



Software
Construction

RWTHAACHEN
UNIVERSITY

ANNUAL REPORT 2025

Contact

office@swc.rwth-aachen.de
www.swc.rwth-aachen.de
+49-241-80-21331
Ahornstr. 55
52074 Aachen, Germany

SWC TEAM



Horst Lichter



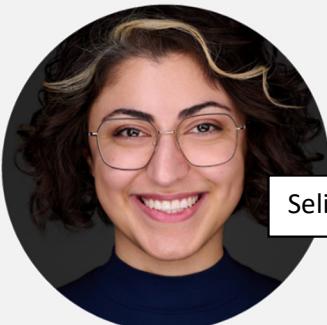
Marion Zinner



Christian Plewnia



Ada Slupczynski



Selin Coban



Alex Mattikat



Nils Wild



Peter Alexander

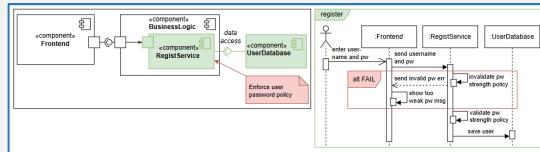


Andreas Steffens

RESEARCH PROJECTS

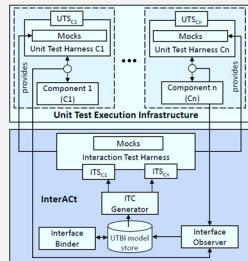
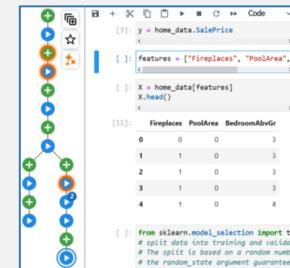
SCAM - Security-Centric Architecture Modelling

Alex Mattukat



SE4ML - Processes, People and Tools

Selin Coban



Vertical Reuse of Unit Test Cases to Automate Integration Testing

Nils Wild

Modernization Approaches for Legacy Systems

Ada Slupczynski



HIGHLIGHTS

MARCH: SWC Research Retreat

This year, we held our annual research retreat at the **Nell-Breuning-Haus** in Herzogenrath.

It was our first time at this conference location. We had plenty of time to discuss our research projects and coordinate internal SWC decisions.



Since we forgot to take photos, an AI did it for us :-)

HIGHLIGHTS

APRIL: Best Paper Award at ISCA 2025, Odense

Alex R. Mattukat received the ICSA 2025 Best Poster Award for his poster:

SecuRe - An Approach to Recommending Security Design Patterns



HIGHLIGHTS

SEPTEMBER: The last SWC Cooperation Project has been completed

The last SWC cooperation project was carried out together with **Generali Informatik Services GmbH**, Aachen.

This project mainly examined non-technical factors influencing the **modernization of legacy systems**.

Ada carried out this two-year project and has now completed it very successfully.

We would like to express our sincere thanks to our partners at Generali for their open and constructive cooperation.

Challenges and Impact Factors on Modernization Projects - Results of an Industry Study

Ada Slupczynski
slupczynski@swc.rwth-aachen.de
Research Group Software Construction
RWTH Aachen University
Aachen, Germany

Horst Licher
licher@swc.rwth-aachen.de
Research Group Software Construction
RWTH Aachen University
Aachen, Germany

1 Introduction
For many years, modernizing existing systems has been a significant challenge for many software organizations. Due to the rapid pace of technological change and the pressure to remain competitive, modernization is still crucial for industry and science. The challenge remains as every modernization project needs to be tailored to the underlying legacy system. There are many experience reports, most of them present success stories of modernization projects (e.g., [2] [3]). In addition, few reports have examined various aspects of modernization projects in industry. For example, Khadka et al. report the results of an extensive industry interview study conducted in the Netherlands [1]. Although they present the most relevant challenges, their work is more exploratory.

The study presented in this paper aimed to supplement the published findings by identifying positive and negative influencing factors and general aspects of modernization projects. The goal was to provide a basis for practical guidelines on what actionable items can be used to improve the work of modernization projects. The study was conducted with a software development organization that has recently carried out various information system modernization projects. The study was designed to answer the following questions:

1. How do examples, motivations, and evaluations of modernization contribute to creating a shared understanding of the modernization process?
2. How can experiences with proven modernization approaches support the system perspective that shows the connections between technical characteristics and modernization strategies?

2 Study Method
The study was conducted from Nov 23 to Aug 24 using expert interviews. This method was chosen to collect experience reports on modernization projects from various stakeholders with many years of experience in different projects in a large software development organization. In total, 21 experts were interviewed. The experts had the following roles and functions in the organization: developers, software architects, system architects, and testers. All interviews took place online and lasted one hour each; all experts were interviewed separately.

The interview consisted of two sections. The first section served to obtain general statements on understanding modernization in an industrial environment. To get unbiased statements, the questions asked in this section were not distributed to the participants beforehand. The second section focused on the technical aspects of modernization and the resulting concrete challenges. These questions were communicated in advance. The interviews were recorded and systematically analyzed. All results and findings were presented and communicated to the organization.

3 Results
The results derived from the interviews' analysis can be divided into two categories: general statements on modernization and factors that influence the modernization of information systems, as presented below.

3.1 General results
Terminology matters! Although all experts clearly stated that continuous modernization is necessary, they had a different understanding of modernization and related approaches. This may result from the lack of unified modernization guidelines encompassing its intricacies. If we do not use the same language, misunderstandings will become more likely!

Modernization projects come too late and have no clear goals! Modernization needs to happen earlier than it usually does. Modernization becomes more complicated when technical debts exist in the legacy system, remaining untouched until they become problematic. Furthermore, the goals of modernization projects are often unclear or extensive, so the projects deliver no or only partial modernizations. This makes it difficult or impossible to evaluate modernizations. As a result, valuable data is lost when planning future

HIGHLIGHTS

OCTOBER: OODACH Meeting at Workplace Solutions GmbH in Hamburg

The so-called OODACH meeting has been taking place for many years. It is an invitational meeting in which scientists and practitioners from Germany, Austria, and Switzerland (DACH) discuss innovative and exciting topics in software engineering.

This year, the OODACH workshop was hosted by **WPS Hamburg**. As always, there were exciting presentations and plenty of time for discussion and networking.

Selin presented some results of her PhD research projects!



HIGHLIGHTS

NOVEMBER: Doctoral Defense of Nils Wild

Nils successfully completed his doctoral project with a presentation and defense. He earned his doctorate with a thesis on

Interaction-based Integration Testing of Component-based Software Systems.

Thanks to all members of the examination committee, especially to Prof. Ian Gorton from Northeastern University.

Congratulations, Dr. Wild!



WHAT ELSE HAPPENED ...

KONRAD FÖGEN APPOINTED AS PROFESSOR IN SOFTWARE ENGINEERING AT FH AACHEN - UNIVERSITY OF APPLIED SCIENCES

In February, Konrad started his new position as Professor in Software Engineering at **FH Aachen - University of Applied Sciences**.

Konrad was a member of SWC from 2015-2020.

Congratulations Konrad!



MORE WOMEN IN SCIENCE

RWTH Aachen University is committed to increasing the **number of women in science**.

Selin has been very involved in this project (and still is today).



© inpact Verlag

PUBLICATIONS

Simon Hacks, Ada Slupczynski (2025)

[Advancing Enterprise Architecture Debt: Insights from Work System Theory](#). In Rébecca Deneckère, Marite Kirikova, Janis Grabis (eds.) *Perspectives in Business Informatics Research - 24th International Conference on Business Informatics Research, BIR 2025, Riga, Latvia, September 17-19, 2025, Proceedings*, Springer Nature Switzerland, Cham, Lecture Notes in Business Information Processing, Vol. 562, ISBN 978-3-032-04375-7, 107-123.

Alex Sabau, Dominik Lammers, Horst Licher (2025)

[SecuRe - An Approach to Recommending Security Design Patterns](#). In CoRR, Vol. abs/2501.14973.

Alex Mattukat, Timo Langstrof, Horst Licher (2025)

[Challenges in Developing Secure Software -- Results of an Interview Study in the German Software Industry](#). In CoRR, Vol. abs/2512.07368.

Alex Sabau, Dominik Lammers, Horst Licher (2025)

[SecuRe - An Approach to Recommending Security Design Patterns](#). In 2025 IEEE 22st International Conference on Software Architecture Companion (ICSA-C), Odense, Denmark, Mar 31 - Apr 4, IEEE, ISBN 979-8-3315-2090-8, 186-189.

Ada Slupczynski, Horst Licher (2025)

[Challenges and Impact Factors on Modernization Projects - Results of an Industry Study](#). In Softwaretechnik-Trends, GI, Bonn, Vol. 45, No. 2, ISSN 0720-8928, 12-13.

Aleksandra Pazova (2025)

[Factors involved in Modernization Decision Making](#). In Softwaretechnik-Trends, GI, Bonn, Vol. 45, No. 2, ISSN 0720-8928, 31-32.

Alex Mattukat, Timo Langstrof, Horst Licher (2025)

[Herausforderungen bei der Entwicklung sicherer Software: Ergebnisse einer Interviewstudie in der deutschen Softwareindustrie](#). In Softwaretechnik-Trends, GI, Bonn, Vol. 45, No. 4, ISSN 0720-8928, 2-7.