empirical studies
   - Motivation
   - Research Goals
   - Object and Scope
   - Subjects
   - Industrial Impact
2. Reflect about the experiences from a researcher's perspective
3. Understand the success factors for gaining support from companies

Five Empirical Studies

- Process for Elicitating Product Line Variability (VaMoS 2008)
- Variability Modeling Approach (ASE Journal 2010)
- Evolution of Component-based Product Lines (WICSA 2012)
- User Guidance Features in a Configuration Tool (ASE 2012)
- Awareness Support in Distributed Configuration (APSEC 2013)

Approach

1. Characterized our studies regarding their focus, method and impact

2. Related our studies using existing success factors for industry-academia collaboration (Wohlin et al., IEEE Software, 2012)

3. Discussed lessons learned

C. Wohlin, A. Aurum, L. Angelis, L. Phillips, Y. Dittrich, T. Gorschek, H. Grahn, K. Henningsson, S. Kagstrom, G. Low, P. Rovegard, P. Tomaszewski, C. van Toorn, and J. Winter, "The Success Factors Powering Industry-Academia Collaboration," IEEE Software, vol. 29(9), pp. 67-73, 2012.

Characteristics of the Studies

- Motivation
  - Assess, Evaluate, Explore
- Object and Scope
  - Process, Modeling Approach, Tools
  - Between several hours and several months
- Research Goals
  - Utility and Usability
- Research Methods
  - Case studies
  - Usability studies
  - Experiments
- 4-12 Subjects
- Industrial Impact
  - Results of study
  - Rollout of tools
  - Development of new features
  - Awareness

Motivation	Object and Scope	Research Goals	Research Method	Subjects	Industrial Impact
Assess variability elicitation process	Variability elicitation process	Validate usefulness of collaborative elicitation process	Experiment with structured workshops	12 software engineers and project managers	The elicited variability allowed development of product line models
Evaluate the DOPLER product line approach	DOPLER approach and meta-tool for variability modeling	Assess Utility of DOPLER for variability modeling in different domains	Multiple case study	4 product line engineers from different partners	The demonstrated flexibility triggered further research and an additional project
Explore developer tasks and challenges of product line evolution	Project performing evolution of a product line	Understand evolution activities, types of change impact analyses, and tool requirements	Exploratory case study observing 30 person months of development	1 engineer and 4 developers	The results were used to refine and extend evolution and traceability support in DOPLER
Assess the usefulness of the DOPLER configuration tool	User guidance capabilities of the DOPLER configuration tool	Investigate usability for end users and utility in industrial use cases	Usability study	9 business-oriented stakeholders	Increased awareness about the tool and many changes improving the tool's usefulness
Explore dependencies in distributed product derivation of multi product lines	A bulletin board for sharing configuration information	Usability and utility of tool-supported collaborative derivation approach	Two phase usability study	12 industrial experts	The demonstrated feasibility triggered further research

Relevance of Wohlin's Success Factors

1. Champion at company

2. Champion's network within the company

3. Buy in and support from company management

4. Buy in and support from industry collaborators

5. Short term results and impact on industry

6. Organizational stability (industry partner)

7. Researcher has a visible presence in industry

8. Regular meetings

9. Relevant expertise of researcher

10. Attitude and social skills of researcher

11. Researcher's commitment to contribute to industry needs

12. Well-organized collaborative research project

13. Research environment at the university

14. Prior experience of industry/academia collaboration

	Success Factors' Importance (++ .. very important; + .. important; o .. not important)													
Study	(1) Champion at Company	(2) Champion's Network	(3) Ind. Mgmt Supp.	(4) Supp. from Ind. Collab's	(5) Short Term Impact	(6) Org. Stability	(7) Res. Visibilty	(8) Reg. Meetings	(9) Res. Expertise	(10) Res. Social Skills	(11) Commitment to Ind. Needs	(12) Proj. Org.	(13) Res. Environment	(14) Prior collab. Exp.
ElVar [6]	++	++	++	++	++	o	o	+	++	++	++	+	o	+
VarMod [2]	++	o	o	++	+	o	o	++	++	+	+	+	o	+
PLEvo [4]	+	+	++	+	++	o	o	++	+	++	++	+	o	+
ConfTools [7]	++	++	+	+	++	o	o	+	++	++	++	+	o	++
DistConf [5]	++	++	o	++	o	o	++	o	+	++	+	+	o	+
Key factors according to our results														
	✓	✓		✓	✓				✓	✓	✓			
Key factors according to Wohlin et al.'s [9] results														
	✓	✓	✓	✓	✓					✓	✓			

Lessons Learned

- Avoid a narrow study scope
  - Accommodating industrial partner's needs
- Use a flexible research design
  - Risk and opportunity management
- Establish trust
  - "Relationship business" matters (Finkelstein)
- Aim for long-term funding
  - Funding programs play an important role