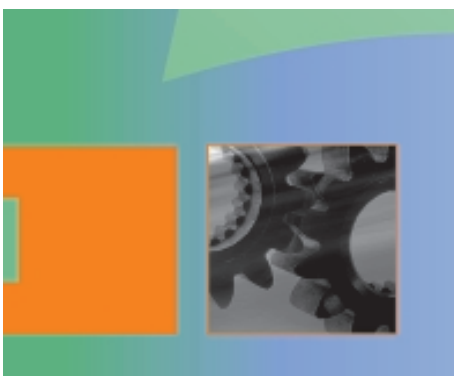
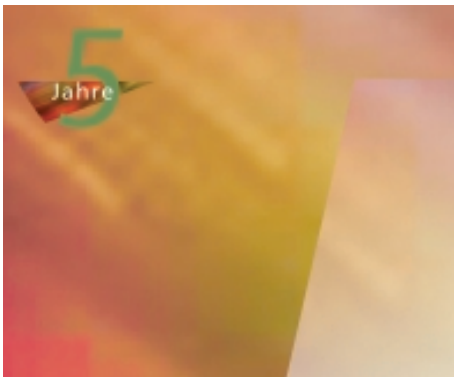




**Fraunhofer**

Institut  
Experimentelles  
Software Engineering



Annual Report 2001

© 2002 Fraunhofer IESE



## Imprint

### Editorial Board:

Dr. Frank Bomarius

Claudia Campbell, M.A.

Dipl.-Dolm. Sonnhild Namingha

Dipl.-Inform. Petra Steffens

### Layout and Graphics:

Grimm & Lang Partnerschaft

Dipl.-Designer, Kaiserslautern

### Printing:

Rohr Druck GmbH, Kaiserslautern

### Photography:

Fraunhofer IESE

view – die agentur, Kaiserslautern

Annual Report of the  
Fraunhofer Institute  
for Experimental Software  
Engineering IESE  
2001

Fraunhofer Institute for  
Experimental Software  
Engineering

Sauerwiesen 6  
67661 Kaiserslautern  
Germany

Phone +49 (0) 6301 707 100  
Fax +49 (0) 6301 707 200

E-Mail [info@iese.fhg.de](mailto:info@iese.fhg.de)  
Internet <http://www.iese.fhg.de>



The highlight of the year 2001 was the fifth anniversary of our institute on March 8. In the historical setting of the "Fruchthalle", Kaiserslautern's convention hall, past achievements were celebrated, successful industrial collaboration projects were illustrated, and future trends and challenges in Software Engineering were discussed. Among the official guests for the anniversary celebration were notables from the world of politics, science, industry, and education, including Mr. Kurt Beck, Minister President of the State of Rhineland-Palatinate. The Fraunhofer-Gesellschaft was represented by its president, Prof. Hans-Jürgen Warnecke; the University of Kaiserslautern by its president, Prof. Günter Warnecke, and the City of Kaiserslautern by its Lord Mayor, Mr. Bernhard Deubig. The welcoming speakers pointed to the rapid growth and achievements of the institute within a brief five years. They also commented on the reputation IESE has achieved within the international scientific and industrial communities as a competence center for Software Engineering. Furthermore, the speakers clearly recognized the significance of the contributions made by IESE employees to the success of the institute.

The anniversary celebration continued with the presentation of four successful industrial IESE projects. Stefan Schulze-Hausmann, a research journalist with the German National TV station ZDF, was the moderator for this section. The presentations included projects on:

- Industrial Training of Software Professionals (presented by IESE project leader Christiane Differding together with Dr. Michael Strugala, Bosch Blaupunkt, and Mr. Hanswilli Jung, Director of the Kaiserslautern Employment Bureau)
- Transfer of Software Engineering Technology to Local Small and Mid-sized Companies (presented by IESE project leader Maud Schlich together with Horst Degen-Hientz, Vice President of Q-Labs GmbH, and Dr. Carlos Lubina, Testo GmbH & Co)
- Continuous Improvement of Quality Software Development based upon Software Inspections for Allianz AG (presented by IESE project leaders Dr. Günther Ruhe and Dr. Oliver Laitenberger together with Mr. Holger Günther, Allianz AG)
- Transfer of Software Product Line and Component-based Software Development Technology to Local Companies (presented by IESE project leaders Dr. Peter Knauber and Michael Ochs together with Mr. Florian Bernauer, maxess gmbh, and Dr. Martin Verlage, Market Maker Software AG)

The afternoon sessions were highlighted by an international scientific colloquium. Some of the most internationally renowned scientists in software engineering presented their views on the future of the field, discussed specific challenges and IESE's anticipated contributions in this regard. The colloquium participants included Prof. Victor Basili, University of Maryland, USA, Prof. Manfred Broy, Technical University of Munich, Germany, Prof. Werner Mellis, University of Cologne, Germany, and Prof. Peter Freeman, Georgia Institute of Technology, USA. The session was concluded by a panel discussion.

Additional significant developments and events in 2001 included:

- changes in the leadership structure of IESE,
- continued growth of third party revenues,
- increased collaboration with the University of Kaiserslautern,
- establishment of the German National Competence Center for Software Engineering, VISEK,
- intensified collaboration with international partners,
- scientific accomplishments and recognitions,
- the initial planning for the new institute building,
- and the Annual Fraunhofer Meeting in Mainz.

During 2001, external project income was maintained at about 80% of all financing, an achievement in light of the overall economic recession. All IESE employees contributed to this excellent performance through their outstanding research and project performance, as seen by the high number of Ph.D. degrees completed during 2001 and the numerous publications in international conferences and journals. This excellence is also reflected by the high number of repeat contracts and long-term strategic collaborations with industry, as well as by numerous awards. Ph.D. degrees were awarded to Christiane Differding, Erik Kamsties, Antje von Knethen, Jürgen Münch, Dietmar Pfahl, and Isabella Wiczorek (who received the award for the best Ph.D. thesis in 2001 of the University of Kaiserslautern). Dr. Volker Hübsch, Dr. Reinhard Schwarz, and Stephan Groß received the Innovation Award 2001 of the State of Rhineland-Palatinate for the IT security tool NIXE™.

In 2001, the leadership structure of Fraunhofer IESE changed due to the departure of Dr. Günther Ruhe (deputy director since the beginning of the institute), who was chosen for the chair of Software Engineering at the University of Calgary, Canada. Dr. Frank Bomarius, deputy director of the institute, took over Dr. Ruhe's responsibilities as director for project and research coordination, and Mr. Holger Westing was employed as managing director for personnel, budget and internal services. The new board of directors reflects the change of IESE to an institute combining scientific and business competence. Dr. Paul Clements, Software Engineering Institute, Pittsburgh, USA, Prof. Mary Shaw, Carnegie Mellon University, Pittsburgh, USA, and Prof. Mike Cusumano, Massachusetts Institute of Technology (MIT), Boston, USA were added to the external advisory board. Thus, all competence areas of IESE are now represented in its advisory board.

The Federal Government (the Ministry for Education and Research – BMBF) selected IESE as the coordinator of Germany's National Competence Center for Software Engineering, titled VISEK. This competence center strives to integrate German research competencies in Software Engineering. Empirically tested research results (in the form of languages, methods and tools) are organized and presented via an Internet portal for efficient transfer to industrial users – especially small and mid-sized companies. VISEK initially consists of eight partners: Fraunhofer Institutes in Berlin, Bonn, Kaiserslautern, and Karlsruhe, Offis in Oldenburg, the Technical University in Munich, and the University in Cottbus. The BMBF supports the development phase of VISEK with more than seven million Euro in financial resources.



Kurt Beck, Minister President of the State of Rhineland-Palatinate, at the 5-year anniversary celebration of Fraunhofer IESE.



Presenting the project on Software Inspection for Allianz AG: moderator S. Schulze-Hausmann, Holger Günther, Allianz AG, IESE project leaders Dr. O. Laitenberger and Dr. G. Ruhe (from left to right).



Participants of the scientific colloquium: Prof. V. Basili, Prof. M. Broy, Prof. D. Rombach, Manfred Roux, Prof. W. Mellis, Prof. P. Freeman (from left to right).



Discussing Software Engineering solutions at Fraunhofer Center Maryland: Kathleen Dangle, Dr. M. Lindvall, and Tricia Larsen (from left to right).



IESE presents its competencies and services at the Fraunhofer Annual Meeting in Mainz.

IESE has intensified its links with the University of Kaiserslautern, especially its Computer Science Department. In addition to IESE's Executive Director holding a chair in the department and graduate students producing Master's and Doctoral dissertations at IESE, a series of new collaborations has been introduced in 2001. IESE has sponsored five stipends for first-semester students in the Computer Science Department. In addition, project courses in collaboration with local companies are being offered to students of applied computer science. Moreover, academic personnel of the Computer Science Department now lend their expertise as scientific advisors: Prof. Jürgen Nehmer for the area of IT security and Prof. Michael Richter for the area of knowledge management. In the future, even closer relationships are anticipated that will benefit both the department and IESE.

The Fraunhofer Virtual Institute for Experimental Software Engineering (FVIESE), consisting of IESE in Kaiserslautern and the Fraunhofer Center for Experimental Software Engineering in Maryland (FC-MD), has been further strengthened during 2001. FC-MD has grown into one of the largest and – scientifically and financially – most successful Fraunhofer centers in the U.S. The excellent reputation of FC-MD is documented by grants from NASA, NSF, and other publicly funded agencies, from major corporations like Motorola and Lucent as well as from small local firms in the State of Maryland. In addition, FC-MD has established collaborations with many international partners, including the Software Engineering Institute and Carnegie Mellon University in Pittsburgh, USA; VTT in Finland; the University of New South Wales in Sydney,

Australia; and many other members of the international network ISERN. These international collaborations provide the groundwork for joint research and international industry projects to FVIESE and to all participants. In addition, exchange programs offer the opportunity for personal advancement and learning for both students and researchers.

In 2001, the Annual Meeting of all 56 Fraunhofer Institutes was held in Mainz, the capital of Rhineland-Palatinate, to recognize the achievements of the two institutes – IESE and ITWM – in this state. This meeting showcased our competencies to numerous representatives of the scientific and industrial community.

In late 2001, plans to develop a Fraunhofer Center for the two Fraunhofer Institutes in Kaiserslautern became reality. Moving into the proximity of the University will not only increase IESE's impact on research as well as economic growth, but will also strengthen regional development by offering highly attractive conditions for start-up companies in the surrounding high-technology park, "PRE Uni Park".

On the whole, 2001 was yet another very successful year. IESE established itself as one of the leading competence centers for Experimental Software Engineering worldwide. As one of the largest concentrations of leading software engineering scientists, IESE promotes an exciting work environment, offers world-class research results, and boasts successful industrial projects. Continuous commitment by all employees guarantees our successful future. I wish to also recognize our deputy directors, the entire leadership personnel as well as the advisory board mem-

bers for their invaluable teamwork and dedication to IESE. Finally, I thank our industrial partners for their long-term trust in our competence and promise to continue to **make their needs our top priority**.

Kaiserslautern, January 2002



Prof. Dr. Dieter Rombach  
Executive Director of the Fraunhofer  
Institute for Experimental Software  
Engineering IESE



Project leader Ralf Kempkens presents the ViSEK portal.



The Innovation Award 2001 winners from IESE with Minister Bauchhage: Prof. D. Rombach, Dr. V. Hübsch, Minister H.-A. Bauchhage, Stephan Groß, and Dr. R. Schwarz (from left to right).



Signing the Property Contract to establish a Fraunhofer Center in Kaiserslautern: the Lord Mayor of Kaiserslautern, B. Deubig; the Notary; and the President of the Fraunhofer-Gesellschaft, Prof. H.-J. Warnecke (from left to right).



Dr. I. Wieczorek received the award for the best Ph.D. thesis in 2001 of the University of Kaiserslautern.

## Profile of Fraunhofer IESE



## Core Competencies



|                                     |    |  |    |
|-------------------------------------|----|--|----|
| Vision and Mission                  | 12 | Core Competencies – an Overview                            | 22 |
| IESE and its Network Partners       | 14 | Experimentation  | 24 |
| Structure                           | 16 | Quality Software Development                               | 28 |
| Advisory Board                      | 18 | Software Product Lines                                     | 32 |
| Development of Budget and Personnel | 19 | Quality and Process Engineering                            | 36 |
|                                     |    | Systematic Learning and Improvement                        | 40 |
|                                     |    | Certifiable Education and Training in Software Engineering | 44 |



Business Areas

Fraunhofer Center for Experimental  
Software Engineering, Maryland

Appendix



|                                     |    |                                   |    |                                 |     |
|-------------------------------------|----|-----------------------------------|----|---------------------------------|-----|
| Business Areas – an Overview        | 50 | Profile                           | 72 | Network in Science and Industry | 84  |
| Software Development                | 52 | Projects in Progress              | 73 | Professional Contributions      | 87  |
| Software Project Management         | 56 | Consortia                         | 76 | Scientific Publications         | 96  |
| Software Improvement Management     | 60 | FC-MD in Figures                  | 77 | Awards                          | 105 |
| Software Competence Management      | 64 | Network, Activities, Publications | 78 | Events                          | 106 |
| Software-based Business Development | 68 |                                   |    | Media Coverage                  | 108 |
|                                     |    |                                   |    | The Fraunhofer-Gesellschaft     | 112 |
|                                     |    |                                   |    | Fraunhofer VIESE Locations      | 114 |
|                                     |    |                                   |    | Fraunhofer IESE Contact Persons | 116 |
|                                     |    |                                   |    | Information Service             | 119 |



# Profile of Fraunhofer IESE



|                                     |    |
|-------------------------------------|----|
| Chapter Contents                    |    |
| Vision and Mission                  | 12 |
| IESE and its Network Partners       | 14 |
| Structure                           | 16 |
| Advisory Board                      | 18 |
| Development of Budget and Personnel | 19 |

Over the past decades, software has become the major "enabling technology" of almost all high-tech product and service industries. These industries can not function without software. Furthermore, the number of product and service features implemented in software continues to increase. Consequently, competitiveness and market success for the majority of industries (telecommunication, car manufacturing, trade, banking, insurance, and other service domains) depend directly upon their competence to develop, purchase, and use software. This is underlined by the fact that in 1999, the German market for software and IT services was worth 30 billion Euro, and an additional 26 billion Euro was generated for software development.

Our vision is that software competence (development, purchase, and use) will become the number one supporting factor for all high-tech product and service companies. This software competence must be developed, managed, and continuously optimized according to well-defined business goals. Industrial examples demonstrate that the effective transfer of new human-based software development technologies requires "experimentation". This experimentally driven transfer approach (i.e., application of the engineering paradigm – plan, do, check, act – to software development) guarantees sustained improvements and, thereby, return of investment. More and more companies will seek external help in order to align their software competencies with their strategic business goals.

Fraunhofer IESE seeks to become one of the preferred industrial partners for contract research and transfer of innovative technologies in the area of software competence. In addition, we strive to become one of the preferred independent competence centers for assessment, studies, and predictions of market and technology trends in the area of software engineering. For that, we offer collaboration to companies in all major business sectors, of all sizes, and in all regions worldwide. We anticipate being recognized as the globally leading applied research and technology transfer center in the area of (experimental) software engineering.

Our primary mission at Fraunhofer IESE is to provide unique and value-adding solutions to our industrial customers. We do this by establishing software improvement programs, by transferring innovative state-of-the-art software technologies, and by performing cooperative research to advance such state-of-the-art technologies. Furthermore, we establish software competence improvement programs, perform studies and assessments, and educate and train software professionals. In addition, we promote experimental software engineering as a proven successful approach for introducing and sustaining engineering-style rigor into industrial software development practice. We advance the state-of-research in software engineering by evaluating promising new technologies experimentally, by developing new technologies based on industrial needs, by packaging proven new technologies for specific customer needs, and by collecting cost/benefit data demonstrating the benefits of new technologies in practice.

Fraunhofer IESE strives to maintain and continuously improve its position with its current as well as with potential industrial partners. Therefore, we consistently monitor our customers' needs, investigate new emerging areas of software engineering, develop promising technologies towards industrial strength, and, finally, transfer these new technologies into industrial practice. This enables our industrial customers to develop needed and sought after software engineering competence in a timely fashion.



The Fraunhofer IESE staff

## The Fraunhofer Virtual Institute

The Fraunhofer Virtual Institute (FVIESE) is comprised of two partner institutions: the Fraunhofer Institute for Experimental Software Engineering (IESE) in Kaiserslautern, Germany and the Fraunhofer Center for Experimental Software Engineering, Maryland (FC-MD) in College Park, Maryland, USA. Both institutions are legally independent units under the Fraunhofer Gesellschaft e.V., Germany and Fraunhofer USA, Inc. The institute directors, Prof. Dieter Rombach and Prof. Victor Basili, coordinate FVIESE.

## Collaborations

Fraunhofer IESE collaborates with technology providers, technology-transfer customers, and strategic partners in national and international cooperations with the purpose of furthering the development of Software Engineering Technology and transferring it into industrial practice.

## International Research Networks

Fraunhofer IESE is a member in several international research networks. The International Software Engineering Research Network (ISERN) with about 27 scientific and industrial members plays a significant role in IESE's international research cooperation. ISERN is a forum for applied Software Engineering researchers to exchange the latest insights and findings in Software Engineering. Leading research institutions within ISERN include: the University of New South Wales, Australia, FC-MD, Maryland, USA, Lund University, Sweden, Tor Vergata University, Rome, the University of Bari, Italy, the University of Strathclyde, Scotland, the University of Hawaii, the University of Maryland, the Nara Institute of Science and Technology, Japan, and VTT in Oulu, Finland. Fraunhofer IESE coordinates the ISERN network. In addition, IESE is a member of the Center for Empirically Based Software Engineering (CeBASE), a project of the National Science Foundation (NSF), USA. Other CeBASE members include the Universities of Maryland, Southern California, Mississippi, and Nebraska.

Bilateral research and exchange programs for students and scientists exist with renowned institutions, such as the University of Maryland's Experimental Software Engineering Group, the University of Southern California's Center for Software Engineering, the Software Engineering Institute (SEI) at Carnegie Mellon University, Pittsburgh, Carleton University in Toronto, the University of Calgary, Canada, the Center for Empirical Software Engineering Research (CESER) at the University of New South Wales, Sydney, and the Software Quality Institute at Griffith University in Australia.



## Publicly-funded Collaborations

On the European level, Fraunhofer IESE coordinates the Experimental Software Engineering Research Network (ESERNET). The main objective of ESERNET is to establish and maintain a European leadership in Experimental Software Engineering as an essential catalyst for fast and sustained improvement of European software competencies. It is funded by the European Commission.

In addition, collaborations within several other publicly-funded consortia exist. These aim either at Software Engineering technology advancement or at dissemination of best practices and technology transfer. Bilateral industrially-funded collaborations often result from these projects. Public project sponsors include the Government of the State of Rhineland-Palatinate, the Federal Government of Germany, and the European Commission.

## Industrially-funded Collaborations

The industrial cooperation partners of Fraunhofer IESE range from large global players to small regional companies. They can be roughly grouped into four categories:

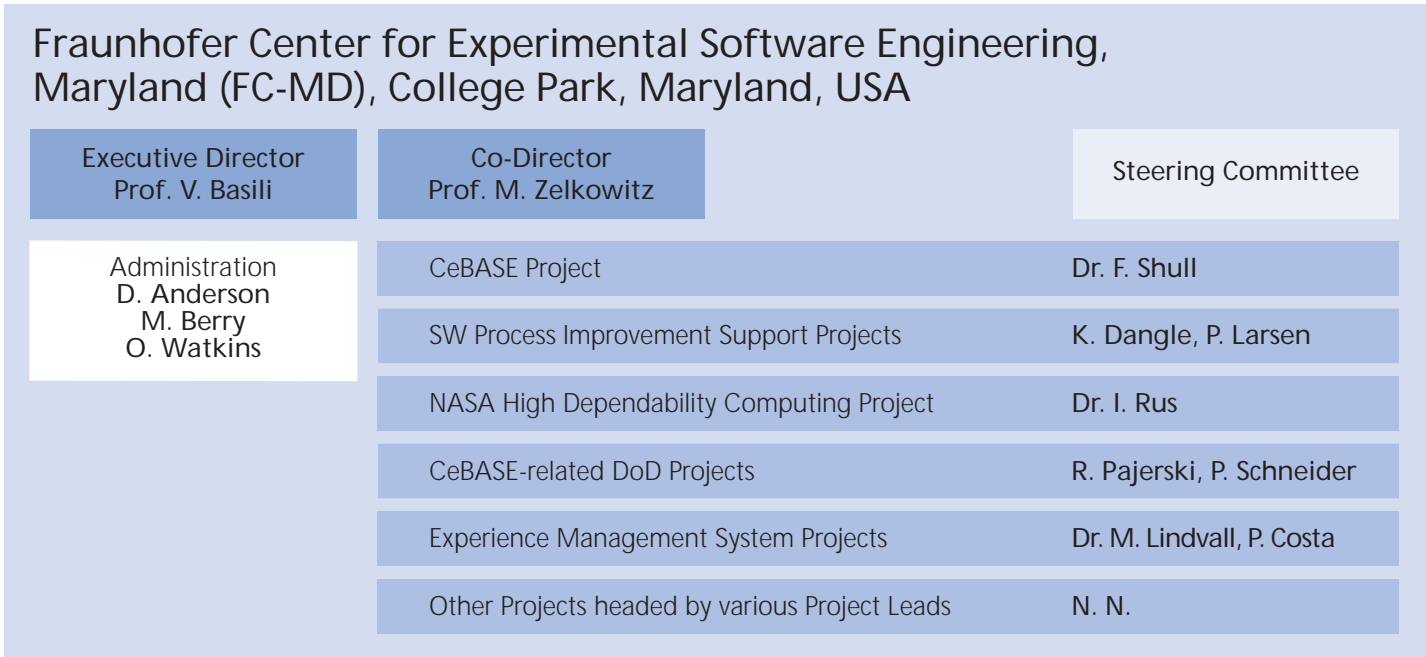
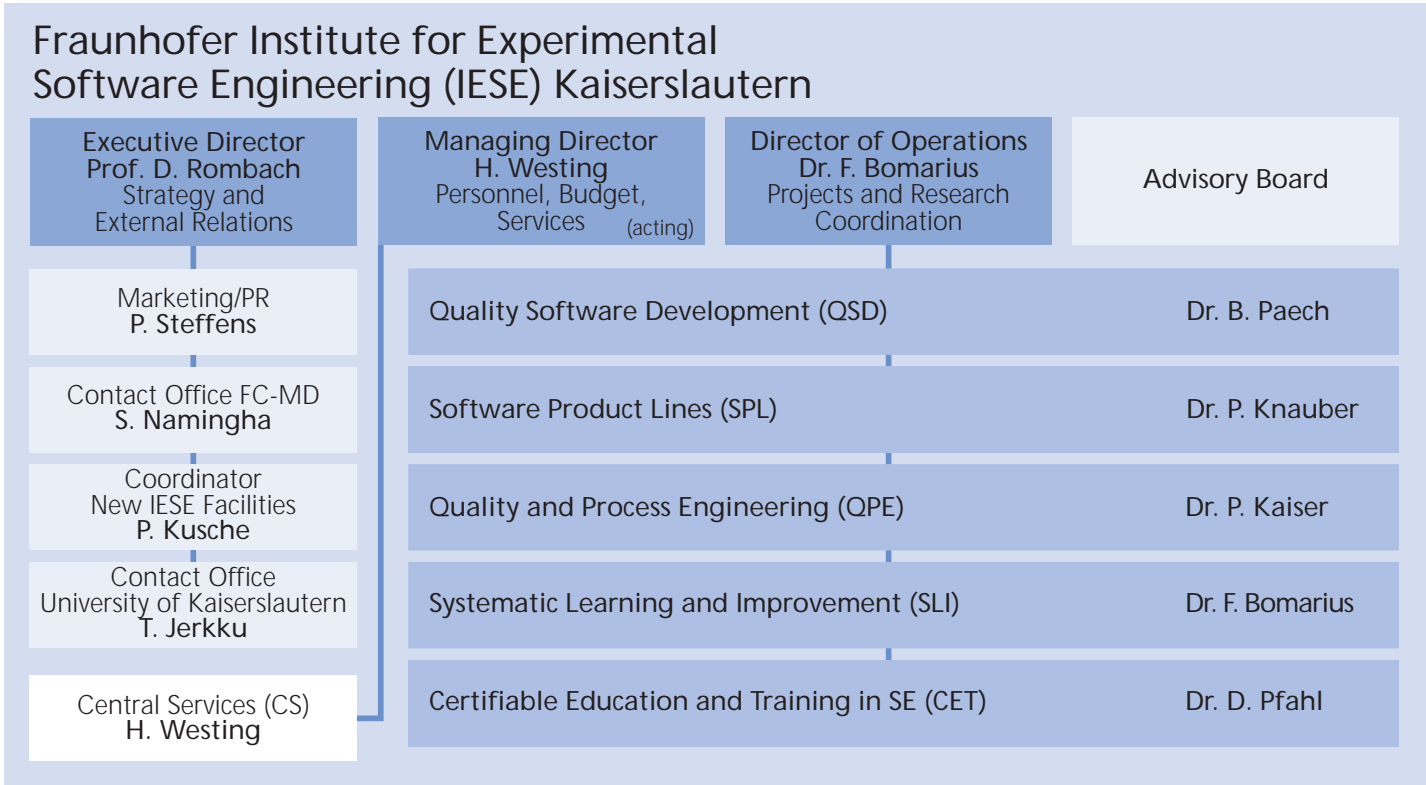
- Large national and international companies that seek help in their mid- to long-term endeavor of quality improvement in software development.
- Large national and international companies that can afford their own R & D departments and that search for competent research partners.
- Medium-size companies that want to set up improvement programs or have to implement technology changes under very tight budget and schedule constraints.
- Small companies that need ready-to-use, proven technology that yields short-term return on investment.

In addition to bilateral collaborations, Fraunhofer IESE and FC-MD have jointly started a multinational consortium of international companies - the Software Experience Center (SEC). In SEC, member companies team up to advance their software engineering competencies on a global scale, i.e., across different sites and business units and in collaboration with other leading companies in the field as well as in other application domains.

## Specialized Services for SMEs

The Competence Center for Software Technology and Training (KSTW) offers services specifically tailored to small and midsize companies. The core offering is focused on base practices in software engineering such as requirements engineering, systematic testing, inspections, etc. KSTW's Software Competence Kit ("Baukasten Software Kompetenz") allows tailored consulting services including the following elements: moderated self-assessment workshops, systematic business process modeling, problem analysis based on ISO 15504/SPICE, and tailored staff qualification.

|   |                                     |
|---|-------------------------------------|
| <h2 style="margin: 0;">Fraunhofer Virtual Institute for Experimental Software Engineering (FVIESE)</h2> | Prof. V. Basili<br>Prof. D. Rombach |
|---|-------------------------------------|



Organizational Charts of the FVIESE institutes: Fraunhofer IESE and FC-MD



To ensure highly effective and efficient execution of daily operations, the FVIESE institutes - Fraunhofer IESE and FC-MD - are organized into several departmental units and staff groups, which constitute the institutes' line structures. The IESE line structure is complemented by a two-dimensional matrix structure.

One dimension of this matrix structure is assigned to so-called "core competencies", each of which focuses on a cluster of related research themes. The other dimension is allocated to so-called "business areas", each of which is motivated by a class of related customer problems. The core competencies are dedicated to developing inno-

vative software engineering methods, technologies, and tools, to proving their benefit, and to packaging research results. This work is typically carried out within public or Fraunhofer base-funded projects. While the core competencies thus prepare the ground for technology transfer, the business areas are devoted to applying the technologies in industrial practice and to initiate their large-scale roll-out.

Business areas are thus responsible for acquiring, setting up, and monitoring industrial projects, for continuously observing and analyzing market needs, for spotting new business opportunities, and for feeding market requirements back to the core competencies.

Each IESE scientist belongs to one core competency and is dynamically assigned to business area projects. Business areas are thus virtual units with no personnel resources of their own (apart from the business area manager), which draw upon the core competencies for staffing customer projects.

One member of the IESE advisory board is assigned to each core competence and each business area, in order to provide advice and guidance on strategic research or market-related issues.

| CC \ BA   | Experimentation<br>Dr. Oliver Laitenberger   | Quality Software Development<br>Dr. Barbara Paech | Software Product Lines<br>Dr. Peter Knauber | Quality & Process Engineering<br>Dr. Peter Kaiser | Systematic Learning & Improvement<br>Dr. Klaus-Dieter Althoff | Certifiable Education & Training in SE<br>Dr. Dietmar Pfahl |   |
|---|--|---|---|---|---|---|---|
| SW Development<br>Dr. Peter Knauber                 |  |   |   |   |   |   | Advisory Board Member<br>Dr. Michael Strugala   |
| SW Project Management<br>Ralf Kempkens              |  |   |   |   |   |   | Advisory Board Member<br>Dr. Thomas Wagner      |
| SW Improvement Management<br>Ralf Kempkens          |  |   |   |   |   |   | Advisory Board Member<br>Dr. Thomas Wagner      |
| SW Competence Management<br>Andreas Jedlitschka     |  |   |   |   |   |   | Advisory Board Member<br>Dietmar Freigang       |
| SW-based Business Development<br>Dr. Frank Bomarius |  |   |   |   |   |   | Advisory Board Member<br>Prof. Michael Cusumano |
|   | Advisory Board Member<br>Prof. Victor Basili | Advisory Board Member<br>Prof. Manfred Broy       | Advisory Board Member<br>Dr. Paul Clements  | Advisory Board Member<br>Prof. Victor Basili      | Advisory Board Member<br>Prof. Werner Mellis                  | Advisory Board Member<br>Prof. Mary Shaw                    |   |

The line structure of Fraunhofer IESE is complemented by a two-dimensional matrix structure of core competencies (CC) and business areas (BA).

## Research

### Prof. Victor R. Basili

Institute for Advanced Computer Science  
Department of Computer Science  
University of Maryland  
College Park, MD  
USA

### Prof. Manfred Broy

Institute for Computer Science  
Technical University of München,  
München

### Dr. Paul C. Clements

Software Engineering Institute (SEI)  
Pittsburgh, PA  
USA

### Prof. Michael A. Cusumano

Massachusetts Institute of Technology  
Sloan School of Management  
Cambridge, MA  
USA

### Prof. Werner Mellis

University of Köln,  
Köln

### Prof. Jürgen Nehmer

Department of Computer Science  
University of Kaiserslautern,  
Kaiserslautern

### Prof. Mary Shaw

Carnegie Mellon University  
Pittsburgh, PA  
USA

### Prof. Günter Warnecke

President,  
University of Kaiserslautern,  
Kaiserslautern

## Industry

### Prof. Ernst Denert

Chief Executive Officer  
IVU Traffic Technologies AG  
Berlin

### Dietmar Freigang

Director Information Systems  
Allianz-Lebensversicherung AG  
Stuttgart

### Monika Gonauser

Department Head  
Siemens AG  
München

### Wolfgang Jung

Head of Development Center  
T-Systems NOVA  
Innovationsgesellschaft mbH  
Saarbrücken

### Günther Plapp

Technical Director  
Robert Bosch GmbH  
Stuttgart

### Dr. Michael Strugala

Blaupunkt Werke GmbH  
Hildesheim

### Dr. Thomas Wagner

Robert Bosch GmbH  
Stuttgart

### Dr. Martin Verlage

MARKET MAKER Software AG  
Kaiserslautern

## Government

### Brigitte Klempt

Director, Department of Research and Technology Transfer  
Ministry of Education, Science and Continuing Education of the State of Rhineland-Palatinate  
Mainz

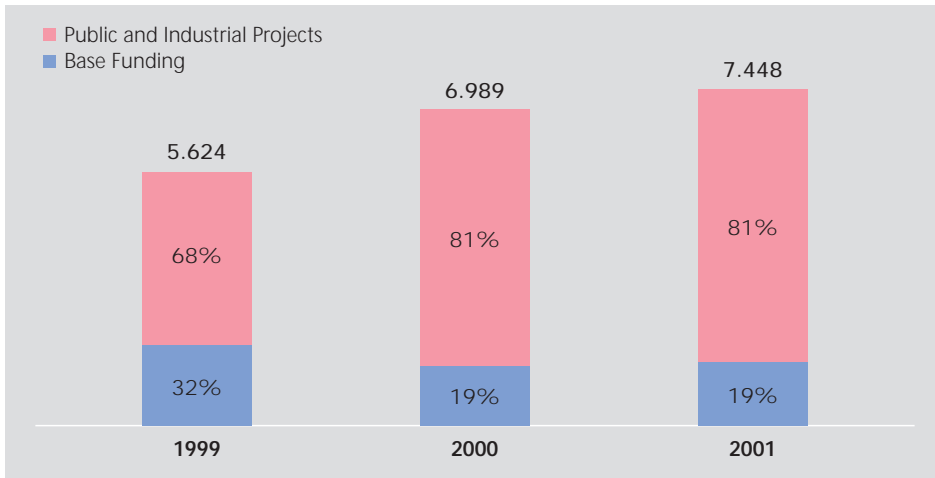
### Dr. Ulrich Müller

Director, Department of Research, Technology, and Media  
Ministry of Economic Affairs, Transportation, Agriculture and Viniculture of the State of Rhineland-Palatinate  
Mainz

### Dr. Bernd Reuse

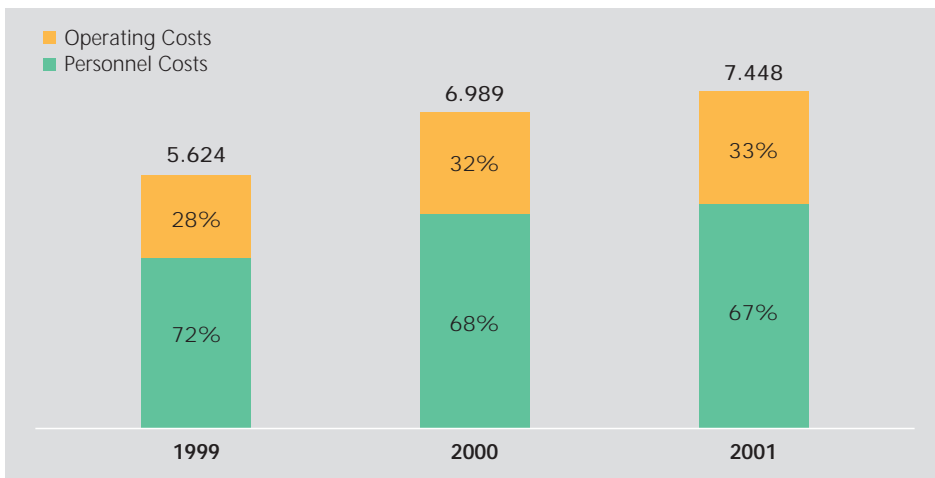
Director, Division on Promotion of Information Processing  
Federal Ministry of Education, Research, Science and Technology (BMBF)  
Bonn

# Development of Budget and Personnel

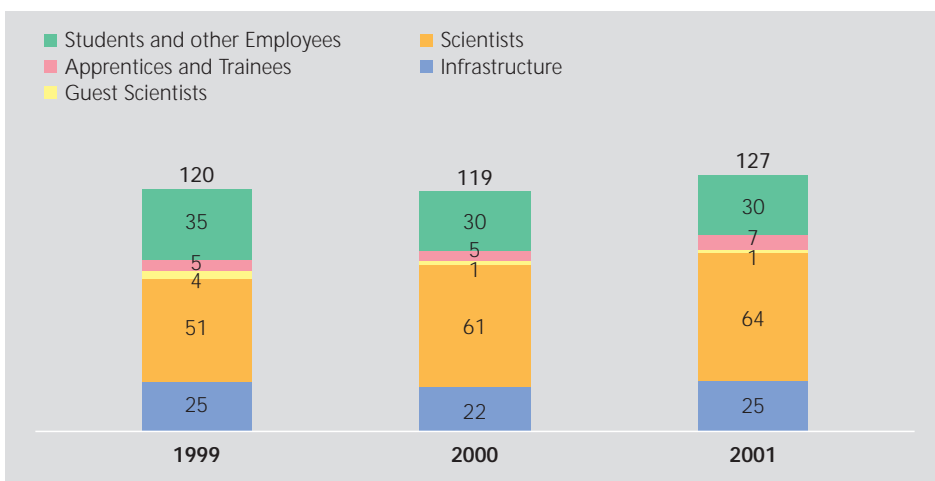


Development of Budget (in T EUR)

The growth in terms of staff was continued throughout 2001. By the end of 2001, IESE employed 89 regular employees, 1 guest scientist, 30 students, 4 apprentices, and 3 trainees. Since at any point in time, approximately 20% of the staff comes from abroad, the institute maintains a unique international flavor. The plan is to grow to about 100 full-time employees by the end of the year 2002.



Development of Costs (in T EUR)



Development of IESE Personnel



## Chapter Contents

|   |    |
|---|----|
| <b>Core Competencies – an Overview</b>                            | 22 |
| <b>Experimentation</b>  | 24 |
| Overview  | 24 |
| GQM – a Method for Experimentation                                | 26 |
| <b>Quality Software Development</b>                               | 28 |
| Overview  | 28 |
| FINE – a Technology for Defect Cost Reduction                     | 30 |
| <b>Software Product Lines</b>                                     | 32 |
| Overview  | 32 |
| Planning Software Product Lines – The Scoping Technology          | 34 |
| <b>Quality and Process Engineering</b>                            | 36 |
| Overview  | 36 |
| Buy-IT – a Methodology for Purchased-based Software Development   | 38 |
| <b>Systematic Learning and Improvement</b>                        | 40 |
| Overview  | 40 |
| NIXE™ – a Tool for Security Audits                                | 42 |
| <b>Certifiable Education and Training in Software Engineering</b> | 44 |
| Overview  | 44 |
| IntView – an Integrated Approach to Courseware Engineering        | 46 |

## Core Competencies – an Overview

### Experimentation

Study Type Selection

Design of Empirical Studies

Study Analysis

Result Packaging



Experimentation represents the backbone of IESE products and services. It offers internal and external services for determining the qualitative and quantitative strengths and weaknesses of software development technologies. The focus of this core competence is the selection of study types, the design of empirical studies, study analysis, and result packaging.

#### Contact

Dr. Oliver Laitenberger  
 Phone +49 (0) 6301 707 211  
 Fax +49 (0) 6301 707 200  
 E-Mail [laiten@iese.fhg.de](mailto:laiten@iese.fhg.de)

### Quality Software Development

Requirements Engineering

Software Design

Inspections and Testing



Quality Software Development provides methods for building software in a systematic way, so that quality requirements can be guaranteed. Special emphasis is on requirements engineering, object orientation in general and UML in particular, componentware, and testing and inspections.

#### Contact

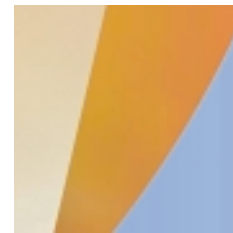
Dr. habil. Barbara Paech  
 Phone +49 (0) 6301 707 211  
 Fax +49 (0) 6301 707 200  
 E-Mail [paech@iese.fhg.de](mailto:paech@iese.fhg.de)

### Software Product Lines

Scoping and Modeling

Architecture Development and Evaluation

Architecture Recovery



Software Product Lines extends the systematic development of quality software development to the area of families of software systems. Families are the most efficient way to software reuse, exploiting synergy effects from managing several similar products as a whole instead of doing redundant work for several separate products.

#### Contact

In 2001: Dr. Peter Knauber  
 Since Feb. 2002: Dirk Muthig (acting)  
 Phone +49 (0) 6301 707 251  
 Fax +49 (0) 6301 707 202  
 E-Mail [muthig@iese.fhg.de](mailto:muthig@iese.fhg.de)

**Quality and Process Engineering**

Goal-oriented Assessment and Measurement

Process Engineering and Technology

Cost and Quality Engineering



Quality and Process Engineering provides the methods to instrument development processes in such a way that relevant process attributes (cost, quality, risk) as well as product qualities can be measured and modeled. This lets managers and developers understand, monitor, control, improve, and finally predict their software development projects, processes, and products.

**Contact**

Dr. Peter Kaiser

Phone +49 (0) 6301 707 251

Fax +49 (0) 6301 707 202

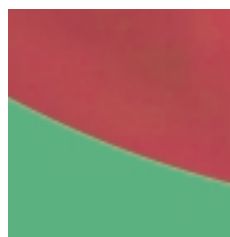
E-Mail [kaiser@iese.fhg.de](mailto:kaiser@iese.fhg.de)

**Systematic Learning and Improvement**

Experience Factory and Organizational Learning

Systematic Improvement

Information Technology Security



Systematic Learning and Improvement develops methods and tools to build tailored knowledge management systems for software development organizations that help capture and make explicit expert experiences, analysis results, and other sources of practical experiences, and packages them for reuse in other development projects.

**Contact**

Dr. habil. Klaus-Dieter Althoff

Phone +49 (0) 6301 707 121

Fax +49 (0) 6301 707 200

E-Mail [althoff@iese.fhg.de](mailto:althoff@iese.fhg.de)

**Certi fiable Education and Training in SE**

Evaluation and Certification

Technology-enabled Learning

Reuse-based Education and Training



Certi fiable Education and Training develops methods for workflow integrated education and training for software engineers. The goal is to support life-long learning and continuing education tailored to specific job profiles and individual career plans of software professionals. This is done by carefully evaluating the learning needs of the software workforce and by exploiting innovative e-learning technologies.

**Contact**

Dr. Dietmar Pfahl

Phone +49 (0) 6301 707 151

Fax +49 (0) 6301 707 203

E-Mail [pfahl@iese.fhg.de](mailto:pfahl@iese.fhg.de)

## Overview

While software has become one of the most valuable and pervasive products of the past decades, its growing complexity and size are responsible for making it one of the most challenging products to build and maintain. The challenge stems from the fact that software development belongs to the most labor- and, at the same time, knowledge-intensive processes of today's world. Hence, it is no surprise that a large variety of techniques and tools exist to support the software development activities. However, it remains unclear when to use a specific technique or tool and what consequences its usage has on the given project schedule, budget, and product quality. It is this lack of knowledge that often qualifies software development more as an art or craft rather than an engineering discipline.

To address this issue, the field of "experimental software engineering" has been established. Its main objective is to support the metamorphosis from crafting software to developing software according to engineering principles. In doing so, empirical studies, such as experiments, case studies, or surveys are conducted to investigate the strengths and weaknesses of existing software development techniques and tools.

The core competence area Experimentation at Fraunhofer IESE systematically implements the ideas of the experimental software engineering field. The term "experimentation" is used in this context in its most general sense, i.e., it is an umbrella term that covers all possible study types. The core competence area offers internal and external services on how to set up and run empirical studies. These facilitate the systematic validation of software techniques and tools.

## Study Type Selection

Different types of empirical studies can be performed to address specific research questions. Among the various types are controlled experiments, quasi-experiments, case studies, and surveys. Each of them conceptualizes empirical research in different ways. There are, for example, different views about the role of theory; also about the sequence and relationship of the activities involved. And since each of them exhibits different strengths and weaknesses, one must be careful in the selection of the specific study type. The general principle is that the research strategy must fit the goal(s) of the study. Although this principle sounds simple, its implementation allows for many pitfalls. These pitfalls are addressed in this part of the core competence area. The results of this work are more detailed guiding principles for the selection of an appropriate type of empirical study or combination of study types comprising a hybrid type as a result.

## The Design of an Empirical Study

The design of empirical studies is concerned with turning the research question into inquiries. In more detail, the design addresses the question of how to manipulate the various variables in order to investigate and examine any effects. Moreover, it links the goals of the study to questions and, finally, to concrete measures that are to be collected. Although this topic represents a crucial part of any kind of study, it is often performed without any real consideration of the issues and possibilities. As a consequence, one can often observe that the study design is inappropriate for the questions to be answered. To avoid this situation, the topic area addresses ways on how to design an empirical study appropriately. The work results provide guidance for researchers and practitioners on how to make their empirical studies successful.



Dr. Oliver Laitenberger

Competence Manager



Prof. Dieter Rombach

Executive Director



Dr. Teade Punter



Andrea Coffey

Secretary



## Study Analysis

Once an empirical study has been performed, the collected data needs to be analyzed in a systematic manner. Unfortunately, many researchers as well as practitioners in software engineering lack the knowledge on how to perform this task rigorously. To alleviate this problem, study analysis as part of our core competence Experimentation covers all questions related to data analysis. The complete portfolio ranges from the selection of appropriate statistical tests to building models that help explain observed effects. In addition, new paths for analyzing data are pursued.

## Result Packaging

The final step of an empirical study is the packaging of the material and the results. Packaging is the most essential element for communicating the findings of an empirical study. Moreover, it helps other researchers replicate an empirical study. And replication is an essential means to achieve and increase the validity and credibility of results.

This topic area therefore addresses questions related to the packaging of the results. This translates to different approaches on how to build experimental packages, but also on how to combine results of different studies using statistical techniques. Some of the latter, i.e., meta-analysis techniques, have recently gained momentum, since more researchers and practitioners perform empirical studies in similar domains and thus the need to combine the results to come up with overall conclusions has become obvious.

## Experimentation in Practice

Experimentation is an essential element of the ViSEK project (Virtuelles Software Engineering Kompetenzzentrum). One of the main objectives of ViSEK is to collect and consolidate knowledge about the latest software engineering technologies and make it publicly available for the German software industry. In the context of this project, empirical studies are the vehicle for determining the strengths and weaknesses of a specific technique, method, or tool, such as inspections, testing, or product lines. The study types include surveys, case studies and controlled experiments. The results of the empirical studies are stored together with the description of the technology. This combination represents a unique knowledge offering for software practitioners and researchers. Practitioners find useful and practical experiences with software engineering technologies. Researchers can use the results to identify areas where more investigation is required.

Experimentation is also a major issue in the ESERNET project. The overall project objective of ESERNET is to establish a world-leading network of excellence in experimental software engineering. The results are used for continuous product and process improvement as a means for improving industrial competitiveness and innovation potential. Among other activities, this project evaluates software engineering practices and packages the gained experience for reuse. Moreover, it uses empirical methods to study and facilitate the systematic introduction of new practices. The results of these activities are collected, analyzed, and published in a knowledge repository.

## Contact

Dr. Oliver Laitenberger  
 Phone +49 (0) 6301 707 211  
 Fax +49 (0) 6301 707 200  
 E-Mail [laiten@iese.fhg.de](mailto:laiten@iese.fhg.de)



## GQM - a Method for Experimentation

Measurement is needed to get better insight into empirical studies. It provides information about the relevance or the relation between techniques or processes or its resulting products. Measurement during an empirical study should be related to the goal(s) of the research. For example, when 'knowing the factors that influence risk management' is desired, an appropriate instrument should be developed that measures those factors.

However, the operationalization from abstract goals into such a measurement instrument is a complex process. It requires a proven approach when expressing goals into a set of metrics. The Goal Question Metric (GQM) paradigm is such an approach. The GQM approach enables goal-oriented measurement and context dependent measurement.

### Benefits

Goal Question Metric (GQM) is essentially a way of thinking about how to ensure that what is intended to be measured will indeed be measured. GQM states that this should be done by posing questions to make goals operational and by defining metrics to give answers to the stated questions. Doing this provides a measurement plan that is dedicated to a specific context. In addition to defining the measurement plan, GQM also pays attention to interpreting the results in order to know that the goals have been achieved.

GQM has been successfully applied in many different projects in the software industry. In Germany, it has been applied, amongst others, at Bosch, Allianz and Tenovis. GQM is also usable when evaluating software technologies. Nowadays, GQM is regarded as a method with a detailed process description and set of techniques. However, there are still issues for improvement.

The possibility of reusing measurement plans is an important issue in this context. Collecting existing measurement plans and being able to reuse them for new measurement needs will reduce the effort of applying a complete GQM program. Small and medium enterprises, especially, can benefit from this way of working. This might also benefit GQM measurement in empirical studies, e.g., when providing a proposal with metrics that are suitable for technique evaluation.

Fraunhofer IESE is therefore working on collecting and structuring measurement plans to facilitate reuse. These plans contain factors and associated metrics that are known to be important ones for a specific area, like project management or maintainability of a product. The factors defined in the existing plan are then matched during the set-up of a new measurement plan.

The measurement plans will be elaborated by working together with other research groups and industry to achieve general acceptance by the international research community. Cooperation aimed at exchanging measurement plans has started this year with the software engineering group of the University of Santa Catarina in Florianópolis (Brazil).

### GQM in Practice

The Hyper project is an example of a project where the Goal Question Metric was applied in an experimentation context. Hyper stands for "High quality of software products by early use of innovative reading techniques". It was a project at Allianz Lebensversicherung - in Stuttgart - to transfer innovative software inspection techniques to the Allianz Euro conversion projects. A new inspection technique, so-called perspective-based inspections, was introduced. The technique tells inspection participants what to look for and how to scrutinize a software artifact for defects. Although numerous controlled experiments have shown the new inspection technique to be particularly cost effective, few results were reported on its use in the context of a development project.

Goals and associated questions were defined to determine the effectiveness of PBR:

- How profitable are inspections?
- Do inspections decrease the number of analysis and design defects detected in testing?
- Do inspections reduce the testing and rework effort?

A measurement program - consisting of questions and metrics - was derived for these questions. The application of this program provided amongst others the following results. With inspections, defects were already detected in the originating phase. In the two projects where inspections were applied, 72%, respectively 100%, of the analysis defects were found as well as 25%, respectively 51%, of the design defects. Inspections were also profitable. Of course, initially it cost more effort to conduct the inspections in early phases of the regular development activities. However, the estimated effort savings due to reduced defect correction effort in later phases were twice the amount of the cost.

The Hyper project shows that GQM is a useful way of structuring measurement in a case study. Doing this makes it possible to make the effectivity of a specific technique visible. Of course, in case of malfunctioning inspections, the GQM measurement would have shown this, too. This makes the approach an essential part of empirical studies. Every project can be approached with GQM to make it into a case study.

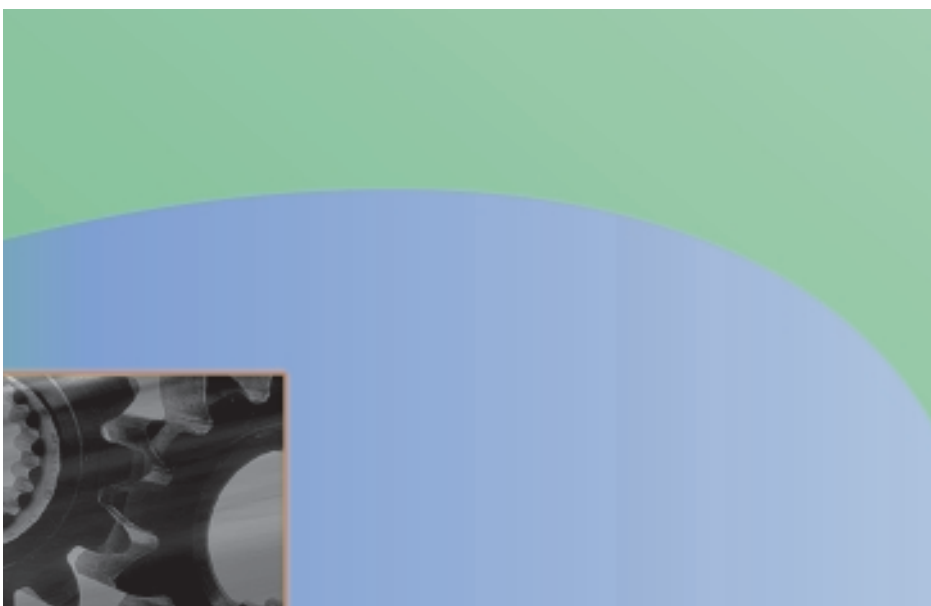
### Services Offered

Transfer of the GQM approach to companies is done in several ways. It is possible to start with a tutorial on GQM. These tutorials are given regularly by IESE experts to unveil the GQM method and its techniques. Measurement experiences illustrate the half, full or multiple day(s) tutorial.

Another possibility is the coaching of a company in conducting a GQM program. IESE experts are then involved in giving advice on how to conduct GQM measurement, for example, on how to start a GQM process, how to select the appropriate metrics as well as how to choose techniques to get the measurement implemented. Industrial transfer might also include advice on how to continue measurement after implementing GQM measurement.

### Contact

Dr. Teade Punter  
 Phone +49 (0) 6301 707 251  
 Fax +49 (0) 6301 707 202  
 E-Mail punter@iese.fhg.de



## Overview

Quality is a critical property of any software system. The perceived quality of a system depends on the nature of the application domain. In the case of safety critical systems, for example, reliability is a crucial aspect of quality, while in the case of a desktop development tool, extensibility is likely to be of major concern. In addition, quality depends on the project context. The functionality sufficient for a small company might not be adequate for a large company.

One common misconception is that quality can be "tested into" a software system after the bulk of the development has been completed. In practice, however, defects detected late in the life cycle require significant rework effort. Only through continuous application of tailored engineering and design techniques at all stages in the life cycle, and through the systematic capture and communication of the resulting knowledge about the system, can the quality goals be attained in a cost-effective way.

The Quality Software Development (QSD) core competence area provides a portfolio of synergistic software engineering techniques that individually, or collectively, help to improve quality software development significantly.

## Component-based Product Line Engineering with UML

Component-based software engineering promises to revolutionize the way in which software systems are developed and maintained. However, contemporary component technologies such as COM+/.NET, EJB/J2EE and CORBA only support components in the final, implementation-oriented stages of development, leaving the earlier stages of analysis and design to be organized in largely traditional, not component-oriented ways. The method developed at IESE supports a model-driven, UML-based representation of components, and a product line approach to their application and deployment. This enables the benefits of component-based development to be realized throughout the entire software life cycle, and allows the reusability of components to be significantly enhanced.

One major benefit of this approach is that components are described in a way that is independent of any specific implementation technology. This separation of concerns, in turn, facilitates a gradual, incremental introduction of component and product line development ideas. A company can start simply by introducing component-oriented UML models of their existing system, and then over time gradually add product line concepts and new implementation technologies.

## Requirements Specification and Management

The success or failure of corporations depends on how well they meet their customers' expectations. Different industrial studies show that one of the major problems with computer-based system development is insufficient handling of requirements. Current practice often neglects the fact that high investments in the requirements phase pay off during the entire development. For example: user acceptance of a system increases through continuous involvement during requirements capture. Requirements documents are an effective means of communication between customers, designers and testers. Requirements specifications support project management, because they can be traced to design or code components.

The RE-KIT method (Requirements Engineering with emphasis on Knowledge Management, Interface Specification and Traceability) developed at IESE, offers methodological and operational support for all requirements engineering activities. Major benefits of RE-KIT are: RE-KIT takes the specific properties and needs of different application domains into account. In particular, it has been validated within the context of business systems and embedded systems. RE-KIT ensures that the requirements engineering process serves the interests of all parties involved. RE-KIT views requirements as "living knowledge", which accumulates over time and which contributes to the



Dr. habil.  
Barbara Paech



Prof. Colin  
Atkinson



Dr. Christian  
Bunse



Dr. Victoria  
Cengarle



Dr. Hans-Gerhard  
GroB



Dr. Erik Kamsties



Daniel Kerkow

Competence Manager

entire product development process. The different components of RE-KIT can be applied individually or in conjunction with each other. Thus, it is possible to incrementally introduce requirements specification and management practices into an organization.

### Defect Cost Reduction through Inspection and Testing

Software development is an activity that heavily depends on human interaction and input, and as a consequence, it is inherently prone to error. To attain adequate quality, therefore, techniques are needed to identify and remove defects in software systems. The QSD core competence area focuses on two techniques that reduce the cost of defects: inspection and testing. These have been shown experimentally to complement each other. Inspections involve the static examination of software documents, while testing involves their dynamic execution under controlled conditions.

Inspections are particularly effective because they make it possible to identify and remove defects early in the development process, before they have caused too much damage. They are consequently applicable in all stages of development, including requirements analysis and design. Based on its long and outstanding experience with the transfer of inspections into industry, IESE has developed its own inspection technology, FINE (Fraunhofer Software Inspections), which is described in detail on the following two pages. Testing is

not only particularly well suited for uncovering defects that only become apparent when a software system executes, but also for demonstrating effectively that, at run time, the software will abide by predefined quality criteria. However, well-established traditional testing techniques do not sufficiently address the characteristics of modern software technologies such as component-based system development, or distributed, embedded, and real-time systems.

IESE is developing an integrated method for the design and testing of object-oriented systems that exploit the power of the requirements and design models for testing. For example, one variant of this method aims at making optimization-based testing technologies applicable to object-oriented real-time systems. In addition, IESE is exploring the synergies between inspections and testing, such as the use of testing data as additional decision criteria for re-inspections, or the exploitation of inspection results for deriving the test software from the specification of the functional software.

### QSD in Practice

The members of this core competence area are spearheading the following projects (among others):

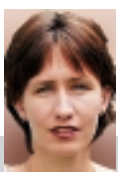
- The development of a method for component-based application and product line engineering.
- The tailoring of the method to embedded systems in the BMBF-funded MDTS project.
- The development of the QUASAR method for integrated requirements specification and quality assurance for embedded systems in the automotive industry.
- The development of the model-based COMPONENT+ testing process for componentware.
- The improvement of requirements documents for electronic control units for the purpose of reuse at DaimlerChrysler.
- The measurement-based evaluation and improvement of the inspection process at Lucent Technologies.
- The development of the BUY-IT requirements process model tailored to subcontracting.
- A study on optimization-based testing for DaimlerChrysler.
- The implementation of quality assurance activities for a big object-oriented development project at Tengelmann.
- Improvement workshops for requirements, design or quality assurance documents and processes.
- Training on requirements specification and management, object-oriented development, inspection and testing.

### Contact

Dr. habil. Barbara Paech  
Phone +49 (0) 6301 707 211  
Fax +49 (0) 6301 707 200  
E-Mail [paech@iese.fhg.de](mailto:paech@iese.fhg.de)



Dr. Antje von Knethen



Kirstin Kohler



Dr. Oliver Laitenberger



Nikolas Mayer



Maud Schlich



Hans Joachim Schwarz



Andrea Coffey



Susanne Märkl

Secretary

Secretary

## FINE – a Technology for Defect Cost Reduction

Many of today's software development organizations constantly struggle with budget, time, and quality problems. One primary reason for this situation can be attributed to the fact that simple engineering principles are discarded. An important principle is to perform quality-enhancing activities as early as possible. Despite the simplicity of this principle, in the software industry the activity of detecting and correcting software problems is often deferred until late in the project. The costs of a defect, however, increase significantly the later in the life cycle the defect is discovered and corrected. It is therefore no surprise that up to 50 percent of all labor hours in software development are not spent on developing software, but on defect detection and correction just before the product is shipped to its customers. This practice is becoming increasingly unacceptable given the accelerated technological change and growing competition in the global software markets. Consequently, if lower costs and higher quality are among the goals of a software development organization, defect detection and removal can not be limited to phases at the end of the development process, but must be integrated into each individual development phase right from the start. This integration, however, requires the availability of adequate processes and technologies.

### Benefits

Fraunhofer Software INspEction (FINE) is an industry-proven means to enable the detection and removal of defects immediately after software documents are created. Based on existing inspection technologies, FINE involves activities in which a team of qualified personnel uses systematic reading techniques to probe whether the created documentation of a software entity is of sufficient quality.

According to the principles of perspective-based inspection, these reading techniques reflect the needs of the document users. Detected quality deficiencies in the form of defects are subsequently corrected. FINE also supports the measurement of defect numbers and the efficiency of the inspection process. The various activities of FINE can be smoothly tailored and integrated into each and every software development approach and activity. Moreover, it can be applied to all kinds of textual or graphical documents, such as the textual description of customer requirements, class diagrams of the system design, or code. Fraunhofer IESE offers a set of tailoring, training, and coaching activities to help practitioners implement the most useful and successful FINE activities.

FINE distills a unique set of benefits for the stakeholders and participants of a software development project. Project managers will quickly realize that FINE is one of the few software engineering technologies that helps address the problems of budget, time, and quality all at once. Results from industrial case studies show that FINE reduces the costs for defects by about 40%. This, of course, has a significant impact on the costs of the whole project. Since problems are addressed when they pop up, deadline pressure situations are

attenuated. And defect detection and removal directly translate to better quality of the intermediate and the final products, which increases customer satisfaction. Developers benefit from FINE in several ways. As authors they enhance the visibility of their work in the development team. Moreover, they get quick qualitative and quantitative feedback on how to improve their work products. As inspectors (i.e., as those who scrutinize the documents for defects) they have the possibility to learn about defect patterns. This knowledge represents an important step towards future prevention of defects. FINE also exposes benefits beyond the ones already mentioned. Since FINE also involves systematic measurement, it is an important impetus for getting software projects under control. This is because the collected information helps shed light on the strengths and weaknesses of the overall development process.



## FINE in Practice

For a client in the automotive parts industry, we introduced perspective-based inspections in the development project. Perspective-based inspection is a typical FINE implementation and advocates the use of a systematic defect detection technique. In addition to the introduction, we analyzed their inspection data and constructed quantitative models to support the planning and evaluation of inspections. For example, one model can be used to assign the appropriate amount of resources to achieve a certain desired level of effectiveness. As another example, we also developed a model to benchmark the efficiency of an inspection with previous similar inspections. This is applied to evaluate the effect of changes to the inspection process.

For a major player in the telecom market, we analyzed the existing inspection process, and developed models to estimate remaining defect numbers to assess the quality of inspected documents.

For a client developing a commercial object-oriented software system, we developed models to predict the fault-proneness using data on design. Such models are valuable for focusing defect detection activities on the components that are most likely to contain defects.

In the BMBF-funded QUASAR project, we are developing techniques that increase the inspection cost-effectiveness of changed documents. A second focal point of this project is the integration of inspection and testing activities. On a technical level, testing can profit from inspection results when, for example, deriving test cases. On a management level, testing data can be used as additional decision criteria for re-inspections or inspection usage of subsequent projects.

## Services Offered

For organizations not yet using software inspections or systematic quality techniques, we offer the following services:

- Tailoring and implementation of software inspections according to the company's development situation. This includes the identification of the most defect-prone documents, the development of checklists or reading techniques for these documents, and the setup of an appropriate inspection process making sure that all stakeholders of the documents participate adequately in the process.
- Training courses for management and practitioners. These courses help spread the knowledge on inspections in the company and also support the motivation for inspection use.
- Coaching of inspection-related activities. In particular, this includes the collection of data on the effects of the new inspection process in the company and the packaging of experiences. The latter ensures continuous improvement of the inspection.

For more advanced companies we offer the following additional services:

- Development and implementation of decision models for inspection management, control, and improvement. These models, for example, help determine whether spending additional inspection effort is worth the effort or whether an additional inspection is required.
- Evaluation of the implemented inspection approach. This evaluation uncovers strengths and weaknesses in the existing inspection implementation, such as an inadequate preparation strategy of inspectors.
- Improvement of the existing inspection approach by proposing dedicated inspection technology. Based on the evaluation, enhancements to the existing inspection implementation are proposed and implemented, such as the reading technique tailored to the documents and the inspectors.

These services are offered to large, medium-size, and small enterprises.

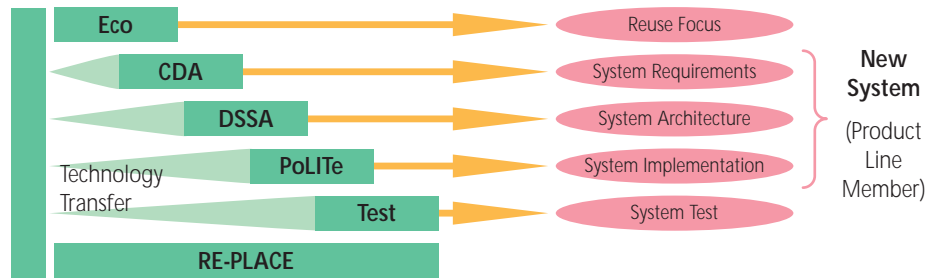
## Contact

Dr. habil. Barbara Paech  
 Dr. Oliver Laitenberger  
 Phone +49 (0) 6301 707 211  
 Fax +49 (0) 6301 707 200  
 E-Mail paech@iese.fhg.de  
 laiten@iese.fhg.de

## Overview

Product line development is currently regarded as the most potent answer to the needs many companies face: more and more products need to be brought to the market in ever shorter time intervals, at lower and lower costs. Product line development enables a company to make optimal use of its resources by setting up a strategic platform for software development. This platform addresses the functionality common across the various products, while the product-specific functionality is built on top of this. By reducing the product-specific parts to a minimum, the organization gains the potential of developing new products very efficiently.

This approach has been shown to work with extreme success for many companies, be they large or small: Hewlett-Packard reduced its time-to-market from about six months to around six weeks, while simultaneously reducing its failure rate by a factor of 25. Cummins, a large American manufacturer of Diesel engines, reduced its time-to-market from about one year to roughly one week. MARKET MAKER Software AG set up a new product line of web-based products and was able to derive from this product line about 15 products in one year, with the time span to field a new product sometimes as low as three days. This shows the tremendous improvement potential that product line development offers to a company.



PuLSE™-Technologies for solving Product Line problems

The development of related software products in the form of a product line affects the complete software development life cycle and adds some additional activities. Consequently, with PuLSE™ (Product Line Software Engineering), the Software Product Line (SPL) competence area at Fraunhofer IESE offers an approach that supports all product line-related activities: from the transfer of first product line concepts into a company to the maintenance of a fully established product line, all technical and organizational aspects are addressed and supported by PuLSE™. On the other hand, PuLSE™ has been designed in a modular way that makes it possible to introduce single aspects into an organization, like product line implementation concepts only.

The Product Line competence area addresses the following main topics:

- planning and modeling,
- architecting and implementation,
- re-engineering and reverse engineering.

These are described in more detail in the following sections.

## Planning and Modeling

In order to be successful with product line development, necessary investments need to be focused on those product functionalities that provide adequate potential for achieving the goals of the company. This is addressed by the PuLSE™ product line planning step Eco, which focuses on defining the product line itself as well as on how it should be developed so as to optimize the benefits that can be reaped from product line development.

During product line modeling, the requirements for all products and characteristics in the product line scope are captured. The product line model contains both common and variable requirements, with common requirements being shared by all members of the product line and variable requirements denoting the differences among product line members. The CDA component of PuLSE™ guides the product line modeling activities.



Dr. Peter Knauber



Michalis Anastasopoulos



Joachim Bayer



Jean-François Girard



Isabel John



Stefan Kettemann

Competence Manager



## Architecting and Implementation

Product lines are centered around a common software architecture. Contrary to one-of-a-kind system architectures, this so-called reference architecture includes not only common but also variable parts: it is generic. All product line members share its common parts and differ only in the variable, that is, optional or alternative parts. The DSSA component of PuLSE™ supports the description, creation, and evaluation of software architectures for product lines and one-of-a-kind systems.

Many different mechanisms are available to implement the variability of product lines using widespread programming languages and development environments. Depending on the development and the target environment of the product line, these mechanisms are more or less adequate. With PoLITe, PuLSE™ offers a framework to select the technology best suited to the given context; the Test component provides the respective support for testing of the resulting implementation.

## Re-Engineering and Reverse Engineering

Usually, companies do not start from scratch when considering a product line approach, but have already developed some related products that can be used as starting point. State-of-the-art technologies in re-engineering and reverse engineering support the identification of similarity and variations among the existing systems – a key aspect of product line development exploited by the RE-PLACE component of PuLSE™.

## SPL in Practice

PuLSE™ or components of PuLSE™ are or were applied in the following projects:

- **Application2Web**  
Together with the Forschungszentrum Informatik at the University of Karlsruhe (FZI) and a large consortium of industrial companies, methods are evaluated to determine how suitable they are for adapting existing software to a web environment.
- **ESAPS, CAFE**  
These two largest European product line projects aim at the integration of the best components from existing product line approaches. Partners are (among others) Siemens, Robert Bosch, Nokia, Philips, and Thales.

- **Component-based Development of Applications ("Komponentenbasierte Anwendungsentwicklung")**  
In this project, a method was defined as a component-based and object-oriented specialization of PuLSE™. The resulting method has been published with Addison-Wesley. Partners in the project are PSIPENTA Software Systems GmbH, Softlab GmbH, and Fraunhofer FIRST.
- **Software Variant Building**  
In this project, PuLSE™ was adapted to the specific needs of small and medium-sized companies and applied there. Partners in this project were Kretz Software GmbH, MARKET MAKER Software AG, tecInno GmbH, Tecmath AG, and Viva Software GmbH.
- **X-trade, X-commerce**  
In a long-term strategic cooperation with maxess systemhaus gmbh, PuLSE™ components are applied for merchandise information systems and e-commerce shops.

PuLSE™ is a registered trademark of the Fraunhofer-Gesellschaft.

## Contact

In 2001: Dr. Peter Knauber  
Since Feb. 2002: Dirk Muthig (acting)  
Phone +49 (0) 6301 707 251  
Fax +49 (0) 6301 707 202  
E-Mail muthig@iese.fhg.de



Roland Laqua



Dirk Muthig



Abdul Noman



Thomas Patzke



Klaus Schmid



Ulla Gelb

Secretary

## Planning Software Product Lines – The Scoping Technology

In these highly competitive times of ours, companies increasingly face the need to develop several variants of their software, targeting different customers and market segments.

This provides the potential for product line reuse, i.e., for developing a common reuse infrastructure from which the various products are then derived.

However, when moving towards a product line (e.g., because a new product line is set up or because several projects are integrated into a single product line), it is necessary to identify which products should be included in the product line, and which components should be included in the reuse infrastructure. These are key decisions that determine the overall profitability of the product line.

This is due to the fact that reaping the benefits of product line development requires investments on behalf of the software development organization for setting up the product line infrastructure, training the personnel in exploiting the product line approach, and adequately restructuring the software development. On the other hand, the benefits from product line development strongly depend on the products that are derived from the product line infrastructure as well as on the components that are available for reuse. Thus, in order to be successful in product line development, investments need to be focused on those functionalities that provide adequate potential for achieving the goals of the company.

The transition to product line development also faces certain risks. Transforming a company into a product line organization should therefore, be accompanied by an effort to identify and address these risks early on.

This product line planning step, which focuses on defining the product line itself as well as how it should be developed in order to optimize the benefits that can be reaped from product line development, is called Product Line Scoping.

### Benefits

The Scoping Technology developed at Fraunhofer IESE enables customers to focus their product line investments on those areas where maximum payoff can be achieved and helps to address product line development risks before they turn into problems. This is particularly important when planning an incremental transition to product line development, as it is important to choose those areas as a starting point that provide the most benefit.

Product Line Scoping by Fraunhofer IESE is supported by a disciplined process that enables even organizations without a background in product line development and quantitative methods to successfully apply the approach. The scoping approach consists of three main components. These components can be recombined and adapted to provide customized scoping approaches tailored to the specific needs of a company.

The three components of the approach are:

- Product Line Mapping
- Domain Potential Assessment
- Reuse Infrastructure Scoping

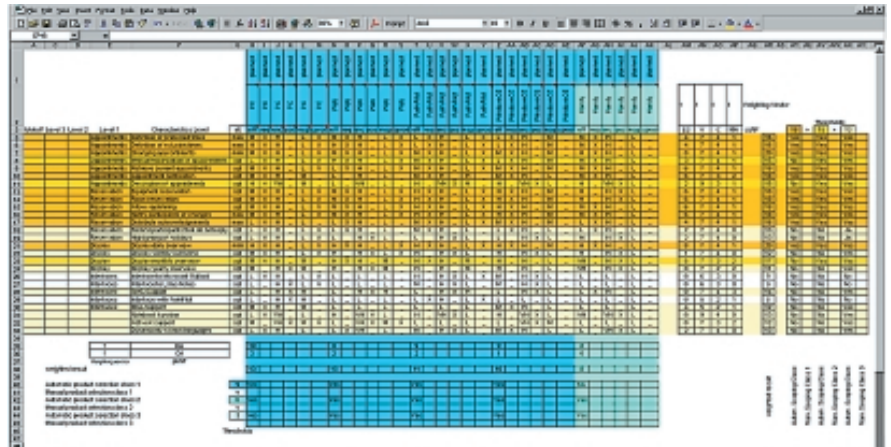
Product line mapping focuses on defining the specific product line and its requirements. While the approach is usually applied after the product portfolio has already been defined, it can also be easily extended to cover product portfolio definition as well in a stakeholder-centric form.

Domain potential assessment provides a focused assessment approach that allows to determine the specific risks and benefits the organization will encounter when moving to product line development for this set of products. This step relies on focused interviews that are performed using standardized assessment questionnaires. This makes it possible to perform the assessment in a reliable and repeatable form.

Finally, reuse infrastructure scoping specifically aims at determining the most adequate product line infrastructure. This approach relies on explicit, quantitative cost-benefit models that allow for the optimization of the benefits that can be accrued from establishing a product platform. As this part requires sophisticated data processing, a tool for handling this data has been developed.

Overall, product line scoping provides the customer with the following benefits:

- It supports the development of a product strategy and links it to the product line implementation approach.
- It focuses the incremental introduction of product line development.
- It makes it possible to focus investments on reusable components where they pay off the most.
- It provides a means for deciding whether and in which way a certain functionality should be introduced into the product platform. In case different groups are responsible for platform and application development, this also addresses the requirements management problem of assigning the different features to the respective development groups.
- It is customizable and can be adapted to a wide range of product line approaches such as PuLSE™ or company-specific approaches.



The PuLSE™-BEAT tool supports efficient data analysis for Product Line Scoping

**Services Offered**

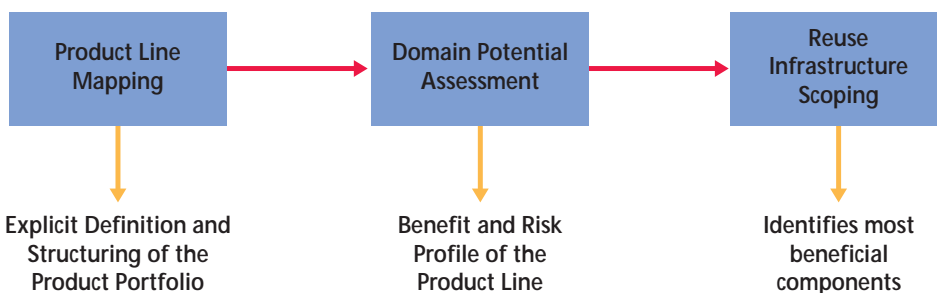
Companies can benefit in many ways from the Fraunhofer IESE expertise on product line scoping:

- We offer product line definition workshops that help a company to strategically define its product line.
- We offer analysis of the product line potential that exists in a specific product line. This enables an organization to derive, in a short time-frame, a profile of the risks and potential that exist in a specific product line without the need to acquire a detailed understanding of product line approaches.

- We offer full support and guidance on developing a product line scope.
- We offer tailoring of the approach to specific product line development contexts, as well as tutorials for introducing this approach into the customer organization.

**Contact**

Klaus Schmid  
 Phone +49 (0) 6301 707 251  
 Fax +49 (0) 6301 707 202  
 E-Mail schmid@iese.fhg.de



The PuLSE™ Product Line Scoping approach

## Overview

The Quality and Process Engineering core competence area (QPE) provides comprehensive support for customers interested in the improvement of software development and subcontractor processes, data-driven project management, and related products. Our main objective is to help our customers increase their productivity as well as reduce time-to-market. We also support them in managing their projects more accurately with respect to time and cost, and in improving product quality.

QPE provides a wide range of services, including:

- Elicitation and assessment of software processes within the ISO 15504 (SPICE) and BOOTSTRAP frameworks
- Assessment and evaluation of software products in order to provide recommendations for improvement
- Support for effective project management by introducing software risk management and data-driven project monitoring
- Setting up and supporting goal-oriented measurement programs for systematic and customized improvement
- Performance of cost-benefit analysis for new methods and technologies before implementing them in order to assess potential gains
- Support for goal-oriented process improvement and process guidance

through the introduction of web-based electronic process guides (EPG)

- Quantitative or hybrid (quantitative/qualitative) modeling for software cost and quality
- Support for organizations in the establishment of purchase-based software development, including supplier selection, subcontractor management, component evaluation, etc.

## Goal-oriented Process and Product Assessment (GPPA)

Goal-oriented Process and Product Assessment (GPPA) supplies expertise and instruments to perform a "health check" for software development. The outcome of an assessment is an advice on where the organization should improve its products and processes, as well as how to improve them. Our services address the following topics:

- Performing focused product and process assessments: we rapidly provide companies with an overview of the current state of a product or process. The ISO 15504 standard (SPICE) is used for process assessments. Product assessments are in line with the ISO 9126 and ISO 14598 standards.
- Introducing and coaching software measurement programs: measurement based on the Goal/Question/Metric approach is used to get a thorough understanding on particular questions of a company. Data analysis results can be used to both

improve processes and monitor projects.

## Descriptive Process Modeling (DPM)

Process engineering plays a major role in today's software industry. Process models are extensively used to help obtain ISO certifications, guide process improvement programs, and introduce "best practices" into organizations. Descriptive Process Modeling (DPM) provides a wide range of integrated services and technologies to support process engineering. We also provide access to our own, specially developed process engineering technologies, incl. the Electronic Process Guide (EPG) and the SpearMint™/EPG process modeling tool. Our services include:

- Improving existing processes. We elicit, document, and analyze a company's process and identify areas for improvement. We then help companies to implement these improvements by introducing innovative technologies.
- Tailoring processes for the company's specific needs. We show companies how to tailor existing or standard processes for a company and/or projects. This also includes adapting processes to organizational changes.
- Providing support to assess the impact of changes. We show through simulation the impact of introducing new methods and technologies on cost, time and quality before an investment is made.



Dr. Peter Kaiser



Danilo Assmann



Ulrike Becker-Kornstaedt



Bernd Freimut



Dirk Hamann



Ralf Kempkens



Dr. Jürgen Munch



Holger Neu

Competence Manager

- Introducing new processes. Using our expertise and technologies, we help companies to introduce new processes into their working environment.
- Communicating and managing processes. We ensure that the company's most up-to-date processes are quickly and easily communicated throughout the company and that they are continuously monitored and adequately modified.

### Cost and Quality Engineering (COE)

Cost and Quality Engineering (COE) focuses on ways to build and apply models and methods aimed at the characterization, evaluation, control, and prediction of a variety of software attributes. This implies the combination of goal-oriented measurement with rigorous and integrated quantitative modeling, and the use of many other experimental techniques. The goal of the COE group is to enable software project managers to make the right decisions in a specific situation, resulting in increased productivity, decreased time-to-market, and lower development effort and cost. Our services address a wide range of issues, including:

- Supporting decision-making during project bidding and planning. We identify important cost and risk factors in our customers' development environment. Based on such analyses, we help build cost and risk models to improve cost estimation and to cope with project risks.

- Facilitating the decision on whether to internally develop a component, subcontract one, or purchase a Commercial-Off-The-Shelf (COTS) component. We support our customers in assessing, selecting, and integrating the most suitable COTS or subcontracted components through the definition of an effective, efficient, and reliable acquisition process.
- Providing guidance on setting up and running inspection and testing activities. We build models to predict the error-proneness of software components to focus verification and validation activities. Moreover, our methods can estimate how many defects remain in a document after inspection, or evaluate the cost effectiveness of inspections.
- Producing industry benchmarks. We explore large industrial data bases and apply and develop methods that are well suited to produce interpretable industry benchmarks for our customers.

### QPE in Practice

- In the APO project, the success of continuous education in industry is evaluated. The approach and techniques of software process assessments are applied.
- Bosch uses a variety of (commercial) software development tools. The goal of our project is to define a process for performing a quantitative cost-benefit analysis of the use of software development tools within Bosch.

- To support the rating of a company, an integrated product and process assessment of a company in the telecommunication domain was performed for DEG.
- We introduce systematic risk management in an embedded software development project at Delphi.
- The focus of a study for Insead/ESA was on determining the most important, predominant cost factors in the context of this company. Based on the results, suggestions on what data to collect in the future were made.
- We develop a simulation-based method to predict the impact of process changes (e.g., use of a new technology) on time, quality, etc. in the SEV project.
- We provide support in adapting software development processes to new organizational structures at Tenovis.
- With WISE, we model and evaluate software development processes for wireless Internet service engineering.
- With Buy-IT, we developed a process and methods to support make-or-buy-decisions, to select COTS or subcontractors, to monitor subcontractors, and to test externally produced products.

### Contact

Dr. Peter Kaiser  
 Phone +49 (0) 6301 707 251  
 Fax +49 (0) 6301 707 202  
 E-Mail [kaiser@iese.fhg.de](mailto:kaiser@iese.fhg.de)



Michael Ochs



Dr. Teade Punter



Martin Soto



Adam Trendowicz



Dr. Isabella Wiczorek



Jürgen Wüst



Jörg Zettel



Ulla Geib

Secretary

## Buy-IT – a Methodology for Purchase-based Software Development

In today's increasingly global markets, meeting product objectives such as short time-to-market and high quality, and development goals such as high productivity are becoming more and more crucial to company success. They constitute a major factor for a company's competitive edge. This fully holds for software development as one example for a global market with the segments application software, embedded software, e-commerce, etc. The goals map to low development effort, short development time, and high software quality. Effort, time and quality thus define the magic triangle for competitive software development. Optimization of these factors ensures the market success of software companies and their products. This can be accomplished by (1) software reuse, i.e., using software components from past projects, (2) product line development, i.e., development of software for reuse, relying on a common platform, and (3) purchase of software, i.e., procurement of any kind of commercially available third party software components. In the past, a considerable amount of research work was spent on software reuse and product line development. Little methodological and operational support is available to guide software organizations in purchasing software components.

The software development process, however, should include methodological support for software purchase as an integral element. This will let software organizations master the challenges arising from purchase-based software development. Fraunhofer IESE has developed a methodology called Buy-IT, which focuses on the issues associated with purchasing and integrating commercially available third party components.

### Benefits

Buy-IT is a methodology framework that provides support for the full range of tasks concerned with the purchase of software components. Possible fields of application for Buy-IT range from making a make-or-buy decision for software components from the point of view of company strategy to the engineering of requirements suitable for the acquisition of software components. Possible applications also include the hiring of a subcontractor, selection of commercial-off-the-shelf (COTS) components, selecting a subcontractor, monitoring and managing the subcontractor with respect to schedule adherence and product quality, analyzing subcontracts regarding legal risks, as well as integrating the purchased component into a given architecture. In order to satisfy all these different demands, Buy-IT is designed for modular and task-oriented application. Each single Buy-IT module satisfies one demand and can be integrated seamlessly with existing processes in a company. Currently, Buy-IT comprises the following modules:

- PRA (Potential and Risk Analysis of Software Components), which offers support for make-or-buy decisions for the various components of a software system.
- REACT (Requirements Engineering for the Acquisition of Software), which provides systematic support for engineering requirements that enable the purchase of COTS software or the hiring of subcontractors.
- CAP (COTS Acquisition Process), which controls and optimizes the COTS assessment and selection process towards assessment and selection cost, COTS risks, and COTS quality.
- SAS (Subcontractor Assessment and Selection), which helps in systematically assessing, selecting and charging subcontractors with the development of components.
- SCM (Subcontractor Monitoring), which operationally describes the actions to take for monitoring the subcontract, including the final approval of the ordered component.
- SINT (System Integration), which provides guidance on integrating the purchased components into a given architecture, overcoming possible architectural mismatches.

### Buy-IT in Practice

Industrial deployment of Buy-IT modules is growing. For example, the CAP module of Buy-IT has been applied in two case studies with Siemens AG – one case study was performed in Germany, the other one was performed in the U.S. The motivation for both studies was to manage the assessment and selection of two large-scale COTS components for Information System development. The effect of the cost optimization features of CAP was that the application of CAP as a systematic process was not measurably higher than the application of the former practice in place, while the quality of the result, i.e., the final selection of COTS components, was seen to be of significantly higher quality, higher reliability, and higher understandability and traceability. Overall, customer satisfaction in this project was high – both from management's point of view and from that of the developers.

### Services Offered

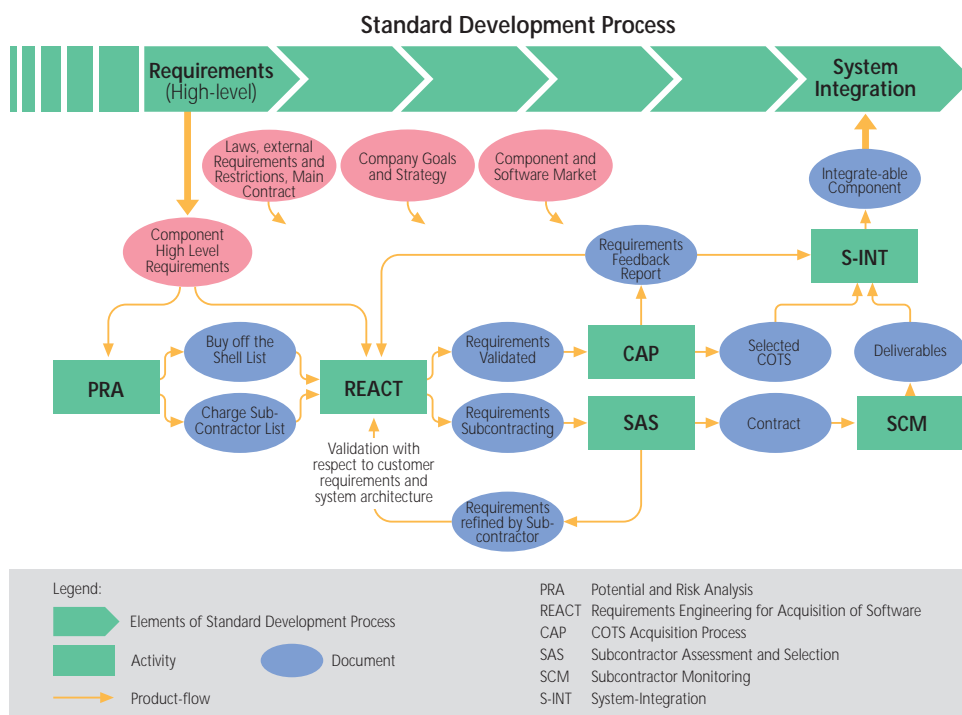
- Training. We provide training to enable the customer to apply the Buy-IT methodology and its individual modules.
- Customization. We tailor the Buy-IT method handbooks and toolboxes to the specific requirements of any development organization.
- Coaching. We provide support the first time Buy-IT modules are applied in a company's projects.
- Implementation. In cooperation with company process experts, we provide support in integrating the Buy-IT methods into the company's process landscape.

### Future Enhancements (planned for 2002)

- Subcontract Risk Assessment will support contractors as well as sub-contractors in assessing the legal risks contained in a subcontract.
- Subcontractor Reviews will enhance the techniques used in Buy-IT/SCM for monitoring subcontracts and subcontractors with respect to output quality.
- Subcontractor Testing will give guidance on developing acceptance criteria and test cases from requirements in the subcontract.

### Contact

Michael Ochs  
 Phone +49 (0) 6301 707 251  
 Fax +49 (0) 6301 707 202  
 E-Mail ochs@iese.fhg.de



The Buy-IT methodology

## Overview

Typically, our customers want to reuse and adapt well-tried solutions. They do not want to repeat mistakes. They want to offer their products and services with constant quality, even if their experts are not available at the moment. Therefore, they seek to make more out of their knowledge based on professional experience management.

That is what the core competence area Systematic Learning and Improvement is about. We support customers in analyzing their knowledge management processes. We help customers not simply to gain experience but also to efficiently and sustainably use it. We support organizations in training employees on these topics. We do not offer knowledge management off-the-shelf, but experience management tailored to individual organizations. The benefit for the customer is that individual experience becomes knowledge for all, that information is at hand when needed, and that the organization takes over the initiative for its own experience management. How can customers benefit from Fraunhofer IESE's competence and experience for their experience management? The following will shortly describe our view on experience management, our competence and experience, our main research and competence development areas, as well as specific competencies built up so far.

Systematic Learning and Improvement develops techniques, methods, and tools for experience management in

the information technology (IT) field. Experience management includes the tasks of efficiently connecting persons who know with those who have to know as well as making personal knowledge and experiences available throughout an organization. For Fraunhofer IESE, experience is knowledge that was acquired in practice. Examples for experiences are lessons learned and descriptive business processes. The basis of experience management is the experience factory concept, the well-known software engineering approach. It is complemented by technologies from artificial intelligence, such as case-based reasoning, ontologies, and data/text mining and approaches from knowledge management for knowledge sharing, content authoring and management, and business process integration.

## Approach

Based on the experience achieved in various industrial and publicly-funded research and transfer projects, we developed the DISER (Design and Infusion of Software Engineering Repositories) methodology for the build-up and operation of experience management systems, including a technical infrastructure for its support. DISER consists of the following nine main steps:

1. Developing a vision for the experience management system
2. Setting goals
3. Setting subject areas
4. Defining usage and filling scenarios
5. Modeling the experience ontology
6. Implementing the experience management system

7. Going online with the experience management system
8. Maintaining the experience management system
9. Integrating existing and generating new knowledge.

DISER usually starts with developing a vision for the experience management system. This means going through all the subsequent eight steps on a rather abstract level. Such a vision explains where the experience transfer can be supported by the experience management system. Based on the vision, concrete goals are defined. This occurs with consideration of the interests of the stakeholders. With each of these goals, appropriate success criteria are associated, which allow the progress concerning the goals to be measured. In the next step, relevant topics, which can contribute to achieving the objectives, are identified and selected via vision and goals. As soon as objectives and relevant topics are known, the acquisition and use of the experiences can be described by scenarios. In the context of the scenarios, the need for information is captured in more detail. This allows to develop a representation pattern for experiences (ontology), which is usually implemented based on a rapid application development approach. Based on the prototype system, the continuous operation of the experience management system is prepared, which includes business process integration, evaluation and maintenance, as well as the integration of available knowledge. DISER includes the creation of a top-down rationale for implementation (pattern and knowledge acquisition plan). This rationale documents the



Dr. habil. Klaus-Dieter Althoff



Dr. Andreas Birk



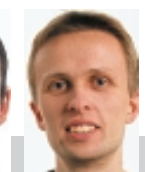
Dr. Frank Bomarius



Bjorn Decker



Erik Dick



Stephan Groß



reference of the components of pattern and knowledge acquisition plan via scenarios and relevant topics to targets and system vision and thus, becomes understandable.

DISER has been developed and validated through various research and transfer projects including partners/customers like Allianz Lebensversicherung, BSR Consulting, DaimlerChrysler Aerospace, DaimlerChrysler Forschung und Technik, Dresdner Bank, empolis knowledge management, Tenovis, Fraunhofer IPA, the University of Kaiserslautern, and the University of Leipzig. One DISER reference project is the IESE Experience Factory, called CoIN (Corporate Information Network, see section "CoIN – Experience Management at IESE" on page 64). Public experience repositories are available through the IESE website.

Currently, DISER is being refined and extended in various directions.

- Product line for experience repositories
- Experience repository maintenance
- Change management and knowledge development for IT processes
- Evolution of experience repository ontologies
- Personalization of knowledge sharing
- Experience-based risk management for software development projects
- Experience-based IT security engineering

In addition to experience management, Systematic Learning and Improvement

has also built up specific competencies in IT security and systematic improvement. Further details on IT security can be found in this report (see section "NIXE™ – a Tool for Security Audits" on page 42). One current research goal is to further integrate experience management and IT security. The BMBF-funded project SKe (Holistic Security Concepts with Dynamic Control Mechanisms for eService Processes) is one means to achieve this. Based on a formal security model and an experience-based security database, a generic method is developed to support eGovernment tasks like car registration, building application, or tax declaration. Methods for systematic improvement are a built-in part of DISER. Furthermore, several software engineering experience repositories are being built.

#### SLI in Practice

Among others, the core competence area Systematic Learning and Improvement has contributed to the following projects:

- CoIN (Fraunhofer IESE corporate information network)  
This experience factory has been online since mid-2000. It currently focuses on lessons learned on project business and descriptive business process models. (See also section "CoIN – Experience Management at IESE" on page 64.)
- indiGo (Integrative Software Engineering Using Discourse Supporting Groupware)  
Development of a discourse-centered discussion platform for

increasing transparency and involvement of stakeholders within software engineering methods. It includes a case study on process learning and change management of IT processes. (See also section "Enhancing Experience Management and Process Learning with Moderated Discourses" on page 60.)

- SKe (Holistic Security Concepts with Dynamic Control Mechanisms for eService Processes)  
Development of an experience-based security database and a generic reference model. SKe includes a case study at a German municipality.
- ViSEK (Virtual Software Engineering Competence Center)  
Experience and content management for software engineering technologies including a technical infrastructure. (See also section "ViSEK – Virtual Competence Center for Software Engineering" on page 54.)
- ESERNET (Experimental Software Engineering Network)  
Experience and content management for software engineering technologies including a technical infrastructure.

#### Contact

Dr. habil. Klaus-Dieter Althoff  
Phone +49 (0) 6301 707 121  
Fax +49 (0) 6301 707 200  
E-Mail [althoff@iese.fhg.de](mailto:althoff@iese.fhg.de)



Susanne Hartkopf

Dr. Volker Hübsch

Andreas Jedlitschka

Markus Nick

Sören Schneickert

Dr. Reinhard Schwarz

Gaby Klein

Secretary

## NIXE™ – a Tool for Security Audits

Today's business increasingly depends on information technology (IT). Therefore, IT security is an important requirement for most enterprises. Unfortunately, securing IT components is a complex and time-consuming task, and skilled security personnel are a very scarce resource.

To improve the efficiency and effectiveness of security assessments, and to optimally deploy available resources, appropriate tool support is called for. NIXE™, which was developed at Fraunhofer IESE, is a tool for performing security checks on UNIX systems. Compared to similar tools, NIXE™ is characterized by a high level of flexibility and modularity. It can be easily configured to meet the individual security requirements of an organization. In addition, it is compatible with a wide variety of UNIX platforms and dialects.

NIXE™ is strictly non-intrusive. It does not interfere with normal system operation, which is an important characteristic in a production environment.

Originally, NIXE™ aimed at supporting large-scale assessment campaigns with hundreds of evaluation targets. But it proved equally useful for the analysis of individual systems. NIXE™ received the Innovation Award 2001 of the State of Rhineland-Palatinate.

## Benefits

Security requirements differ for each system. To obtain meaningful and concise evaluation results, it is essential to tailor the individual evaluation criteria to meet the local security policy. In NIXE™, evaluation criteria are configurable in a very flexible manner. However, describing each and every security detail is a rather tedious task. To simplify tool customization, a configuration run can automatically extract the relevant security settings of a reference system and transform them into corresponding NIXE™ evaluation criteria. Subsequent evaluation runs compare the actual configuration settings of the evaluation target with NIXE's pre-computed evaluation profile (see the figure below).

If an appropriate reference system is not available, the user may instead load one of the default evaluation profiles that are part of the NIXE™ package. Alternatively, even an insecure reference system may be chosen for a configuration run. In both cases, the resulting evaluation profile requires manual fine-tuning.

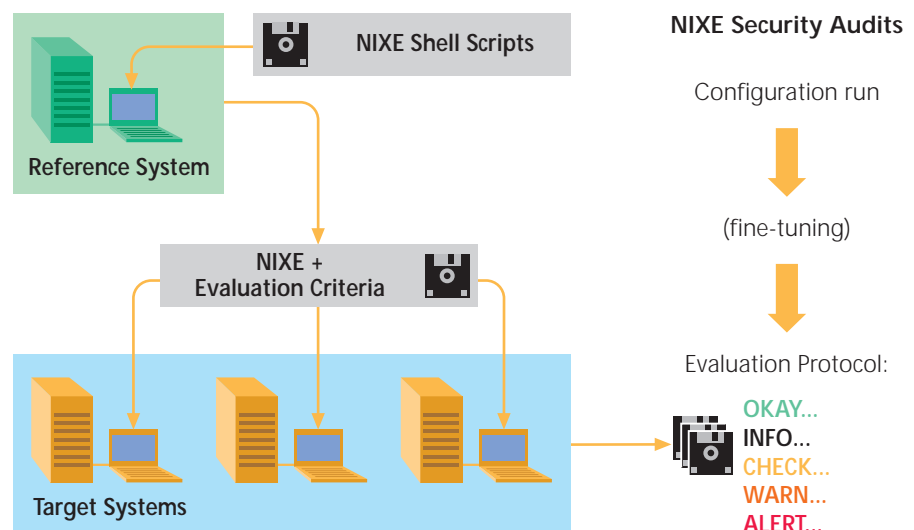
Different types of evaluation criteria may be specified, including:

- White lists (or black lists, respectively) for permissible accounts, user groups, services, ports, paths, software packets, patches, etc.
- Path attributes such as permission mask, owner group, checksum, etc.
- Attribute-value pairs for kernel, service, and protocol parameters

A severity level is assigned to each specification. Depending on severity, specific findings are reported as OKAY, INFO, CHECK, WARN, or ALERT messages. Criteria and severity levels can both be tailored to the specific needs of an assessment, and logging may be restricted to selected message types, thus minimizing tool output. Furthermore, NIXE™ is able to compare two evaluation protocols – typically, an older one and a more recent one referring to the same evaluation target – and to list only those findings that differ.

Currently, NIXE™ comprises 23 evaluation modules. They cover a wide spectrum of security aspects, for example:

- Firmware and kernel parameters
- Installed software packets and patches
- User account settings
- Audit, logging, and authentication settings



- Paths and path attributes
- Mount points and mount options
- System services and service configuration
- Protocol configuration
- Open ports

New evaluation modules are added according to our customers' demands.

All NIXE™ functionality is implemented as a collection of shell scripts. From a user's perspective, this has several advantages. First, NIXE™ is highly portable because any UNIX dialect is able to execute shell scripts. Second, tool installation is trivial because no additional runtime support is required. Third, the script format of the tool and the lack of installation steps make the tool and its modes of operation highly transparent. On the one hand, users can convince themselves that the tool does not harm the running system under evaluation. On the other hand, the user can easily change and extend the tool's functionality.

### NIXE™ in Practice

Fraunhofer IESE uses NIXE™ for cost-effective baseline security audits. The tool relieves our experts of routine work and lets them focus on non-trivial aspects of IT security that are beyond the capabilities of automated analysis. Especially for small and medium enterprises, tool support is essential to reliably identify common security gaps, even with a very tight budget.

Fraunhofer Central Administration hired IESE to carry out a sample security survey of several Fraunhofer institutes. Each of the selected institutes was visited for about half a day. We used



For NIXE™, Fraunhofer IESE received the Innovation Award 2001 of the state of Rhineland-Palatinate

NIXE™ to efficiently collect information. Key personnel were interviewed while running the tool. IESE experts briefly discussed the main findings of NIXE™ with the local staff. A detailed analysis of NIXE™ results and interviews was prepared off-line. Documenting all findings was the factor that dominated the overall costs of the survey.

Our cooperation with DeTeMobil Deutsche Telekom MobilNet GmbH aims at large-scale security audits covering a hundred or more UNIX systems. In a large audit campaign, the effort required to prepare a suitable evaluation profile is negligible compared to the analysis of evaluation results. In this context, it is essential to customize the tool to the specific security standards of our client to minimize the probability of so-called false positives or false negatives in the evaluation protocol. A concise evaluation report is an important prerequisite to delegate the pre-configured tool to local system administrators. They have limited expertise in IT security and would easily be confused by an output that is too verbose.

### Services Offered

We offer a number of services to our partners and customers that are centered on NIXE™:

- NIXE™ audits. We carry out NIXE™-based, cost-effective security evaluations. This service addresses small and medium-sized enterprises in particular, which lack qualified security staff and can not afford the costs of an in-depth manual inspection.
- Training. We show clients how to employ NIXE™ to their best advantage. We help them to interpret the evaluation results and to select appropriate countermeasures.
- Pre-Configuration. We help our clients to tailor NIXE's evaluation profile to their specific needs.
- Audit design. We support clients in their planning of large-scale security audits and help them to fit NIXE™ into the overall audit process.
- Adaptation. We extend the functionality of NIXE™ to cover customer-specific security aspects, and we show clients how to make their own changes to the evaluation logic.

Of course, NIXE™ is only one facet of our offerings. We advise our clients on general aspects of IT security management and provide expert opinion on the security of client-specific IT components and services.

NIXE™ (Non-intrusive unIX Evaluation) is a registered trademark of the Fraunhofer-Gesellschaft.

### Contact

Dr. Reinhard Schwarz  
 Phone +49 (0) 6301 707 121  
 Fax +49 (0) 6301 707 200  
 E-Mail schwarz@iese.fhg.de

## Overview

While software is of paramount importance for market success in all high-tech and service domains, software engineering (SE) competence development does not live up to this challenge and demands tremendous improvement efforts. Moreover, the increasing need for personalized on-the-job and on-demand qualification of the workforce in software engineering methods, tools, and techniques is intensified by shorter and shorter innovation cycles of software technology.

One possibility of dealing with this situation is to establish effective and efficient SE qualification systems that do not only offer traditional in-class training courses, but also take advantage of state-of-the-art e-learning technologies. Associated qualification programs and products must be tailored to development and business processes, software application domains, individual competence profiles of the software engineers, and to the qualification needs of the organization.

To control the efficiency of SE qualification systems, measures to evaluate the success of learning, adequate use of e-learning technology (e.g., hypermedia courseware, simulation, collaborative learning infrastructures), improved e-learning methodologies, and sustained quality assurance of e-learning environments, portals, and products (e.g., courseware modules, curricula) have to be established.

To increase the efficiency of SE qualification systems, systematic reuse of training materials and subject matter contents as well as the integration of e-learning processes and infrastructures with state-of-the-art knowledge management solutions are required.

Within the competence area CET, research in several of these crucial areas is conducted and related services are provided to software development organizations, SE education and training service providers, qualification and training system development organizations, and SE content providers.

### Evaluation of SE qualification systems

CET develops a modular assessment method for the systematic evaluation of qualification processes, qualification products (i.e., curricula and courseware), competence profiles, qualification needs, and software infrastructures for learning (e.g., portals, learning environments).

### High-quality courseware development

CET offers a methodology for improving hypermedia courseware production towards higher efficiency and quality. The core of this methodology is a comprehensive development process that follows the principles of software and hypermedia engineering. The process integrates all role-specific points of view (e.g., instructional,

technical, managerial), supports systematic reuse, and promotes effective quality assurance techniques.

### Workflow-integrated qualification of the software engineering workforce

CET develops curricula for recently created IT job profiles that aim at certifiable work-process-oriented qualification of the software workforce.

### Collaborative learning over the Web

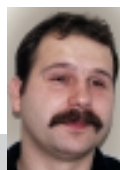
CET offers a comprehensive methodology for hypermedia-based, collaborative learning in software organizations. Based on a set of fundamental principles of continuing education, this methodology connects learners with knowledge possessors and other learning resources in the most adequate way, depending on their current learning situation. By offering innovative concepts of creating and documenting new knowledge while learning, the new methodology integrates technology-enabled learning with knowledge engineering.

### Simulation-based learning

CET helps software managers to cope with the dynamic complexity of software development by providing guidance on building and using quantitative simulation models as a source for learning and improvement. Simulation models help software engineers and



Dr. Dietmar Pfahl



Dennis Angermann



Niniek Angkasaputra



Dr. Dieuwke de Haan



Dr. Christiane Differding



Manfred Eberle



Ines Grützner



Astrid Haas



Claudia Hebestreit



Martin Koch

Competence Manager

managers understand the effects of new technologies and policies on the performance of software development processes. Based on simulations, decision-makers can explore and analyze potential process improvements before implementation in a pilot project. In addition, quantitative simulation models can be used to support planning and control tasks.

### Product lines for learning environments

CET aims at providing a method for analyzing learning environments with regard to their effectiveness in supporting web-based collaborative learning, and to provide guidance on how to evolve them. One key element of the method under development is a new formalism that helps to capture and describe the user requirements of web-based collaborative learning infrastructures. It is expected that the new method will improve the effectiveness and efficiency of developers of collaborative learning environments. In addition, the method will support current and prospective users of collaborative learning environments in analyzing their purchase decision.

### Improved reuse of learning materials

CET develops a comprehensive concept map for the domain of software engineering. After completion, this concept map will support the semi-automatic annotation and retrieval of learning

material fragments for the purpose of reuse. On the non-technical level, CET investigates the return on investment (ROI) of reuse-supporting e-learning systems.

### Training services

CET offers a bundle of consulting services related to the design, implementation and management of training programs for software organizations. Typically, these services are offered in collaboration with the SWA Software Akademie AG.

### CET in Practice

In 2001, CET contributed to the following projects:

- FKN (Fraunhofer Knowledge and Learning Network): Development of high-quality courseware modules for hypermedia-based UML training.
- Allianz Lebensversicherung: Usability evaluation of the proprietary Allianz learning portal.
- MAN Roland Druckmaschinen: Definition of required competence profiles and analysis of qualification needs.
- Robert Bosch GmbH: Design and implementation of qualification measures in order to teach software engineering skills to hardware engineers.
- APO (Arbeitsprozessorientierte Weiterbildung in der IT-Branche):

Development of curricula for the workflow-integrated qualification of IT professionals.

- Construction Kit "Software Competence": Development of a modular qualification handbook for SMEs and courseware units for web-based training on object-oriented software development.
- CORONET (Corporate Software Engineering Knowledge Networks for Improved Training of the Workforce): Project coordination and main responsibility for the development of the web-based collaborative learning methodology CORONET-Train.
- E-Qualification Framework: Development of a comprehensive process model for the systematic development of high-quality courseware modules.
- indiGo (Integrative Software Engineering using Discourse-Supporting Groupware): Development of an e-moderation method.
- Teachware on Demand: Automatic decomposition of learning material into fragments plus annotation of these fragments for semi-automatic selection and re-composition of fragments into new learning material.

### Contact

Dr. Dietmar Pfahl

Phone +49 (0) 6301 707 151

Fax +49 (0) 6301 707 203

E-Mail [pfahl@iese.fhg.de](mailto:pfahl@iese.fhg.de)



Erwin Konrath



Patrick Leibbrand



Dr. Marta Lopez Fernandez



Eric Ras



Dr. Günther Ruhe



Silke Steinbach-Nordmann



Ludger Thomas



Sonja Trapp



Carsten Vollmers



Kornella Laß



Kornella Streb

Secretary

Secretary

## IntView – an Integrated Approach to Courseware Engineering

Technology-enabled learning using the web and the computer is becoming more and more important, especially in the continuing education of the workforce. However, high-quality courseware for training of the workforce is still rather seldom today. One reason for this situation can be traced back to the process of courseware development. First, the development of high quality courseware is a very expensive and labor-intensive process. This is especially due to the fact that courseware development is a multidisciplinary team approach. Furthermore, as in the early days of software development, courseware is still developed mostly from scratch. Well-defined, explicit, detailed, and integrated processes to provide sufficient guidance and support for all disciplines in everyday courseware development work are rather seldom. That is, the development process used and thus the quality of the courseware produced often depend heavily on the experience, knowledge and skills of the development team members and their ability to cooperate. In courseware development projects lacking sufficient process guidance, only highly qualified people working together long-term as a team are able to produce high quality courseware within given time and budget constraints. Often, this prerequisite is not given. As a consequence, most of the courseware development projects today face problems with meeting schedule, staying within budget, and producing quality courseware at the same time.

### Benefits

The goal of the IntView courseware development methodology is to provide courseware developers with a tool to reduce the overall development effort and, at the same time, to increase the probability of finishing a courseware project within schedule and budget, and with high technical quality. The quality criteria to be achieved are defined as courseware requirements.

IntView consists of a life cycle model, a process model, and a set of guidelines defining how to tailor the process model to a specific project context. As a comprehensive development methodology, IntView integrates all important views of high quality courseware development (i.e., managerial, content-instructional, and graphical-technical views on the process with one view comprising several roles) dealing with all four dimensions of courseware (that

is, content, instructional strategy, content presentation style, functionality). In addition, IntView integrates existing courseware development approaches with elements of hypermedia and software engineering approaches. Furthermore, IntView introduces a set of intermediate quality assurance activities inspired by state-of-the-art software engineering principles that verify the quality of intermediate work products. On the other hand, IntView also integrates already existing courseware quality assurance measures like formative and summative evaluations.

On a high level of abstraction, the IntView courseware methodology can be described as a product-centered life cycle model, as shown on the opposite page. This life cycle model comprises all phases necessary for producing the main products of courseware development, and their temporary relationships. The IntView life cycle model is the starting point for the definition and detailed description of the IntView process model that supports and guides teams in everyday work. This process model is supplemented by guidelines for tailoring the development process in order to meet the needs of a specific project. The IntView process model is available as an Electronic Process Guide. This Electronic Process Guide is a website supporting and guiding courseware development teams during everyday work.

In its current version, the IntView methodology is restricted to the development of large drill and practice courseware as well as non-adaptive and adaptive tutorial courseware. The development of educational games, simulations, and additional types of courseware is not being covered.



## IntView in Practice

The IntView courseware development methodology was applied in a project that adapted and extended an existing UML courseware for the training of technical managers into a courseware for the training of software designers.

The courseware for the training of technical managers includes information required for the decision on the use of UML as well as for the introduction of UML into an organization. Furthermore, this courseware enables technical managers to interpret UML diagrams. This courseware is currently available in German only under the name "UML interaktiv für Entscheidungsträger" at the URL <http://www.iese.fhg.de/UML-Kurs>. The courseware can be used without any fee by registered users. A registration form is available at the same URL.

The courseware for training software designers teaches the development of UML diagrams in software projects. Therefore, it adapts the content of the courseware for the training of technical managers. In addition, it provides a module presenting the theory of all UML diagrams in detail. Furthermore, this module provides practical guidelines on the generation process of UML diagrams. It is a 30 hours delivery time tutorial developed with the same tools and technologies as the courseware for training technical managers. Furthermore, the user interface design and the functionality design are identical.

## Services Offered

Fraunhofer IESE offers the following services around IntView:

Companies developing courseware can be supported through:

- Analysis of the current courseware development process
- Adaptation of the IntView methodology to the characteristics of the company based on the results of the analysis of the current development process
- Introduction of the adapted IntView methodology at the customer's site

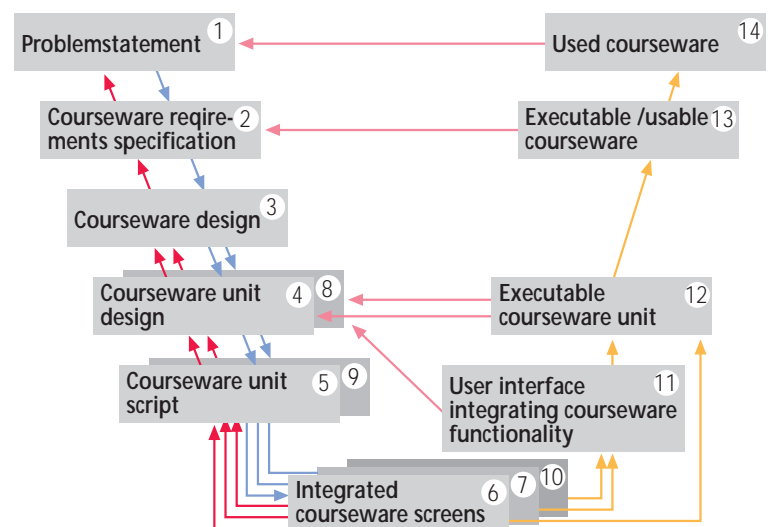
Companies intending to buy courseware can benefit from IntView through:

- Evaluation of the quality of courseware candidates according to customer characteristics and requirements
- Evaluation of the pilot application of the purchased courseware

The courseware described has been partly developed in the strategic research project of the Fraunhofer-Gesellschaft "Fraunhofer Knowledge & Learning Network (FKN)". The development of the IntView methodology was partly funded by the "e-Qualification Framework (e-QF)" project under grant 01AK908A of the German Federal Ministry of Education and Research (BMBF).

## Contact

Ines Grützner  
 Phone +49 (0) 6301 707 151  
 Fax +49 (0) 6301 707 203  
 E-Mail [gruetzne@iese.fhg.de](mailto:gruetzne@iese.fhg.de)



→ is refined to → is verified against → is integrated in → is validated against

The logical product-centered IntView lifecycle model



Fraunhofer Institut Experiment Software  
IESE



## Chapter Contents

|  |    |
|--|----|
| <b>Business Areas – an Overview</b>  | 50 |
| <b>Software Development</b>  | 52 |
| PuLSE™ – Software Product Lines in Practice                                    | 52 |
| VISEK – Virtual Competence Center for Software Engineering                     | 54 |
| <b>Software Project Management</b>   | 56 |
| Estimating Software Costs for BMW Projects                                     | 56 |
| Cost-Benefit Analysis of IT Software Investments                               | 58 |
| <b>Software Improvement Management</b>   | 60 |
| Enhancing Experience Management and Process Learning with Moderated Discourses | 60 |
| Securing an Internet Lottery for Süddeutsche Klassenlotterie                   | 62 |
| <b>Software Competence Management</b>  | 64 |
| CoIN – Experience Management at IESE   | 64 |
| via-it – the Virtual IT Academy of Rhineland-Palatinate                        | 66 |
| <b>Software-based Business Development</b>                                     | 68 |
| Designing an E-Commerce Strategy for i&M                                       | 68 |

## Business Areas – an Overview

### Software Development

PuLSE™ - Efficient Mass Production of Software

Component-based Product Line Engineering

DeCoR – Software Defect Cost Reduction

FINE – Fraunhofer Inspection



Our experts in re-engineering and product line development show you the most economical way of carrying your legacy systems into the future. We help you to evolve existing systems into product lines and to integrate component-ware into your systems.

We help you to select, tailor, and continuously improve the software development practices best suited to your market's and your organization's needs.

#### Contact

In 2001: Dr. Peter Knauber  
 Since Feb. 2002: Dr. Peter Kaiser  
 Phone +49 (0) 6301 707 251  
 Fax +49 (0) 6301 707 202  
 E-Mail kaiser@iese.fhg.de

### Software Project Management

Data-driven Cost/Quality/Risk Management

Subcontractor Assessment and Management

Software Procurement



We help you to implement lean practices for planning, tracking, and predicting cost, quality and risk by integrating goal-oriented measurement, assessment, and benchmarking.

We help you to select, integrate and manage subcontractors or to select, evaluate and integrate purchased (off-the-shelf) software.

#### Contact

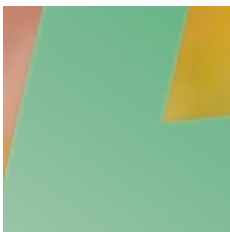
Ralf Kempkens  
 Phone +49 (0) 6301 707 251  
 Fax +49 (0) 6301 707 202  
 E-Mail kempkens@iese.fhg.de

**Improvement Management**

Process Assessment and Improvement

Product Assessment and Improvement

IT Security



We perform efficient, reliable, and reproducible assessments of your practices and products and help you implement an action plan that meets your actual business goals.

We help you to detect vulnerabilities that may become targets of deliberate as well as accidental threats, define security goals for your organization, and determine action plans for achieving and sustaining them.

**Contact**

Ralf Kempkens

Phone +49 (0) 6301 707 251

Fax +49 (0) 6301 707 202

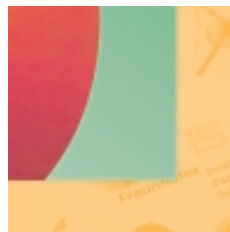
E-Mail [kempkens@iese.fhg.de](mailto:kempkens@iese.fhg.de)

**Software Competence Management**

Learning Software Organization

Job-oriented Education and Training

Education and Training on Demand



We help you to continuously identify and capture valuable information from processes, products, and people. This enables you to assess, manage, and maintain knowledge, and to supply it to your entire organization.

We help you to determine current and future job profiles of your IT personnel, tailor and perform education programs to build the core competencies of your workforce. We provide modules for training on demand integrated with your work processes.

**Contact**

Andreas Jedlitschka

Phone +49 (0) 6301 707 121

Fax +49 (0) 6301 707 200

E-Mail [jedl@iese.fhg.de](mailto:jedl@iese.fhg.de)

**Software-based Business Development**

Innovation Management

Expert Reports

Software Economics

E-Business

Technology Consulting

Change Management



We help you to continuously innovate your software-related business practices so as to enable you to compete proactively.

We help you to make informed decisions regarding risk, cost and benefit of new technologies as well as of process and organizational changes.

**Contact**

Dr. Frank Bomarius

Phone +49 (0) 6301 707 121

Fax +49 (0) 6301 707 200

E-Mail [bomarius@iese.fhg.de](mailto:bomarius@iese.fhg.de)

## PuLSE™ – Software Product Lines in Practice

MARKET MAKER Software AG is a company for financial information software and data. In 1999, MARKET MAKER decided to invest in a new family of systems that share the idea of web-based financial information. The MERGER project was set up and started with the intention to produce a generic platform and mechanisms to build financial information systems faster and with high quality. One example of such a system is a public website that offers information on securities and the stock market to the general public. Another example of such a system is a bank's internal security information system for financial advisers.

In order to ensure their mid- and long-term competitiveness, MARKET MAKER wanted to achieve a fast time-to-market. A fast time-to-market would allow them to improve their market position, support expansion of the coverage of market segments, and lead to unique selling propositions. In the growing market of web-based financial information systems, MARKET MAKER must produce new systems quickly and be able to extend their base functionality



in a customer-specific way to stay competitive and keep their customers competitive.

On the other hand, product quality is a key issue for MARKET MAKER: their customers require the systems to be available 24 hours a day, 7 days a week. Additionally, the data delivered by the systems (e.g., current stock prices) must be current and correct at all times to be of use and prevent financial damage.

## Approach

Software product line concepts promise to provide a solution to the MARKET MAKER challenges: effort for developing customer-specific systems is reduced by building a common core platform (also called product line infrastructure) that all systems are derived from. Customer-specific products are then built on top of that core platform, that is, they reuse the product line infrastructure. The development and maintenance effort for the platform is shared by all products that are derived from it; thus, overall effort and costs decrease dramatically. Quality can be expected to improve because product lines guide people in how to perform reuse-oriented software development in a planned and systematic way.

In 1999, MARKET MAKER decided to extend a previously existing cooperation with Fraunhofer IESE under the umbrella of the ESAPS project (a large European research project (Eureka Σ! 2023 Programme, ITEA project 99005)). In this cooperation, the PuLSE™ approach was applied to design and optimize the MERGER platform. PuLSE™ (Product Line Software Engineering) is a product line approach developed at Fraunhofer IESE. It supports all product line-related activities: from the transfer of first product line concepts into a company to the maintenance of a fully established product line, all technical and organizational aspects are addressed and supported.



Special emphasis of the PuLSE™ application at MARKET MAKER was placed on the identification of the optimal focus for reuse activities and on the architecture of the MERGER platform.

## Results

After 12 calendar months of development activity, the first product was deployed at MARKET MAKER. By mid-2001, approx. 20 members of the MERGER product line were in service, and many more are planned. New customer systems that only require the basic functionality can be put together in a day or two, once the design of the HTML pages is provided. An example of one customer's system is shown on this page. The figure illustrates the "Steckbrief" (i.e., composite page) view on an instrument. This view provides all of the basic information about a particular stock, taken from a variety of sources such as real-time feeds, news databases, historical price data, estimates, or computed technical indicators.

The increasing productivity through the PuLSE™ product line approach can be illustrated with an example from user administration: the core user management component was developed in several person days. Once this was in place, variants of this component for specific customers only required 10% of the initial effort.



Example of customer system created by MARKET MAKER Software AG

## Partner

MARKET MAKER Software AG  
67655 Kaiserslautern  
www.market-maker.de

## Contact

In 2001: Dr. Peter Knauber  
Since Feb. 2002: Dr. Peter Kaiser  
Phone +49 (0) 6301 707 251  
Fax +49 (0) 6301 707 202  
E-Mail kaiser@iese.fhg.de

## ViSEK – Virtual Competence Center for Software Engineering

The project Virtuelles Software-Engineering-Kompetenzzentrum (ViSEK) aims at providing German software developing companies with fast and simple access to the latest and most appropriate methods for developing software according to engineering principles.

Its primary goals are to

- build up a community of software engineering experts and professional users as well as to
- create an Internet portal through which the expert knowledge of ViSEK partners will be made accessible to the more than 20,000 software developing companies in Germany.

The portal or virtual competence center therefore represents a basis for successful knowledge transfer between research and industry and vice versa. Under the leadership of Fraunhofer IESE, seven research organizations integrate and process their expert knowledge in an electronic knowledge base. During a three-year build-up phase from 2001 to 2003, ViSEK will be funded by the German Ministry for Education and Research (BMBF) with € 6.75 million. Since October 2001, visitors of the virtual competence center at the website [www.visek.de](http://www.visek.de) have been able to inform themselves on up-to-date, empirically proven methodologies and access experience reports. Moreover, they have been able to get into contact with experts.

ViSEK provides a variety of services to its users. Besides discussion forums and information on software engineering technologies, tools, and experience, ViSEK will serve as a procurement platform for consultancy, technology transfer, and software tools.

### Approach

ViSEK will provide knowledge that is both generic and specific to application domains. At first, the two domains critical systems and e-business are addressed. Critical systems address mission critical, safety critical, or business critical systems, all with special requirements on the software embedded in or controlling the system. Examples for domains with such systems are automotive and avionics, but also banking or insurance. ViSEK's e-business focus addresses all net-enabled software developments that support relationships and processes between business partners, customers, and employees of a company.

The ViSEK partners are documenting their application-specific experience together with descriptions of up-to-date methods addressing common problems of software development.

The knowledge documented in ViSEK is stored in a knowledge database, which is represented in the web portal via small "knowledge building blocks" in an understandable way. The user can navigate through the knowledge building blocks with a simple mouse click and, for example, query for experience reports on a certain method or list experts who can give further information on the application of a tool.

Besides project coordination, the role of Fraunhofer IESE within ViSEK is mainly to document methodologies and experience for state-of-the-art software development. The methods that are addressed first are inspections and Product Line Engineering, two main competence areas of IESE. Software Inspections offer an easy to apply, flexible, and highly effective way to improve the quality of designs, documents, or code in the development process. Product Line Engineering is a software engineering principle that addresses the reuse of architecture and components of product lines, e.g., common functionality in different models of mobile phones. Both topics will be represented by several dozen knowledge bricks in the ViSEK database and interlinked with other methodologies or tools provided by the other partners.

For the integration of existing knowledge, the seven ViSEK partners created a software engineering map (SE-map) that covers all domains, processes, methods, and techniques represented by ViSEK. The SE-map will also be used on the portal to ease navigation.

Whereas in the first year of the project, the existing know-how was structured and content was prepared, in the subsequent years, active community building will be addressed through events and workshops. Empirical studies will be performed to add experience on the success criteria of applying state-of-the-art software engineering in industry.



The portal will be open to the general public and a lot of its services and content will be available for free. ViSEK's business model, however, aims at self-financing without major public help from 2004 onwards. Hence, certain content will be restricted to paying members or fees may be collected for services that were arranged through ViSEK.

## Results

After the first months of the project, the structure of the repository schema has been defined and initial content is ready to fit the structure. A first version of the ViSEK portal is online at [www.visek.de](http://www.visek.de), offering services and collaboration possibilities for industry that range from consulting to workshops to internships at a ViSEK partner.

Several thousand people have visited the ViSEK website in the first months after opening and more than 100 have registered for a beta test phase of the

knowledge database. Initial contacts to international projects that have matching goals have been established (CeBASE, [www.cebase.org](http://www.cebase.org) in the USA and ESERNET, [www.esernet.org](http://www.esernet.org) in Europe). In the future, closer collaboration is planned.

The project is well on track to becoming the prime address for German industry for finding solutions to their problems in software development. The fast and simple access over the Internet enables small and medium-sized companies, in particular, to benefit from up-to-date software methodology and to easily contact experts.

## Partners

- Brandenburgische Technische Universität Cottbus, Forschungsgruppe Software-Systemtechnik, Cottbus
- Fraunhofer-Institut für Rechnerarchitektur und Softwaretechnik FIRST, Berlin
- Fraunhofer-Institut für angewandte Informationstechnik FIT, St. Augustin
- Fraunhofer-Institut für Experimentelles Software Engineering IESE, Kaiserslautern
- Fraunhofer-Institut für Informations- und Datenverarbeitung IITB, Karlsruhe
- Fraunhofer-Institut für Software und Systemtechnik ISST, Berlin
- Institut für Informatik IV, TU München, München
- Oldenburger Forschungs- und Entwicklungsinstitut für Informatik-Werkzeuge und -Systeme OFFIS, Oldenburg

## Contact

Ralf Kempkens

Phone +49 (0) 6301 707 251

Fax +49 (0) 6301 707 202

E-Mail [kempkens@iese.fhg.de](mailto:kempkens@iese.fhg.de)



## Estimating Software Costs for BMW Projects

The responsibility of the BMW Software Development and Production Environment Division is to support all BMW software projects on a conceptual and strategic level. One of the main goals is to optimize the development process for application software. This includes the provision of methods and tools for software project management and controlling.

One important challenge for the BMW application software development is the estimation of cost for software projects. This is essential in order to properly estimate their internally developed projects as well as assessing incoming bids. However, the estimation of cost for software projects is one of the most important and most difficult management tasks. A number of problems are commonplace and may explain the situation. These problems are related to a lack of necessary input data from past projects and a lack of knowledge about which data to collect that has the most impact on the cost.

Another challenge and vision for BMW is to support the reuse of software engineering know-how across different software projects. One example for such know-how is cost-related data collected during projects and the lessons learned when applying different cost estimation procedures.

In collaboration with Fraunhofer IESE, a concept for the establishment of an appropriate cost estimation procedure at BMW was introduced. In addition, an iterative and incremental approach to establishing the reuse of software engineering know-how was proposed.

## Approach

The cost estimation concept was based on the COBRA™ method (Cost Estimation Benchmarking and Risk Assessment). This method was initially developed by Fraunhofer IESE and can be easily tailored to a specific project context. COBRA™ is based on expert opinion and data from past projects. It provides decision support during the estimation process, and its application leads to relatively accurate results.

COBRA™ consists of two main components. The first component determines the most important cost factors and assesses their influence on cost. The second component defines a quantitative model for cost estimation that efficiently uses the data identified as important.

To collect useful cost data, it is necessary to determine predominant, influential factors on cost. This is done through knowledge acquisition of experienced project managers. Within the BMW project, representative BMW project managers were asked to decide about the relative importance of a large number of potential cost factors. Based on these results, interviews were performed to quantify the cost drivers according to their relative impact on cost. Uncertainty in the answers was also taken into account.

The size of the software system is one of the most important cost factors and thus is considered in the first component of COBRA™. Within the BMW project, a sizing procedure was defined following standard size measures, such as function points. This procedure also utilizes the information from the BMW development standard.

The results obtained regarding the cost drivers can not be applied to all the heterogeneous systems within BMW as a whole. Rather, they should be applied to similar, comparable projects only. Therefore, project characteristics that distinguish different types of projects were determined in collaboration with the BMW project managers. These project attributes determine the scope of a COBRA™ application.

All the above mentioned parts were integrated in a COBRA™ model that is valid for a specific type of BMW projects. Since a lot of uncertainty exists at an early stage in a project, COBRA™ incorporates the possibility for quantitative risk management using Monte-Carlo simulations. This allows for the assessment of the probability of overrunning a certain budget for a project. The relevant data collection instruments were defined and usage scenarios were described.

Addressing BMW's second objective, a concept for reusing software engineering know-how was proposed. Based on a baseline, an incremental iterative approach was suggested that included three steps. In each step, the technical and organizational level was taken into account. The first step describes initial means to establish the technical infrastructure and enable corresponding processes on the organizational level. The second step evaluates the feasibility of establishing knowledge management at BMW. The third step incorporates a description of how to run and maintain an experience factory.



## Results

The main results of this project are documented and consist of:

- A repeatable ranking procedure of cost factors regarding their importance. This enables BMW to perform a ranking of potential cost factors in any other project environment.
- An interview-based process to determine the relative impact of cost factors. This documentation is essential in order to apply the COBRA™ principles to other project environments.
- A proposal for a sizing procedure for BMW projects. This procedure serves as a starting point to consistently collect sizing information on upcoming projects. Size estimation is one important component in order to apply COBRA™. Beside this, the application of any other cost estimation procedure also requires reliable size measurement.
- A definition of important data to collect for accurate cost estimation of BMW software projects and the corresponding data collection procedures. This enables BMW to collect important cost-related data.
- A description of how to use the data for estimation and bid assessment. These scenarios are important for project managers who want to apply COBRA™ in order to assess and estimate a new upcoming software project.
- A description of how to build a COBRA™ model. This information is essential for project managers who want to establish COBRA™-based cost estimation for different project environments.
- A description of a concept to reuse software engineering know-how. This might serve as a starting point to efficiently pilot the COBRA™ method in a specific project environment and to deploy it across different divisions.

## Partner

BMW AG  
Software Development and Production Environment  
80788 München

COBRA™ is a registered trademark of the Fraunhofer-Gesellschaft.

## Contact

Dr. Isabella Wieczorek  
Phone +49 (0) 6301 707 251  
Fax +49 (0) 6301 707 202  
E-Mail [wieczo@iese.fhg.de](mailto:wieczo@iese.fhg.de)



## Cost-Benefit Analysis of IT Software Investments

Decisions on directing IT investments and costs towards a beneficial output in the software development process have become more and more important to companies during the past few years. Especially in decisions on investments to support a software development process with tools for the production of software, organizations have a major interest in whether such an investment will pay off in the future. Such IT investment decisions may range from patterns like "do or don't for a new feature within a tool", "do or don't for a new tool", "make or buy a tool", to performing maintenance actions in one of the previously listed cases. This pay-off should best be measured in terms of cost or effort savings along the software production process, in terms of improved software product quality, simultaneously resulting in lower rework cost and higher customer satisfaction, and in terms of a decrease of time-to-market.

Robert Bosch GmbH and Fraunhofer IESE have set up a project to develop, probe, and document a method for quantifying and analyzing the costs and benefits of possible IT investments to make such decisions in a systematic, data-based, transparent, traceable, and repeatable way.

## Approach

The project is performed jointly by the Business Area Gasoline Systems (GS) of Robert Bosch GmbH and the IESE competence area Quality and Process Engineering (QPE). The goal of the project is to customize and transfer a method that is scalable with respect to the size of the potential IT investment, that is easy to apply by personnel, and that allows for learning and improvement of the method. Moreover, the method supports users in building decision models, feeding them with the right data, and making a transparent, traceable IT investment decision.

Fraunhofer IESE has developed a customized method for performing such cost/benefit quantification and analyses before the actual IT investment takes place. After a characterization of the IT investment scenario, the cost and benefit quantification can be based on various types of data such as subjective measurement data, expert opinion-based data, historical data of comparable IT investment decisions, or crisp data. Uncertainty implied in non-crisp data-based situations can be integrated with cost/benefit models and thus be controlled, aiming at keeping the quantification, analysis, and eventual IT investment decision as realistic as possible. Currently, the basic method has been defined and is being applied in a "do or don't feature in tool", a "do or don't tool", and a "make or buy tool" pilot scenario. The initial cost and benefit factors that influence a decision have been identified. In 2002, the decision models for all three scenarios will be developed and quantification of the cost and benefit factors will be performed. After finalizing the quantification phase, IT investment decisions

for the three scenarios will be made. In case of a positive decision, the IT investments will be performed, i.e., the projects resulting from the three scenarios will be conducted. For those projects that are conducted, re-quantification of the cost benefit factors will be performed after each project's touchdown. This will end up in verification of the IT investment decisions that were made.

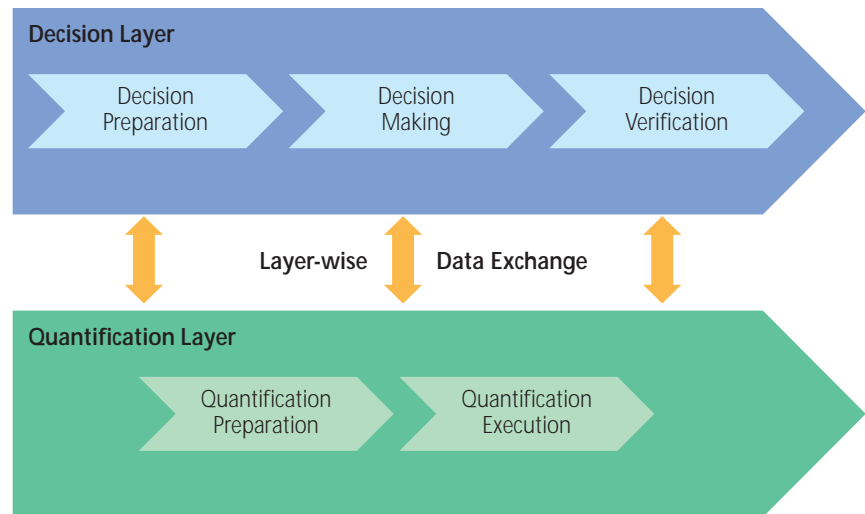
As a result of learning from the three pilot scenarios, changes and improvements will be integrated in the method. The method and the flow of activities will be documented in a method handbook. The handbook will include activity descriptions, techniques, roles, templates, and checklists to perform the method and make it repeatable for Bosch personnel.

The fundamental design of the method is depicted on the opposite page. The method consists of two layers: the decision and the quantification layer. In each layer the various phases of the method are depicted. In the decision layer, phases for preparing, making, and verifying an IT investment decision can be found, whereas the quantification layer provides phases for preparing and executing the quantification of cost and benefit factors associated with the IT investment decision to be made.

## Results

The result of the joint project of Bosch GS and Fraunhofer IESE will be an applicable and validated method tailored to the customer's needs in daily work. The method

- provides scalability from "half or one day small group desk work" up to "group-based identification and quantification as well as decision model building" depending on the size of the IT investment under analysis,
- can be changed, adapted, and improved by experience from past projects to better reflect possible changes in organizational culture, needs, and goals,
- makes IT investment decisions of Bosch GS transparent and traceable to the internal customers,
- integrates different kinds of data sources such as subjective measurement, expert opinion-based data, historical data of comparable IT investment decisions, or available crisp data, and
- makes IT investment decisions of Bosch GS systematic, repeatable, and comparable.



Layers and phases of the quantification method

### Partner

Dr. Wolfgang Stolz  
 Department Head  
 Robert Bosch GmbH, Gasoline Systems  
 GS/EMW  
 71701 Schwieberdingen

### Contact

Michael Ochs  
 Phone +49 (0) 6301 707 251  
 Fax +49 (0) 6301 707 202  
 E-Mail [ochs@iese.fhg.de](mailto:ochs@iese.fhg.de)



## Enhancing Experience Management and Process Learning with Moderated Discourses

To remain competitive in service-oriented and knowledge-intensive businesses, rapid innovation cycles and organizational learning are necessary. Process models of organizations constitute a major knowledge asset to this type of learning. However, in order to be applicable, these process models must be continuously evaluated and improved as well as being enriched with further knowledge.

The project indiGo (Integrative Software Engineering using Discourse Supporting Groupware), funded by the BMBF (German Ministry of Education and Research) is a joint effort of Fraunhofer IESE and Fraunhofer-Institut für Autonome intelligente Systeme (AiS) that strives to support this evaluation and enhancement of process models through the following services:

- The members of an organization may engage in discourses concerning process models before their introduction and during their implementation, thus supporting the change and adherence to the new processes.
- The members may annotate process models with personal notes, thus supporting their execution of the process.
- They are offered process-related lessons learned, which match current project contexts and are one-click-integrated into the process model.
- At the organizational level, discourses are analyzed and summarized to improve process models and create new lessons learned, thus lowering the cost of continuous process improvement and extraction of relevant experience.

## Approach

An initial challenge for indiGo was the fact that members of organizations often resist accepting software engineering methods. Therefore, indiGo's objectives were

- to integrate as many organizational members as possible before and during the discourse
- to analyze and qualify discourse contributions and extract lessons learned for storage in an experience base.

indiGo sought to reach these objectives by developing a comprehensive set of methods integrated within a software infrastructure. These methods constitute an operative approach combining e-moderation, elicitation of experiences, and improvement of process models, i.e., process learning. The software infrastructure includes Zeno (a groupware for discourses), INTERESTS (an experience management environment), SPEARMINT/EPG as a tool for process modeling and publishing, and tools for text mining in discourses.

To enrich the process models with further knowledge, the method set of indiGo allows for the attachment of personal notes to the process model elements and for their discussion in various groups. Furthermore, it encourages the organization of communities covering topics related to the implementation of processes. It presents efficient instruments for e-moderators to monitor, analyze, summarize, and control the discourse. Finally, indiGo will provide text-mining tools to analyze and qualify these discourse contributions, so that lessons learned can be extracted for storage in an experience base. With case-based reasoning, lessons learned can be presented

matching current project contexts and processes. Not only does indiGo offer comprehensive methods for the cooperation between e-moderators, process authors, process owners, and publishers, it also enhances current experience management by providing a solution for integrating discussion results into an experience base. This experience base functions as a repository for the reuse of experience. Therefore, the indiGo methods and tools support the acceleration of innovation cycles. In this project specifically, this is facilitated through the following enhancements: more persons can participate, more information on processes is recorded in the form of discourses, and the recorded information is better analyzed and exploited through text mining and case-based reasoning.

Both, the methods and the infrastructure of indiGo have been evaluated in a practical case study.



indiGo

## Results

indiGo is an ongoing project that began in May 2001 and is expected to be completed by the end of 2003. So far, the following results have been achieved:

- design and evaluation of the user interface
- requirement analysis and architectural design of the entire system
- development of a method for e-moderation.

## Partner

Fraunhofer-Institut für Autonome intelligente Systeme AiS  
Schloss Birlinghoven  
53754 Sankt Augustin

## Contact

Dr. habil. Klaus-Dieter Althoff  
Phone +49 (0) 6301 707 121  
Fax +49 (0) 6301 707 200  
E-Mail [althoff@iese.fhg.de](mailto:althoff@iese.fhg.de)

## Securing an Internet Lottery for Süddeutsche Klassenlotterie

*"The generation of random numbers is too important to be left to chance."*

– Robert R. Coveyou

Online lottery draws on the Internet are gaining in popularity. Süddeutsche Klassenlotterie (SKL) offers EUROJOKER, a lottery whose draws are published hourly on the Internet. Drawing a new winning number every hour, seven days a week, challenges conventional lottery procedures. The provision of sufficient operators and supervisors for such frequent manual draws with a mechanical lottery device would be inefficient and expensive. Therefore, SKL decided to employ a software-based drawing device.

However, software lacks the (literal) transparency that is an important characteristic of traditional lottery devices. In fact, a software simulation of a mechanical lottery device is far from trivial. Or, as John von Neumann, the famous mathematician and computer pioneer, put it: "Anyone who considers arithmetical methods of producing random digits is, of course, in a state of sin." Considerable thought and reflection is needed to gain trust in such drawing software. Proving the system's correctness, fairness, and resistance to manipulation attempts requires a combination of skills that is beyond the capabilities of SKL and its software suppliers. Consequently, SKL sought independent expertise. In this situation, Fraunhofer IESE with its diverse spectrum of competencies in software engineering, IT security, and mathematics was ideally suited to act as an expert consultant.

### Approach

The correctness of a software-based lottery device depends on a number of critical factors, including:

- Statistical evenness: every winning number has equal chances of being drawn.
- Unpredictability: even with perfect knowledge of the software and past lottery draws, it must be impossible to predict the next winning number.
- Impartiality: neither SKL nor anyone else must affect the outcome of a draw.
- Tamper-resistance: the system must withstand attacks.

The first two items ensure that the draws are fair in the sense that they appear to be truly random – regardless of any "insider knowledge" a lottery player may have. This is mainly a mathematical property, but correct programming is a prerequisite to preserve random behavior. The latter two items belong to the realm of IT security. The drawing device should function properly even in a hostile environment.

To ensure all these properties, Fraunhofer IESE scrutinized the drawing algorithm and its underlying random number generator, including available design documentation. In addition to formal analysis, the statistical properties of winning numbers were empirically validated by examining large data samples with several test suites especially designed for random number testing.

Producing correct winning numbers is only part of the problem. It is equally important that every draw is properly documented in a log file and transmitted to the Internet without modification. Therefore, the post-processing of random numbers (formatting, recording, printing, transmitting) was studied intensively to exclude coding errors or even malicious trapdoors in the lottery software.

The platform on which the software is executed – an Intel PC running under Linux, including a firewall protecting its network interfaces – also received careful analysis. Even correct software may produce incorrect results if the runtime environment is misconfigured or subject to manipulation. To this end, the lottery device was examined with NIXE™, a security checker developed by Fraunhofer IESE. Automated testing was complemented by manual inspection of critical aspects of the system configuration.

Sustained levels of security require continuous effort and care. Unsafe procedures may often compromise a secure system. Accordingly, an evaluation of organizational aspects was part of the overall assessment.

To provide meaningful evidence, a final challenge was to prove that the production system and the system under study were identical. Note that due to time and budget constraints, most of the analysis had been carried out offline. To ensure the authenticity of the drawing system, a snapshot of the final system configuration (including operating system) was recorded. Next, the equivalence of this recording and the reference system under scrutiny was established and the recording was digitally signed. Finally, a so-called fingerprint of the digital signature was copied into the assessment report to firmly link the evaluation results to the running configuration.

## Results

Our assessment exposed a number of improvement potentials. Several (from a security perspective non-critical) coding errors were discovered that had failed to be noted by the software provider's quality assurance. As an additional line of defense against intrusions into the drawing software, Fraunhofer IESE recommended adding parameter checking to some critical software modules.

Fraunhofer IESE proposed some security measures to improve the "hardening" of the runtime environment. For example, access permissions were assigned more restrictively. System services not needed for the lottery software were shut down and their communication ports closed. The firewall's filtering rules were simplified but tightened.

Furthermore, our risk analysis identified exceptional conditions of the lottery device that were not covered by SKL's security policy, but should have been considered explicitly.

In summary, most of the recommended changes were minor modifications. Their implementation caused negligible costs but led to substantial gains in security. Both SKL and its software provider benefited from the assessment:

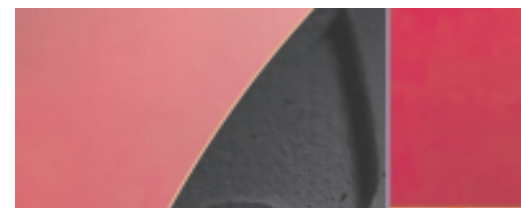
- Fraunhofer IESE helped the software developers to eliminate some hidden weaknesses that might have caused problems in future releases of the drawing software.
- The provider received valuable general security advice.
- SKL received independent reassurance that no single aspect of the generation of random numbers was left to chance.

## Partner

Süddeutsche Klassenlotterie  
81737 München  
www.skl.de

## Contact

Dr. Reinhard Schwarz  
Phone +49 (0) 6301 707 121  
Fax +49 (0) 6301 707 200  
E-Mail schwarz@iese.fhg.de



## CoIN – Experience Management at IESE

Two typical problems are well known in business and research. One is that the main experience of an organization resides in the brains of a few experts, which are rarely accessible because of their involvement in many different tasks. Therefore, this, possibly small, group of experts becomes a scarce resource as information providers. The other problem is the fast growth of the organization itself, meaning that the size does no longer allow talking to all people on a weekly basis. Thus, experience sharing on a personal basis does not work anymore.

Hence, it has become increasingly important (a) to provide the less experienced people with default processes and guidelines to jump-start them, (b) to build up their expertise more quickly, and (c) to facilitate experience sharing among all employees. For this purpose, the Corporate Information Network (CoIN) initiative was established at Fraunhofer IESE, which is a learning organization called "Experience Factory".

Bridging these gaps is the responsibility of the CoIN project. Additionally, CoIN is used as a real project environment for the development and validation of techniques and methods for goal-oriented experience management, including knowledge elicitation, processing, dissemination, presentation, maintenance, and evaluation. It consists of three main parts: the experience base, the CoIN team, and an Intranet representation (CoIN Portal). The objectives of CoIN are to provide

users with valuable information/knowledge at the right time, in an adequate representation, and within the actual context ("just-in-time").

### Approach

Within the experience base included in CoIN, all kinds of experience necessary for our daily business are stored in so-called experience packages (e.g., projects, business processes, document templates, guidelines, observations, improvement suggestions, problems that occurred and problem fixes that were applied). Defined processes (e.g., structured interviews in project touch-down meetings) populate this experience base systematically with experience typically needed by our project teams. Dedicated improvement processes analyze problems that have occurred, devise improvement actions to avoid their recurrence, and implement strategic decisions by the institute's leadership. However, elicitation, distribution, and integration of process descriptions and lessons learned need an investment of effort.

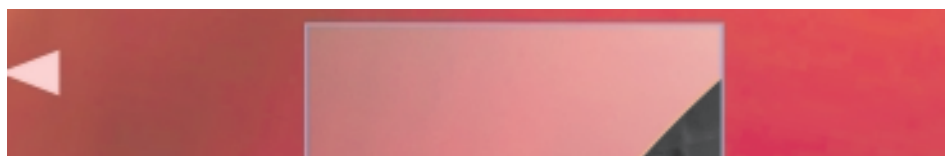
All these experience packages are highly interrelated. For example, projects produce deliverables in the form of slide presentations and reports. Slide presentations may be summaries of reports. Observations and problems are gained during a project while a particular business process was performed, that is, we have to deal with context-sensitive experience. Such kind of experience is unique in the sense that exactly the same context will not recur. Therefore, people will be searching for experience that has been gained in similar contexts. Both, the requirement for supporting different kinds of

interrelated experience packages and the need for context-sensitive, similarity-based retrieval, demand a specialized technical infrastructure for the experience base.

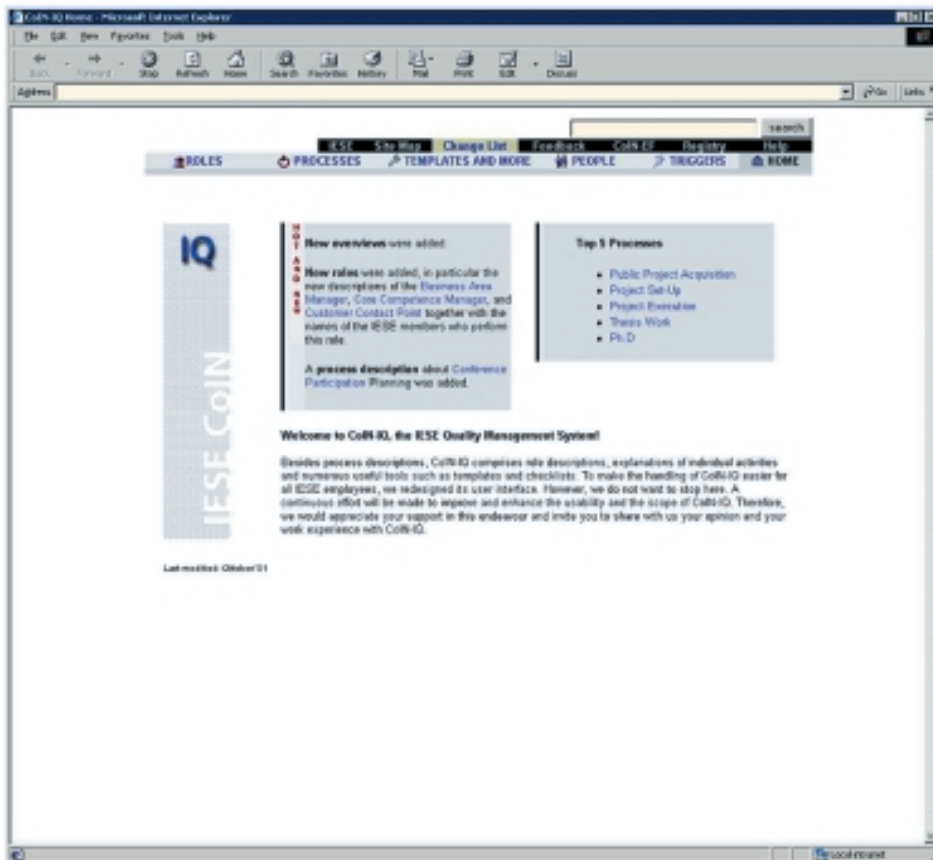
These are common requirements for an experience base. Our solution to meeting these requirements is INTERESTS (Intelligent Retrieval and Storage System). It consists of tools for rapid application development of experience base systems, for accessing and presenting the experience base contents using a standard experience base browser, an experience base server synchronizing (and logging) access to the experience base, and a database that stores all information. Due to easy adaptation to company specific requirements and existing infrastructure, supplier independence is achieved. INTERESTS is extensible by different tools for text mining, data mining, and retrieval.

Each experience package is implemented as a "case" based on a structural CBR approach. This includes a domain ontology for modeling the different types of case concepts, formal and informal case attributes together with the respective similarity measures, as well as relations between cases.

The next step will be to enable personalization for experience base users through improved (adaptive) user modeling and integration of knowledge management and e-learning.







User interface of CoIN on the IESE Intranet

## Results

In different projects, both industrial and research-oriented, the benefits of our experience base approach have already been demonstrated. The repository-based approach ("using the experience base") provides more useful guidelines and observations per time period (in terms of both effort and duration) than the human-based approach ("talking to your colleague"). In addition, the repository-based approach provides useful guidelines and observations not obtained by the human-based approach. The overall conclusion was that at best both approaches are combined.

Until now we have gathered for more than two years of operational experience in maintaining CoIN, and we have successfully adapted CoIN to partners/customers.

## Contact

Andreas Jedlitschka  
 Phone +49 (0) 6301 707 121  
 Fax +49 (0) 6301 707 200  
 E-Mail jedl@iese.fhg.de

## via-it – the Virtual IT Academy of Rhineland-Palatinate

A study in 2001 by the BMBF (the German Ministry of Education and Research) has revealed a lack of highly qualified IT specialists in Germany. It appears that existing educational systems alone have not been able to respond to current industry needs for highly trained IT personnel. This inadequacy is explained by institutionally ineffective training content on one side and rapidly changing mandatory IT know-how on the other side. Thus, attention should focus on new learning techniques that respond to this rapidly changing IT know-how while being cost- and time-efficient. One of these new learning techniques is online education. While numerous institutions nationwide are offering this already, they are still working individually and independently. Therefore, consistent course curricula do not exist, the educational market is not transparent, and high quality of training can not be guaranteed. To remedy this situation, the state of Rhineland-Palatinate has started an initiative to establish a virtual center of continuing education in the IT sector.

Fraunhofer IESE responded to this initiative by founding via-it – the Virtual IT Academy – to establish a virtual center of continuing education in the IT sector for the state of Rhineland-Palatinate. The backbone of this virtual center is an Internet portal that pools existing continuing educational programs in the IT sector. The first project of its kind nationwide, via-it is financed by the state of Rhineland-Palatinate and offers all forms of modern and

traditional learning methods – offline as well as online. In addition, via-it offers a variety of services, such as an easily accessible online course catalog, job market, and news and information about the IT training and job market. via-it addresses individual learners, companies that are interested in IT training, and institutions that offer IT training and education.

In establishing a virtual center of continuing education, quality assurance is one of the main concerns. Therefore, institutions that offer courses and training programs through via-it must meet high quality standards on a continuing basis. This guarantees high quality curricula and professional training to students and, at the same time, makes the IT training market transparent to all participants.

### Approach

The starting point for via-it was a survey that had been requested by the Ministry for Commerce, Transportation, Agriculture, and Viticulture in Rhineland-Palatinate. That survey revealed that IT specialists, particularly in the areas of software development, database development, and web design, are in high demand and short supply. It also showed that companies and offices desire professional training programs to obtain highly qualified personnel. To satisfy these needs and desires, via-it pursues the following objectives:

- Design of market-oriented and career-focused curricula
- Design of quality assurance techniques for training methods
- Development of guidelines for web-based learning
- Coordination and certification of courses and curricula
- Establishment of an Internet portal

The Internet portal is the backbone of via-it. This portal represents the "campus", where education, information, and communication take place. The participants choose freely when and where they want to study, communicate and/or receive information. via-it chose time4you GmbH communication & learning as its partner for the implementation of the Internet portal. time4you is one of the leading companies in Germany providing e-learning and e-collaboration solutions. As a service provider and software producer, it offers tailor-made e-learning solutions to national as well as international partners.

Virtual learning requires a different didactic approach than traditional learning does. Since this form of learning is relatively new, appropriate guidelines for web-based learning do not yet exist. To meet its high quality standards, via-it takes advantage of the expertise in distance education of the ZFUW (Zentrum für Fernstudien und Universitäre Weiterbildung) of the University of Kaiserslautern. The ZFUW has worked in the area of distance education for many years. As a partner institution of the Fernuniversität Hagen, it works as a regional study center. In

addition, the ZFUW has designed and conducted its own distance learning and e-learning programs.

The challenge for via-it in designing market-oriented and career-focused curricula lay in two aspects: to evaluate the personnel needs of the IT market, and to develop curricula that supply the learners with all necessary skills to respond to the market's demands. The survey of the Rhineland-Palatinate ministry provided the necessary data to evaluate the needs of the IT market. Based upon this data, via-it has designed a variety of course curricula that blend technical skills with soft skills and combine courses using both traditional and modern learning concepts. All courses offered through the virtual academy must meet high quality standards on a continuing basis. Only courses that meet these standards will be accepted into via-it's course catalog and, consequently, into the curricula. As a result, via-it provides a consistently high level of quality, which is guaranteed by certification of all courses and curricula. In order to be able to apply high quality standards, quality assurance techniques have to be designed. Fraunhofer IESE contributed its knowledge in the area of quality assurance to design these techniques.

## Results

The Virtual IT Academy of Rhineland-Palatinate is an ongoing project, which started in the fall of 2000. The Internet portal with the projected services will be available in its pilot phase starting in mid-2002. In 2001, via-it

- evaluated the personnel needs of the IT market in the state of Rhineland-Palatinate,
- designed guidelines for web-based learning,
- designed nine curricula based upon the personnel needs of the IT market, and
- designed quality assurance techniques for web-based training methods.

The objectives for 2002 are

- to set up the Internet portal,
- to launch the virtual academy in its pilot phase.

In order to launch the virtual academy, the contribution of the partner SWA Software Akademie AG is needed. The SWA is responsible for establishing contacts to institutions that offer courses and training programs as well as to individual learners and companies interested in IT training, specifically to small and medium-size enterprises (SMEs). Furthermore, SWA will be responsible for the technical support of the Internet portal.

## Partners

- Fraunhofer IESE (project leader)  
67661 Kaiserslautern
- SWA  
Software Akademie AG  
67657 Kaiserslautern
- ZFUW  
Zentrum für Fernstudien und  
Universitäre Weiterbildung  
67663 Kaiserslautern
- time4you GmbH  
communication & learning  
76133 Karlsruhe

## Contact

Dr. Volker Hübsch  
Phone +49 (0) 6301 707 121  
Fax +49 (0) 6301 707 200  
E-Mail huebsch@iese.fhg.de





## Designing an E-Commerce Strategy for i&M

According to a recent market survey conducted by the Deutsche Post AG for Germany, media (e.g., books, CDs, videos) and IT products (e.g., software and PC equipment) rank highest among the products sold over the Internet. However, lately more and more companies of the brick-and-mortar industry, in particular, suppliers or retailers of construction materials, have also started to enter the e-commerce arena, both for B2C and B2B sales. Motivated by these developments, Interpares-Mobau GmbH & Co. KG ("i&M" for short), one of the leading German retail associations for construction materials, entered into a cooperation with Fraunhofer IESE. The objective of the cooperation was to determine a strategy that could guide i&M's future activities in the area of B2C as well as B2B e-commerce.

i&M comprises approximately 270 retailers, located all over Germany. The individual retailers are supported by i&M in a number of ways, including the purchase of products from manufacturers and other suppliers, the supply of products to the retail outlets, IT services, and marketing activities. Each associated retailer decides independently to which extent he wants to make use of such services. The association also operates a central web site, which primarily informs about the i&M retail locations, competencies, products, and services. For a small subset of products - gardening tools and equipment as well as tiles -, the web site already includes shop functionality.

i&M chose Fraunhofer IESE as partner for this strategic project because of IESE's competence in the areas of process engineering, e-business models, channel and online marketing, as well as security issues for internal and external networks.

## Approach and Results

The project was carried out in several phases. First, a base-lining of the business model of i&M as well as of current market trends within the construction materials industry was conducted. Based on this analysis, a model for an i&M e-commerce solution was proposed. For implementation of the proposed solution, a roadmap was designed and evaluated by means of a SWOT analysis.

During the base-lining of the i&M business model, the following aspects were analyzed: target customers and markets, marketing and sales channels, range of products and services, suppliers and supply chain, fulfillment issues, pricing policy, and IT infrastructure. For the analysis, data were collected from various sources: in on-site structured interviews with selected i&M associates, the situation from the point of view of the individual retailers was examined; through participation in various i&M working groups, currently valid constraints given by the existing IT infrastructure and resulting from current market developments were surveyed. In addition, a competitor analysis was conducted, focusing on competitors' e-commerce activities.

The e-commerce solution that was designed pursued a multi-channel strategy, but at the same time aimed at

- avoiding channel conflicts,
- synchronizing all marketing and sales channels,
- maintaining retailer autonomy with regard to pricing, range of products, and customer data, and
- maximizing synergies with regard to technical development and maintenance of the solution.

For this solution, a marketing strategy was outlined, including aspects of traffic generation, click-to-sales conversion, customer relationship management, and marketing controlling. The solution was evaluated from the perspective of the association as a whole as well as from the point of view of the individual associates.



In the final step of the study, a road map was designed, which aimed at harmonizing the current IT and e-business efforts of i&M with the development activities required for implementing the proposed model. The roadmap was subjected to a SWOT analysis. In a survey among members of the i&M association, the associates' position concerning the proposed model and road map was determined.

Both the proposed e-business model and the road map for its implementation were designed in close cooperation with the IT and e-commerce working groups of i&M. This ensured that the proposed strategy reflected the interests of all involved parties including the retailers as well as central service functions, such as the IT unit.

#### Partner

Interpares-Mobau GmbH & Co. KG  
76185 Karlsruhe  
www.i-m.de

#### Contact

Dipl.-Inform. Petra Steffens  
Phone +49 (0) 6301 707 160  
Fax +49 (0) 6301 707 200  
E-Mail [steffens@iese.fhg.de](mailto:steffens@iese.fhg.de)





# Fraunhofer Center for Experimental Software Engineering, Maryland

## Chapter Contents

|   |           |
|---|-----------|
| <b>Profile of Fraunhofer Center Maryland</b>        | <b>72</b> |
| Background  | 72        |
| Business Fields, Targets, Benefits                  | 72        |
| Competencies and Offerings                          | 72        |
| <b>Projects in Progress</b>                         | <b>73</b> |
| Development of an Experience Management System      | 73        |
| Software Process Improvement Implementation Support | 73        |
| Reading/Inspection Technologies                     | 74        |
| State-of-the-Art Software Inspections               | 74        |
| DoD Software Intensive Systems (SIS)                | 75        |
| NASA High Dependability Computing Project           | 75        |
| <b>Consortia</b>                                    | <b>76</b> |
| Center for Empirically Based Software Engineering   | 76        |
| Software Experience Center                          | 76        |
| <b>FC-MD in Figures</b>                             | <b>77</b> |
| <b>Network, Activities, Publications</b>            | <b>78</b> |
| Steering Committee Members                          | 78        |
| References  | 78        |
| Research Partners                                   | 78        |
| Events  | 78        |
| Visitors hosted                                     | 79        |
| Staff Professional Activities                       | 79        |
| Publications  | 80        |
| Presentations, Tutorials                            | 81        |



## Background

In 1994, Fraunhofer-Gesellschaft e.V. (FhG) established Fraunhofer USA (FUSA), headquartered in Plymouth, Michigan, as the mechanism for fostering collaborative activities with research institutions and industries in the United States. Since then, six separate centers have been set up in the United States, each center affiliated with both a local American university and one of the FhG Institutes in Germany.

The Fraunhofer Center for Experimental Software Engineering, Maryland (FC-MD) is the only FUSA center to specialize in software and related engineering fields, with a focus on the use of experimental approaches to introduce innovative techniques into industry. FC-MD is an applied research and technology transfer organization, and is affiliated with the University of Maryland and the Fraunhofer Institute for Experimental Software Engineering (IESE) in Kaiserslautern, Germany. Its primary focus is to improve the quality of software related products and services by working directly with organizations, learning about their particular business needs, and tailoring improvement to those needs.

## Business Fields, Targets, Benefits

Software development is an activity not often well understood, especially with respect to the role that software plays in a company's business strategy. Too often, software is late to deliver, over budget, and unreliable. Competitive companies are continually looking for ways to better control, manage, predict, and evaluate their software efforts. Standard solutions, such as ISO 9000 certification or a Software Capability Evaluation, are often proposed to these problems without an accompany-

ing understanding of their effect on the business product. Companies need to adapt effective processes to their own environment and the FC-MD will use its expertise to help organizations customize solutions. FC-MD believes that its unique expertise and experience-based program combine to make it a market leader in the delivery of customized process solutions to companies.

FC-MD emphasizes software engineering, software development practices, and software processes using application development, feedback, and learning as the basis for improving software development technologies for its client organizations. By using this proven approach, the FC-MD enables its clients to become more competitive in critical information technology fields. Global, national, and regional organizations can benefit from FC-MD services.

## Competencies and Offerings

FC-MD supports organizations committed to research and development in the discipline of software engineering and its enabling technology. It facilitates collaborative activities between private-sector companies, government agencies, and academic institutions, in order to develop innovative, actionable approaches. The core competencies of FC-MD lie in the areas of technology transfer and process and product improvement.

As technology transfer agents, FC-MD facilitates transferring a specific process technology into a project using the following support activities:

- Provide an initial evaluation of client software environment and organization using questionnaires to qualitatively and quantitatively describe the project's products and processes.

- Recommend a specific process technology to transfer into practice based on the business goals and problem areas identified. Integrate the new technology into the project's existing processes and provide technology training.
- Collect study data (objective measures and subjective impressions) from the project and analyze the impact of the new technology on both the product and the process. Tailor the resultant process based on feedback received and continue to evolve the technology for the organization from project to project.

Process and product improvement focuses on establishing Experience Factories in organizations and across an entire company. Support activities include the following measures:

- Characterize and evaluate client engineering environment by conducting a detailed software product and process survey. Evaluate the organization's business goals, structural elements, and infrastructure systems with respect to the Experience Factory model. Recommend new development technologies and any organizational changes needed to facilitate the changes. Use and leverage existing processes by tailoring the new technologies to operate within the existing environment.
- Using the measures from multiple project applications of the new technology, build and/or refine the organization's models for errors, cost estimation, and schedule. Recommend further management measures and analysis techniques to assure the continuing success of the process changes.
- Support building local and company-wide experience bases to allow the organization to expand their learning organization concepts to other projects and divisions.



## Development of an Experience Management System

Knowledge intensive organizations are highly dependent on their employees. Organizations for software development and applied research are prominent examples as their products are intangible and seldom documented, so most of the knowledge resides in employees' brains. The damage to the organization can be severe when employees leave and take the undocumented knowledge with them.

To prevent such damage and to enable organizational learning, an Experience Management System (EMS) is under development that will capture, structure, and share knowledge within an organization.

EMS is based on FC-MD's Executive Director Victor Basili's concepts of the Experience Factory and our experience with solving knowledge management problems. The Experience Factory recognizes that all organizations need to learn from their past successes and failures, and from one another. A vital point in enabling such organizational learning is to make knowledge available and accessible to all employees.

The first phase of the project was devoted to requirements analysis based on the evaluation of an already existing prototype of EMS and analysis of current commercial systems. One main requirement is for EMS to support distributed and fast-paced knowledge intensive software organizations. It is therefore based on advanced Internet and client-server database technologies as well as state-of-the-art graphical user interfaces. During the second phase of the project, the EMS was implemented in Java and populated with experience packages important to the FC-MD's business activities. Examples of experience packages are project, proposal, and document packages. The EMS will be field-tested and used by FC-MD employees and further fine-tuned to serve its users well.

Doing this has several benefits:

- To learn about the system from a customer's perspective
- To package the knowledge and processes about FC-MD for use by our customers
- To define the process of implementing an Experience Factory and associated technology in a research organization, for use in other projects.

After field testing and updating the system locally, EMS will be available to industry to help take it to the next levels of functionality and usability.

### Contact

Dr. Mikael Lindvall  
 Phone 1-301-403-8972  
 Fax 1-301-403-8976  
 E-Mail mlindvall@fraunhofer.org

## Software Process Improvement Implementation Support

FC-MD assists private industry companies in achieving their software process improvement goals through baseline assessments, action planning assistance, and periodic consulting support. Staff expertise in lessons learned for process improvement in small organizations and non-traditional software environments plays a significant role in the delivery of these projects. Organizations served include: IIT Research Institute and Systems Integration and Development.

### Partners

- IIT Research Institute, Lanham, Maryland
- Systems Integration and Development (SID), Rockville, Maryland

### Contact

Kathleen Dangle  
 Phone 1-301-403-8973  
 Fax 1-301-403-8976  
 E-Mail kdangle@fraunhofer.org



## Reading/Inspection Technologies

Software inspections have been shown to be a practical method of ensuring that software artifacts, created during the software lifecycle, possess the required quality characteristics. For instance, inspections have been used to improve design and code quality by increasing defect removal during development. In this way, inspections help reduce defects in a software system by ensuring that the software artifacts that are necessary for its construction correctly reflect the needs of stakeholders.

FC-MD has continued its work on the research and application of "software reading techniques," which increase the effectiveness of software inspections by providing guidelines that inspectors can use to examine (or "read") a given software artifact and identify defects. There is empirical evidence that software reading is a promising technique for increasing software quality for different situations and document types, not just limited to source code. Software reading can be performed on all documents associated with the software process, and is an especially useful method for detecting defects, since it can be applied as soon as the documents are written. FC-MD is engaged in a number of collaborations for the purpose of refining reading techniques for different stages of the lifecycle.

Perspective-Based Reading (PBR) is a set of reading techniques for inspecting software requirements. PBR has been the subject of replicated experiments in universities around the world and has been introduced in industrial case studies. FC-MD collaborated with IESE to develop a tutorial for introducing PBR to a wider industrial audience, which was delivered at the ICSE 2001 conference and the NASA IV&V facility.

A related area that is of increasing interest to industrial organizations is that of inspecting Object-Oriented artifacts. Inspections of OO artifacts present unique challenges because of the possibility for multiple and subtle relationships between objects in the system. FC-MD is collaborating with researchers at the University of Maryland, College Park, and the Federal University of Rio de Janeiro to refine and evaluate a set of reading techniques for OO design inspections. The aim of the techniques is to ensure that the problem domain has been correctly understood before the system is constructed, and to catch fundamental design problems before they have the chance to affect implementation.

### Partners

- Federal University of Rio de Janeiro - COPPE/Computer Science and System Engineering Department, Brazil
- NASA Independent Verification and Validation Center, West Virginia
- University of Maryland, Maryland

### Contact

Dr. Forrest Shull  
 Phone 1-301-403-8970  
 Fax 1-301-403-8976  
 E-Mail [fshull@fraunhofer.org](mailto:fshull@fraunhofer.org)

## State-of-the-Art Software Inspections

The Fraunhofer Center - Maryland is working with NASA's Goddard Space Flight Center (GSFC) to improve their processes for inspecting software work products to find defects. Software defects have had negative effects on NASA missions, ranging from the expense of corrective actions to the loss of the mission. The inspection or reading of software products such as requirements, design, or code is a proven verification and validation technique for ensuring that the finished system is of higher quality and reliability. However, these inspection techniques must be continuously assessed and improved.



The Fraunhofer Center - Maryland is working with GSFC to pilot an integrated, full life cycle approach to readings and inspections, and to assess whether new reading techniques that have been validated under laboratory conditions can be applied effectively within NASA. A unique outcome for this research will be the integration of a well-proven process for inspections across the software engineering life cycle and advanced reading techniques that detect more faults and are more cost effective.

FC-MD is working, first, to interview developers and extract lessons learned from projects in the NASA environment. FC-MD personnel interview developers who have completed projects using inspections, collecting qualitative data from their experiences to produce a lessons learned report. The next phase of the work will involve studies of reading techniques (specific techniques for performing effective inspections) in the NASA environment. Controlled experiments will be carried out to measure the impact of reading techniques when applied to NASA products by experienced developers.

The final result will be to update the GSFC approach to inspections based on the lessons learned from this work.

#### Partner

NASA Goddard Space Flight Center,  
Greenbelt, Maryland

#### Contact

Dr. Forrest Shull  
Phone 1-301-403-8970  
Fax 1-301-403-8976  
E-Mail [fshull@fraunhofer.org](mailto:fshull@fraunhofer.org)

#### DoD Software Intensive Systems (SIS)

Over the next two years, FC-MD will be working with a few Department of Defence (DoD) software organizations to implement Experience Factories at their sites. In concert with USC's Center for Software Engineering, FC-MD is developing a tailorable version of the Experience Factory (EF) guidelines, incorporating complementary processes and tools. The methods being integrated include goal-question-metric definition; data collection, analysis, and interpretation guidelines; and experience feedback processes.

This project began in May 2001 with the identification of three candidate technology-consumer organizations within the Department of Defense (DoD). The initial pilot project, selected in October, is an MIS system at the Software Engineering Center in Fort Belvoir, VA. Initial EF activities are underway, gathering a sufficient amount of information to characterize the project's products and processes.

#### Partner

DoD Software Intensive Systems Office,  
Virginia

#### Contact

Rose Pajerski  
Phone 1-301-403-8967  
Fax 1-301-403-8976  
E-Mail [rpajerski@fraunhofer.org](mailto:rpajerski@fraunhofer.org)

#### NASA High Dependability Computing Project

The goal of the recently launched High Dependability Computing Project (HDCP) is to investigate the use of experimental methods to evaluate new design and development approaches and technologies for improving NASA's capability to create highly dependable software.

Begun in November 2001, the incremental, five-year, cooperative agreement is part of a broad strategy for dependable computing that links NASA, corporate partners and universities and research centers such as Carnegie Mellon, University of Maryland, Fraunhofer Center Maryland, University of Southern California, Massachusetts Institute of Technology, University of Washington and University of Wisconsin. Initial planning activities are underway to determine the specific activities of each group.

#### Contact

Ioana Rus  
Phone 1-301-403-8971  
Fax 1-301-403-8976  
E-Mail [irus@fraunhofer.org](mailto:irus@fraunhofer.org)

## Center for Empirically Based Software Engineering

One necessary step towards the goal of building more reliable software systems, on time and within budget, is to establish an institutionalized empirical discipline for understanding causal relationships among the processes, components, and technologies that affect the building of systems. As in the physical and natural sciences, experimentation in software engineering requires a community in which proposed experimental designs can be critiqued by multiple researchers, in which experimenters access the resources they need to perform experiments, and in which the results of experiments replicated at different locations can be analyzed for what they say about the "big picture."

For these reasons the Fraunhofer Center - Maryland cooperates with four universities across the country to form the Center for Empirically Based Software Engineering (CeBASE). Through CeBASE, FC-MD undertakes original empirical research and is developing a prototype system for sharing and evolving the results of such research with a community of affiliated researchers and practitioners. CeBASE develops and refines techniques to increase the descriptive and predictive power of empirical models, and studies specific software development technologies to enable industrial organizations to understand the benefits and drawbacks of those technologies in their specific context. FC-MD also helps to provide courses and symposia on empirical methodologies and results, and assist the use of empirical knowledge in software engineering education.

### Partners

- University of Maryland, College Park, Maryland
- University of Southern California, Los Angeles, California
- Mississippi State University, Mississippi
- University of Nebraska, Lincoln, Nebraska

### Contact

Dr. Forrest Shull  
 Phone 1-301-403-8970  
 Fax 1-301-403-8976  
 E-Mail fshull@fraunhofer.org

## Software Experience Center

The goal of the Software Experience Center (SEC) Consortium, a joint project between the Fraunhofer Center - Maryland and Fraunhofer IESE, is to improve the software competencies and development practices of member companies. To achieve this goal, member companies share past and ongoing experiences in software process improvement and particular development technologies. The Fraunhofer organizations contribute their expertise to help analyze, package, and disseminate the lessons to be learned from these experiences.

The Fraunhofer organizations collaborate to provide a number of services to member companies:

- Twice-yearly workshops are organized to provide a forum for the discussion of software development experience.
- The Fraunhofer organizations produce a series of experience reports that address specific technologies of interest to the Consortium. The reports are gathered and stored in the Fraunhofer-operated SEC Experience Base for use and feedback by all members.

- The Fraunhofer organizations have developed an extensive network of software experts, both within the organizations and externally, that can be made available to SEC member companies.

The Consortium is currently composed of five international corporations with significant investments in software development: ABB, Boeing, Daimler-Chrysler, Motorola, and Nokia. One last member is being solicited, since membership is limited to a maximum of six companies.

The latest Consortium workshop was held in April, 2001, in Seattle and sessions ranged from in-depth working groups to presentations of experience reports. Session topics were selected by the member companies and included distributed software development, software requirements engineering, and defect analysis, among others.

### Partners

- ABB, Corporate Research Ltd., Baden-Dättwil, Switzerland
- Boeing Company, Seattle, Washington, USA
- DaimlerChrysler AG, Stuttgart, Germany
- Motorola, Inc., Schaumburg, Illinois, USA
- Nokia Corporation, Helsinki, Finland

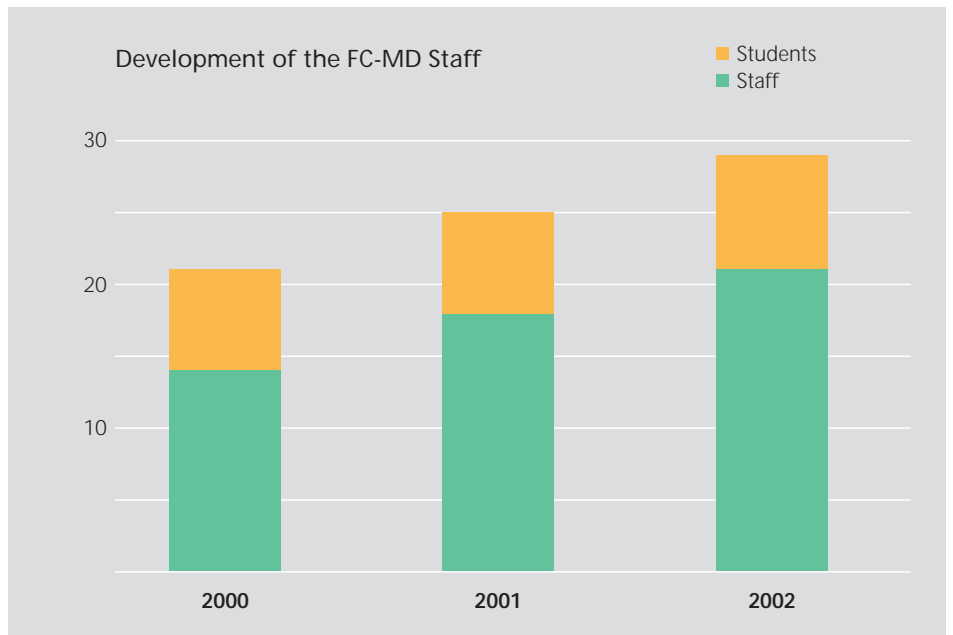
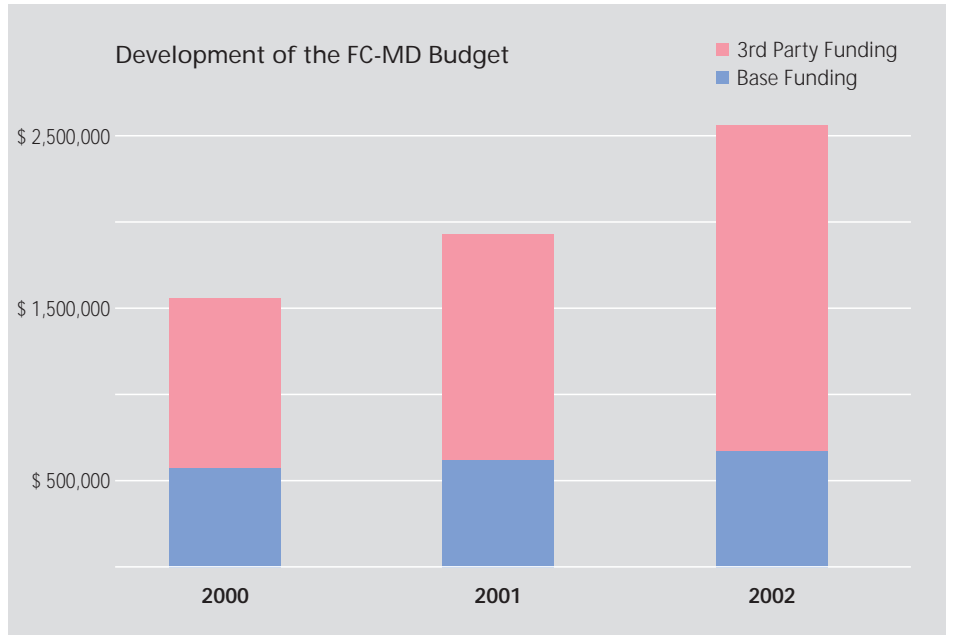
### Contact

Dr. Forrest Shull  
 Phone 1-301-403-8970  
 Fax 1-301-403-8976  
 E-Mail fshull@fraunhofer.org



The Center added three new scientists and two administrative staff members in 2001 and expects to add an additional three more in 2002. We have also hosted a number of visiting scientists, professors, and students this year and expect to continue at this level during subsequent years. The student population stayed the same as in 2000.

The Center generated over 67% of its revenue from new and continuing agreements with external government and industry sources in 2001. Next year, the estimate is that over 70% of our revenue will derive from these sources.



## Steering Committee Members

Mr. Keith Blurton  
Vice President  
Fraunhofer USA

Secretary David Iannucci  
State of Maryland Department of  
Business and Economic Development

Prof. Dieter Rombach  
Executive Director  
Fraunhofer Institute for Experimental  
Software Engineering

Mr. Seymour Moskowitz  
Senior Vice President  
Anteon

Dr. Michael C. Dyer  
Corporate Fellow, Software Engineering  
Lockheed Martin Corporation

Dr. Michael Plett  
Vice President  
Computer Sciences Corporation

Mr. Frank E. Herman  
Vice President  
BAE Systems

General Emmett Paige, Jr.  
President and Chief Operating Officer  
OAO Corporation

Dr. Stephen Halperin  
Dean, College of Computer,  
Math and Physical Science  
University of Maryland

## References

- ABB
- ACS
- Anteon
- BAE Systems
- Boeing
- CSC
- CSX WT
- DACS
- DaimlerChrysler
- DoD
- IITRI
- Lockheed Martin
- Motorola (USA)
- OAO
- NASA
- Nokia
- NSF
- Q-Labs, Inc. (USA)
- SID
- Telcordia
- State of Maryland

## Research Partners

- Experimental Software Engineering Group, University of Maryland, Maryland, USA
- Federal University of Rio de Janeiro - COPPE/Computer Science and System Engineering Department, Brazil
- International Software Engineering Research Network (ISERN)
- Mississippi State University, Mississippi, USA
- NASA Independent Verification & Validation Facility, West Virginia, USA
- Norwegian Technical University, Norway
- Software Engineering Laboratory, NASA Goddard Space Flight Center, Maryland, USA
- University of Kaiserslautern, Germany
- University of Nebraska, Lincoln, Nebraska, USA
- University of Sao Paulo, Brazil
- University of Southern California, California, USA
- University of West Virginia, West Virginia, USA
- Vienna Institute of Technology, Austria

## Events

Fraunhofer USA  
Pre-Board/Board Meeting,  
February 13

FC-MD Steering Committee Meeting,  
July 20

Fraunhofer USA Directors Meeting,  
October 16

FC-MD Steering Committee Meeting,  
December 16

## Visitors hosted

Michael Frey  
University of Kaiserslautern,  
November '00 through May '01

Lou Blazy  
NASA HQ,  
January 23

Robin Moulder  
WebCradel,  
February 2

Ira Forman  
IBM,  
March 8

Barry Boehm  
USC,  
March 15

Keith Blurton  
Fraunhofer USA,  
March 21

Rich Turner  
OSD SIS,  
March 16 and November 16

Pat Neary and Sy Moskowitz  
Anteon,  
April 4

John Salasin  
DARPA,  
April 20

Frank Bomarius and Dirk Muthig  
Fraunhofer IESE,  
April 30

Reidar Conradi  
NTNU,  
May 23

Ravi Bhutani  
President, CIPS,  
Potential SWIC Member,  
June 4

Jon Valett  
Q-Labs,  
June 28

E. Simmonds, K. Blurton  
Fraunhofer USA,  
September 7

Frank Anger  
NSF,  
October 2

Ray Vaughn  
Mississippi State University,  
June 28, July 16-17 and October 4-5

Marco Torchiano  
NTNU,  
October 12

Stefan Biffi  
Technical University of Vienna,  
on sabbatical with IESE,  
October 15-17

Grady Campbell  
Prosperity Heights Software,  
October 30

Plinio Vilela  
October 31

Raimund Feldmann  
University of Kaiserslautern,  
November 5-20

Paolo Donzelli  
Office of the Prime Minister of Italy,  
Dept. of Informatics,  
December 3

## Staff Professional Activities

### Dr. Victor Basili

- Associate Editor, Journal of Systems and Software, Elsevier North Holland, Inc.
- Co-Editor-in-Chief, Empirical Software Engineering, An International Journal, Kluwer Academic Publishers
- Editor, Software Engineering Advance Book Series, Kluwer Academic Publishers
- Founding Member, ISERN - International Software Engineering Network
- Member, Advisory Committee, Airlie Software Council, DoD Best Practices Initiative
- Member, IEEE Software Process Achievement Awards Committee
- Member, Q-Labs Advisory Board, College Park, Maryland
- Member, Advisory Board (Kuratorium) of the Fraunhofer Institute for Experimental Software Engineering, Kaiserslautern, Germany
- Non-resident Visiting Professor, Computer Science Department, University of New South Wales, Sydney, Australia.
- Recognition by JSS as the No 2 Software Engineering researcher with respect to publications

### Dr. Mikael Lindvall

- Member, Institute of Electrical and Electronics Engineers (IEEE), Computer Society

**Dr. Ioana Rus**

- Reviewer for Computer Magazine
- Member, Institute of Electrical and Electronics Engineers (IEEE), Computer Society
- Member, Association for Computing Machinery (ACM)

**Dr. Forrest Shull**

- Program Committee, International Conference on Product-Focused Software Process Improvement (PROFES), Kaiserslautern, Germany, September 2001
- Reviewer for the International Conference on Software Engineering and Knowledge Engineering (SEKE), Buenos Aires, Argentina, June 2001
- Reviewer for IEEE Transactions on Software Engineering
- Reviewer for IEEE Software Magazine

**Dr. Marvin Zelkowitz**

- Series Editor, Advances in Computers, Academic Press, 1994 - present
- Editorial Advisory Board, Journal of Computer Languages, 1980 - present
- Editorial Board, Journal of Empirical Software Engineering, 1995 - present

**Publications<sup>1</sup>**

Boehm, B.; **Basili, V.**: Software Defect Reduction Top 10 List, IEEE Computer, Vol. 34, No. 1, January 2001

**Rus, I.**; Collofello, J.: Integrating Process Simulation and Reliability Models, CrossTalk, Vol.14, No.1, January 2001

Donzelli, P.; **Rus, I.**; Cantone, G.: Integrating Quality Modeling with Requirements Engineering, The 12th European Software Control and Metrics Conference, ESCOM2001, London, April, 2001

Conradi, R.; **Basili, V.**; Carver, J.; **Shull, F.**; Travassos, G.: A Pragmatic Documents Standard for an Experience Library: Roles, Documents, Contents, and Structure, CS-TR-4235 and UMIACS-TR-2001-24, April 2001

**Basili, V.**; Boehm, B.: COTS-Based Systems Top 10 List, IEEE Computer, Vol. 24, No. 5, May 2001

**Zelkowitz, M.**; **Rus, I.**: Understanding IV&V in a Complex Evolutionary Environment: The NASA Space Shuttle Program, Proceedings of International Conference on Software Engineering ICSE2001, Toronto, Canada, May 2001

**Basili, V.**; **Lindvall, M.**; **Costa, P.**: Implementing the Experience Factory Concepts as a Set of Experience Bases, Proceedings of SEKE 2001 Conference, Buenos Aires, Argentina, June 2001

Mendonca, M.; Seaman, C.; **Basili, V.**; Kim, Y.:

A Prototype Experience Management System for a Software Consulting Organization, Proceedings of SEKE 2001 Conference, Buenos Aires, Argentina, June 2001

**Shull, F.**, Carver, J.; Travassos, G.H.: An Empirical Methodology for Introducing Software Processes, Proceedings of European Software Engineering Conference, Vienna, Austria, September 2001

**Basili, V.**; **Tesoriero, R.**; **Costa, P.**; **Lindvall, M.**; **Rus, I.**; **Shull, F.**; **Zelkowitz, M.**: Building an Experience Base for Software Engineering: A Report on the First eWorkshop, Proceedings of PROFES 2001, Kaiserslautern, Germany, September 2001

Melo, W.; **Shull, F.**; Travassos, G.H.: Software Review Guidelines, Technical Report ES-556/01 of the Systems Engineering and Computer Science Program, COPPE, Federal University of Rio de Janeiro, Brazil, September 2001

**Zelkowitz, M.**; **Rus, I.**: The Role of Independent Verification and Validation in Maintaining a Safety Critical Evolutionary Software in a Complex Environment: The NASA Space Shuttle Program, Proceedings of International Conference on Software Maintenance, Florence, Italy, November 2001

Morisio, M.; Seaman, C.; **Basili, V.**; Parra, A.; Kraft, S.; Condon, S.: COTS-Based Software Development: Processes and Open Issues, Journal of Systems and Software, December 2001



**Basili, V.; Costa, P.; Lindvall, M.; de Mendonca Neto, M. G.; Seaman, C.; Tesoriero, R.; Zelkowitz, M.:**  
An Experience Management System for a Software Engineering Research Organization,  
Proceedings of the 26th Annual NASA Goddard Software Engineering Workshop, Greenbelt, MD, USA, November 2001

**Zelkowitz, M. (Ed.):**  
Advances in Computers 54-55 (2001)  
Academic Press, London, UK.

**Pratt, T.; Zelkowitz, M.:**  
Programming Languages: Design and Implementation,  
Fourth Edition, Prentice Hall, Upper Saddle River, NJ, 2001

**Travassos, G.H.; Shull, F.; Carver, J.:**  
Working with UML: A Software Design Process Based on Inspections for the Unified Modeling Language,  
Advances in Computers Book Series, 54(35-97), Academic Press, 2001

**Shull, F.; Tesoriero, R.:**  
Study Guide to Accompany Shari Lawrence Pfleeger's Software Engineering: Theory and Practice.  
Prentice Hall, 2nd edition, 2001

## Presentations, Tutorials

**Shull, F.:**  
"Improving Software Inspections by Using Reading Techniques",  
Tutorial at ICSE2001, Toronto, Canada  
May 2001

**Shull, F.:**  
"Software Inspections at NASA: Lessons Learned on the State of the Practice",  
Presentation at the 1st Annual NASA Office of Safety and Mission Assurance Software Assurance Symposium,  
Morgantown, WV, USA  
September 2001

**Shull, F.:**  
"Improving Software Inspections by Using Reading Techniques",  
Tutorial at the NASA Software Independent Verification and Validation (IV&V) Facility, Fairmont, WV, USA  
September 2001

**Bechtold, R.; Dangle, K.:**  
"Lessons Learned Implementing the CMM for Small Organizations: Their Application to the CMMI",  
Software Engineering Process Group Conference, New Orleans, LA, USA  
March 12-15, 2001,  
European Software Engineering Process Group Conference, Amsterdam, Netherlands,  
June 11-14, 2001,  
Schlumberger Software Métier Managers Meeting, Austin, Texas, USA  
August 29, 2001

**Marciniak, J.; Larsen, P.; Menezes, W.:**  
"Getting to Level 2 and More in Acquisition Environments",  
Software Engineering Process Group Conference, New Orleans, LA, USA  
March 2001

**Zelkowitz, M.:**  
"How You Know What Is So: How Science Learns About The World Around Us",  
N.C.A.S. Workshop on Understanding Belief, Winchester VA, USA  
May 2001,  
University of Maryland Senior University, USA  
October 2001

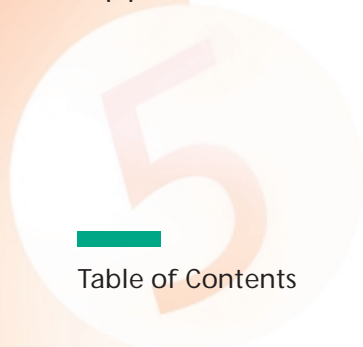
**Zelkowitz, M.:**  
Panel on "What are the Missing Elements from Software Engineering Research?",  
COMPSAC, Chicago, USA  
October 2001



Section  
(h:mm)  
1:15  
00

1:15  
00

556  
5021  
224  
862  
3689  
4258  
1025



## Table of Contents

|   |            |
|---|------------|
| <b>Network in Science and Industry</b>                      | <b>84</b>  |
| Industrial Partners   | 84         |
| National Research Partners                                  | 85         |
| International Research Partners                             | 85         |
| International Software Engineering Research Network (ISERN) | 86         |
| Visitors hosted   | 86         |
| <b>Professional Contributions</b>                           | <b>87</b>  |
| Lecturing Assignments                                       | 87         |
| Editorial Boards  | 88         |
| Committee Activities  | 88         |
| Scientific and Technological Advisory Boards                | 90         |
| Keynotes  | 90         |
| Presentations   | 90         |
| Memberships in Industrial Advisory Boards                   | 95         |
| Memberships in Professional Associations                    | 95         |
| <b>Scientific Publications</b>                              | <b>96</b>  |
| Books   | 96         |
| Articles in Books   | 96         |
| Articles in Journals  | 96         |
| Published Dissertations                                     | 97         |
| Contributions to Conference Proceedings                     | 98         |
| Fraunhofer IESE Reports                                     | 102        |
| ISERN Reports   | 103        |
| Postdoctoral Degrees  | 103        |
| Doctoral Theses   | 103        |
| Diploma Theses  | 104        |
| Project Theses  | 104        |
| <b>Awards</b>   | <b>105</b> |
| Internal  | 105        |
| External  | 105        |
| Appointments and Honors                                     | 105        |
| <b>Events</b>   | <b>106</b> |
| <b>Media Coverage</b>                                       | <b>108</b> |
| IESE in the Media   | 108        |
| ViSEK in the Media  | 110        |
| <b>The Fraunhofer-Gesellschaft</b>                          | <b>112</b> |
| <b>Fraunhofer VIESE Locations</b>                           | <b>114</b> |
| <b>Fraunhofer IESE Contact Persons</b>                      | <b>116</b> |
| <b>Information Service</b>                                  | <b>118</b> |

## Industrial Partners

- ABB Corporate Research Ltd.
- AEG Energietechnik GmbH
- Alcatel Alsthom
- Allianz Lebensversicherungs-AG
- Atlante
- Axis
- BASF AG
- Bauer & Partner AG
- BMW AG
- Boeing Company
- Brose AG
- Brown, Boverie & Cie
- CAP Gemini Ernst & Young
- CAS Computer Anwendungs- und Systemberatung GmbH
- Combitech Software AB
- DaimlerChrysler Aerospace AG
- DaimlerChrysler AG
- Delphi Automotive Systems
- Deutsche Bahn AG
- Deutsche Bank AG
- Deutsche Flugsicherung GmbH
- Deutsche Investitions- und Entwicklungsgesellschaft mbH
- Deutsche Lufthansa AG
- Deutsche Telekom AG
- Deutsches Zentrum für Luft- und Raumfahrt e.V.
- Dräger Medical Technology
- Dresdner Bank AG
- empolis knowledge management gmbh
- EMSIG
- Ericsson (Finland, Sweden and USA)
- Ericsson Eurolab Deutschland GmbH
- ESA European Space Agency
- Etnoteam S.p.A.
- F. Hoffmann-La Roche Ltd.
- Fannie Mae
- GCE – Gesellschaft für Computer Engineering mbH
- GEVA – Datentechnik GmbH
- Heidelberger Druckmaschinen AG
- HIGHWARE sarl
- Honeywell Regelsysteme GmbH
- Horst Klaes GmbH u. Co KG
- ICON Intelligent Control Gebäudetechnik GmbH
- InfoGraph GmbH
- INSEAD
- Insiders GmbH
- Interpares-Mobau GmbH & Co. KG
- Irish Medical Systems
- Kommunikations- und Datentechnik GmbH
- Kretz Software GmbH
- LMS Durability Technologies GmbH
- Lucent Technologies Network Systems GmbH
- MAN Roland Druckmaschinen AG
- Mannesmann-VDO
- Markant Südwest Handels GmbH
- MARKET MAKER Software AG
- maxess systemhaus gmbh
- MEDIASYS GmbH
- Motorola Inc.
- Nokia Mobile Phones
- Norwegian Health Informatics
- Philips
- PMS Mikado Software Consult GmbH
- Preussen Elektra AG
- proALPHA Software AG
- Psipenta Software Systems GmbH
- Q-Labs GmbH
- QuantiMetrics UK Ltd.
- Robert Bosch GmbH
- Sainco
- SAP
- Schlumberger RPS
- Schneider Automationstechnik GmbH
- sd&m software design & management GmbH & Co. KG
- Sieda GmbH
- Siemens AG
- Società Interbancaria per l'Automazione
- Softlab GmbH
- softTECH - Software Technologie GmbH
- STOTAX GmbH & Co. KG
- Süddeutsche Klassenlotterie
- SWA Software Akademie AG
- SYSTEM NET
- Tecmath AG
- Telvent
- Tengelmann  
Warenhandelsgesellschaft
- Tenovis GmbH u. Co KG
- Testo GmbH & Co. KG
- Thomson-CSF Elektronik GmbH
- time4you GmbH
- T-Mobil GmbH
- Tokheim Corporation
- Union Fenosa
- Viva Software Entwicklung GmbH
- VTT Electronics
- Walter AG
- ZF Lenksysteme GmbH

## National Research Partners

- Center for Learning Systems and Applications (LSA), University of Kaiserslautern, Kaiserslautern
- Department of Programming Languages and Compilers, Institute of Computer Science, University of Stuttgart, Stuttgart
- Fernuniversität Hagen, Hagen
- Forschungszentrum für Informatik (FZI), Karlsruhe
- Fraunhofer-Institut für Angewandte Informationstechnik (FIT), St. Augustin
- Fraunhofer-Institut für Autonome Intelligente Systeme (AIS), St. Augustin
- Fraunhofer-Institut für Graphische Datenverarbeitung (IGD), Darmstadt
- Fraunhofer-Institut für Integrierte Publikations- und Informationssysteme (IPSI), Darmstadt
- Fraunhofer-Institut für Produktionstechnik und Automatisierung (IPA), Stuttgart
- Fraunhofer-Institut für Rechnerarchitektur und Softwaretechnik (FIRST), Berlin
- Fraunhofer-Institut für Software- und System-Technik (ISST), Berlin
- Fraunhofer-Institut für Techno- und Wirtschaftsmathematik (ITWM), Kaiserslautern
- Institute for Image Processing and Applied Informatics, Inc., University of Leipzig, Leipzig
- Knowledge Discovery and Machine Learning, Otto-von-Guericke University Magdeburg, Magdeburg
- Special Research Institute Development of Large Systems with Generic Methods (SFB 501), University of Kaiserslautern, Kaiserslautern
- The Research Institute for Validation of AI Systems (VAIS), Technical University Ilmenau, Ilmenau
- University of Essen, Essen
- University of Kaiserslautern, Kaiserslautern
- Zentrum für Fernstudien und Universitäre Weiterbildung (ZFUW), University of Kaiserslautern, Kaiserslautern

## International Research Partners

- Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands
- Artificial Intelligence and Machine Learning, University of Wyoming, Laramie, WY, USA
- Associação CCG/ZGDV, Centro de Computação Gráfica, Coimbra, Portugal
- BOOTSTRAP Institute, Oulunsalo, Finland
- Carleton University, Ottawa, Canada
- Centre de Recherche Informatique de Montreal (CRIM), Montreal, Canada
- Centre for Advanced Empirical Software Research (CAESER), University of New South Wales, Sydney, Australia
- Centre for Object Technology Applications and Research, Sydney University of Technology, Sydney, Australia
- Department of Computer Science, University of Utrecht, Utrecht, The Netherlands (cooperation contract)
- Department of Systems and Informatics, University of Florence, Florence, Italy
- European Software Institute (ESI), Bilbao, Spain (formal affiliation agreement)
- Experimental Software Engineering Group of the University of Maryland (UMD/ESEG), University of Maryland, College Park, MD, USA (formal affiliation agreement)
- Expert Systems Group, Computer Sciences Corporation, St. Leonards, Australia
- Federal University of Santa Catarina, Florianopolis, Brazil
- Georgia Tech University, Atlanta, GA, USA
- GraFP Technologies Inc., Montreal, Canada
- Helsinki University of Technology, Helsinki, Finland

- Independent Verification and Validation Facility, NASA Ames Research Center, Fairmont, WV, USA
- Information and Software Engineering, George Mason University, Fairfax, VA, USA
- INRIA Rennes, Rennes, France
- Institut für Informationsverarbeitung und Computergestützte neue Medien (IICM), Technical University, Graz, Austria
- Institute for Information Technology, National Research Council of Canada, Ottawa, Canada
- Institute for Representation and Reasoning, University of Edinburgh, Edinburgh, Scotland, UK
- Istituto per la Ricerca Scientifica e Tecnologica (IRST), Trento, Italy (formal affiliation agreement)
- IVF Industrial Research and Development Corporation, Mölndal, Sweden
- Joint Research Centre for Advanced Systems Engineering, Macquarie University, Sydney, Australia
- Knowledge Media Institute, Open University, Milton Keynes, UK
- Northern Ireland Knowledge Engineering Laboratory, University of Ulster, Newtownabbey, Northern Ireland, UK
- Norwegian University of Science and Technology, Trondheim, Norway
- Semantics Designs, Austin, TX, USA
- Software Engineering Institute (SEI), Carnegie Mellon University, Pittsburgh, PA, USA (formal affiliation agreement)
- Software Engineering Laboratory (SEL), NASA/Goddard Space Flight Center, Greenbelt, MD, USA
- Software Engineering Research Centre (SERC), Utrecht, The Netherlands
- Software Engineering Technology Inc. (SET), Knoxville, TN, USA
- Software Process Support Lab, University of Calgary, Calgary, Canada
- Software Productivity Consortium NFP, Herndon, VA, USA

- Software Technology Transfer Finland, Espoo, Finland
- SQI Software Quality Institute, Brisbane, Australia
- Technical University Delft, Delft, The Netherlands
- Technical University Eindhoven, Eindhoven, The Netherlands
- The Eindhoven Embedded Systems Institute (EESI), Eindhoven, The Netherlands
- Universidad Politecnica de Madrid, Department of Telematics Engineering, Madrid, Spain
- University of British Columbia, Electrical and Computer Engineering, Vancouver, Canada
- University of Oulu, Oulu, Finland
- University of Tennessee, Knoxville, TN, USA
- VTT Electronics, Oulu, Finland (formal affiliation agreement)

### International Software Engineering Research Network (ISERN)

- Carleton University, Canada
- Central Research Institute of Electric Power Industry, Japan
- DaimlerChrysler Research Center, Germany
- Ericsson Radio Systems AB, Sweden
- Fraunhofer Center Maryland, USA
- Fraunhofer Institute for Experimental Software Engineering, Germany
- Lucent Technologies - Bell Laboratories, USA
- Lund University, Sweden
- Motorola, USA
- Nara Institute of Science and Technology, Japan
- Norwegian University of Technology and Science, Norway
- NTT Data Corporation, Japan
- Politecnico Madrid, Spain
- Quality Laboratories Sweden AB (Q-Labs), Sweden
- Solid Information Technologies, Finland
- Telcordia, USA
- Technical University Vienna, Austria
- Università degli Studi di Roma "Tor Vergata", Italy
- University of Bari, Italy
- University of Hawaii, USA
- University of Kaiserslautern, Germany
- University of Maryland, College Park, USA
- University of Maryland, Baltimore County, USA
- University of New South Wales, Australia
- University of Southern California, USA
- University of Strathclyde, Scotland, UK
- VTT Electronics, Finland

### Visitors hosted

- Mr. Najden Selenogorski, Lord Mayor of Kaiserslautern's Partner City Pleven, Bulgaria, February 21
- Mr. Matthias Brandt, Institute of Economic Science, University of Leipzig, Leipzig, Germany, 4 weeks within February - August
- Prof. Stefan Biffli, Institute for Software Technology, Technical University Vienna, Vienna, Austria, February - December
- Dr. Frank Maurer, University of Calgary, Department of Computer Science, Calgary, Canada, March 05 - April 20
- Prof. Daniel Berry, University of Waterloo, Department of Computer Science, Waterloo, Canada, March 15 - 18
- Prof. Jorge L. Diaz-Herrera, Southern Polytechnic State University, Georgia, USA, May 7
- Prof. Warren Moseley, Western Illinois University, Department of Computer Science, Macomb, Illinois, USA, May 10
- Mrs. Birgit Geppert, Avaya Labs Research, Basking Ridge, New Jersey, USA, May 16
- Mr. Frank Rössler, Avaya Labs Research, Basking Ridge, New Jersey, USA, May 22
- Prof. Lionel Briand, Carleton University, Ottawa, Canada, June 08-11
- Mr. Daniel Lichtnow, Federal University of Santa Catarina, Florianopolis, Brazil, September 1-30
- Mr. Karl Lebsanft, Siemens AG, Munich, Germany, September 11

# Professional Contributions

Mr. Alessandro Maccari, Nokia Research, Helsinki, Finland, September 14

Prof. Dieter Ehrenberg, University of Leipzig, Leipzig, Germany, October 1

Prof. Ross Jeffery, University of New South Wales, Department of Information Systems, Sydney, Australia, November 12-16

Mr. Hilari Mateo, University Politècnica de Catalunya, Barcelona, Spain, July - December

## Lecturing Assignments

**Althoff, K.:**

Lecture:  
Anwendungen fallbasierter Systeme, Department of Computer Science, University of Kaiserslautern, Winter 2000/2001

**Althoff, K.:**

Lecture:  
Entwicklung und Einführung fallbasierter Systeme, Department of Computer Science, University of Kaiserslautern, Summer 2001

**Atkinson, C.:**

Lecture:  
Component-based Software Engineering, Department of Computer Science, University of Kaiserslautern, Summer 2001

**Atkinson, C.:**

Lecture:  
Software Engineering I, Department of Computer Science, University of Kaiserslautern, Winter 2001/2002, Co-lectured with Prof. D. Rombach

**Bomarius, F.:**

Lecture:  
Software Engineering, Department of Industrial Engineering, University of Applied Sciences of Zweibrücken, Winter 2000/2001

**Differding, C.:**

Lecture:  
Quality Management, Department of Industrial Engineering, University of Applied Sciences of Zweibrücken, Winter 2000/2001

**Hartkopf, S.:**

Lecture:  
Software Engineering I, Informatik Fachrichtung Technik, Berufsakademie Mannheim, Winter 2001/2002

**Kohler, K.:**

Seminar:  
Fehlerreduktion durch Inspektionen, STI Kaiserslautern, November 8, 2001

**Muthig, D.:**

Seminar:  
Wiederverwendung in der Praxis, STI Kaiserslautern, June - September 2001

**Paech, B.:**

Lecture:  
Requirements Engineering, Department of Computer Science, University of Kaiserslautern, Summer 2001

**Paech, B.:**

Lecture:  
Use-Case-basierte Anforderungsbeschreibung, Department of Computer Science, University of Applied Sciences of Furtwangen, Summer 2001

**Pfahl, D.:**

Lecture:  
Software Project Management, Department of Industrial Engineering, University of Applied Sciences of Zweibrücken, Winter 2001/2002

**Rombach, D.:**

Lecture:  
Software Engineering I, Department of Computer Science, University of Kaiserslautern, Winter 2000/2001

**Rombach, D.:**

Lecture:  
Software Engineering II, Department of Computer Science, University of Kaiserslautern, Summer 2001,

**Rombach, D.:**

Lecture:  
Software Engineering I, Department of Computer Science, University of Kaiserslautern, Winter 2001/2002, Co-lectured with Prof. C. Atkinson

**Rombach, D.:**

Practical Assignment:

Open Source Entwicklung im Bereich M-Commerce, AG Software Engineering, University of Kaiserslautern, Winter 2001/2002, in co-operation with maxess systemhaus gmbH, AB Datenbanken, Informationssysteme, and IESE

**Rombach, D.:**

Lecture and Practical Assignment:

Software Engineering II, Department of Computer Science, University of Kaiserslautern, Winter 2001/2002

**Rombach, D.:**

Seminar:

Software Engineering I, Department of Computer Science, University of Kaiserslautern, Summer 2001

**Rombach, D.:**

Seminar:

Forschungsmethoden (in Software Engineering), Department of Computer Science, University of Kaiserslautern, Winter 2000/2001

**Schlich, M.:**

Seminar:

Systematisches Testen von Software, STI Kaiserslautern, December 10-11, 2001

**Steffens, P.:**

Seminar:

Customer Relationship Management, Deutsche Post, February 2001

**Steffens, P.:**

Seminar:

E-Commerce, net@kademie, May and June 2001

**Steffens, P.:**

Seminar:

Online-Marketing, Deutsche Post, May and November 2001

**Editorial Boards****Althoff, K.:**

- Journal on Artificial Intelligence (KI), Editorial Board Member, since 2000

**Becker-Kornstaedt, U.:**

- Reviewer for SEKE 2001, Buenos Aires, Argentina, June 2001

**Bomarius, F.:**

- Editorial Board Member, Ph.D. Theses in Experimental Software Engineering, Fraunhofer IRB Publishing Company, 2001

**Paech, B.:**

- Editorial Board Member, Ph.D. Theses in Experimental Software Engineering, Fraunhofer IRB Publishing Company, 2001

**Rombach, D.:**

- Member, Editorial Board, Informatik: Forschung und Entwicklung, Gesellschaft für Informatik GI, Springer-Verlag, since 1993
- Member, Editorial Board, International Journal of Software Process, Improvement and Practice, John Wiley and Sons, since 1994
- Associate Editor, International Journal of Empirical Software Engineering, McKluwer Academic Publishers, since 1996
- Member, Editorial Board, IEEE Computer Magazine, since 1999
- Editorial Board Member, Ph.D. Theses in Experimental Software Engineering, Fraunhofer IRB Publishing Company, 2001

**Ruhe, G.:**

- International Journal of Software Engineering and Knowledge Engineering, Special Issue on Knowledge Discovery from Empirical Software Engineering Data (Guest Editor)
- Editorial Board Member, Ph.D. Theses in Experimental Software Engineering, Fraunhofer IRB Publishing Company, 2001

**Committee Activities****Althoff, K.:**

- Program Co-Chair, Profes 2001, Kaiserslautern, Germany, September 2001
- Co-Chair, "Wissensmanagement in der digitalen Ökonomie - Technologien und Methodologien, Anwendungen und Erfahrungen", 5. Internationale Tagung Wirtschaftsinformatik 2001, Augsburg, Germany
- Co-Chair, Workshop "Wissensmanagement in der Praxis - Erfahrungen aus erfolgreichen und weniger erfolgreichen Wissensmanagement-Projekten", 1. Konferenz "Professionelles Wissensmanagement - Erfahrungen und Visionen", Baden-Baden, Germany
- Program Committee Member, ICCBR 2001, International Conference on Case-Based Reasoning
- Program Committee Member, INOR 2001, Workshop "Individual and Organizational Learning for Software Improvement", 13th International Conference on Software Engineering and Knowledge Engineering (SEKE 2001), Buenos Aires, Argentina, June 2001
- Program Committee Member, GWCBR 2001, 9th German Workshop on Case-Based Reasoning, Baden-Baden, Germany, March 2001
- Program Committee Member, ICCBR 2001, Workshop "Case Authoring" and Workshop "Process Oriented Knowledge Management", 4th International Conference on Case-Based Reasoning, Vancouver, Canada
- Co-Speaker, GI AK WM, Arbeitskreis "Wissensmanagement in der Praxis" des Fachbereiches KI der Gesellschaft für Informatik e.V., since March 2001



- Vice Spokesman, GI-Fachgruppe, Fachgruppe 1.1.3 "Maschinelles Lernen" der Gesellschaft für Informatik e.V., since 1994

#### Atkinson, C.:

- Program Committee Member, Informatik 2001, Workshop "Component-based Application Engineering in Research and Practice", Vienna, Austria, September 2001
- Program Committee Member, UML 2001, 4th International Conference on the Unified Modelling Language, Toronto, Canada, October 2001
- Program Committee Member and Steering Committee Member, ECOC 2001, Enterprise Distributed Object Computing Conference, Seattle, USA, September 2001

#### Bomarius, F.:

- Program Co-Chair, Profes 2001, Kaiserslautern, Germany, September 2001

#### Bunse, Ch.:

- Organisation Committee, Informatik 2001, Vienna, Austria, September 2001
- Program Committee Member, Informatik 2001, Workshop "Component-based Application Engineering in Research and Practice", Vienna, Austria, September 2001

#### Knauber, P.:

- Workshop Organizer, "Software Product Lines: Economics, Architectures, and Implications", May 2001
- Program Committee Member, 3rd International Conference on Generative and Component-based Software Engineering (GCSE), October 2001
- Program Committee Member, International Workshop on Product Line Engineering - The Early Steps: Planning, Modelling and Managing (PLEES), September 2001

#### Münch, J.:

- Session Chair, Profes 2001, Kaiserslautern, Germany, September 2001
- Executive Board Member, Temporary Research Institute SFB 501, Development of Large Systems with Generic Methods

#### Paech, B.:

- Program Committee Member, Modellierung 2001
- Program Committee Member, RE-Track Wirtschaftsinformatik 2001
- Program Committee Member, ESEC-Workshop Software Evolution 2001
- Program Committee Member, Internationale Tagung Software Trends 2001
- Program Committee Member, Australian Requirements Engineering Workshop 2001

#### Pfahl, D.:

- Program Committee Member, LSO 2001 - International Workshop on "Learning Software Organizations", Profes 2001, Kaiserslautern, Germany, September 2001
- Program Committee Member, INOR 2001, Workshop "Individual and Organizational Learning for Software Improvement", 13th International Conference on Software Engineering and Knowledge Engineering (SEKE'01), Buenos Aires, Argentina, June 2001
- Program Committee Member, ECBS 2001 - IEEE International Conference and Workshop on the Engineering of Computer-based Systems, since August 2001

#### Rombach, D.:

- General Chair, Profes 2001, Kaiserslautern, Germany, September 2001
- Program Committee Member, SQM 2001, 6. Kongress Software Qualitätsmanagement, Bonn, Germany, April 2001
- General Chair, 7th International Software Metrics Symposium, London, UK, April 2001
- Program Committee Member, WISE'01: Workshop on Inspection in Software Engineering, Paris, France, July 2001
- Appraisal Committee Member, Evaluation of M.A. and Ph.D. Software Engineering Program Proposal, Department of Computing & Software, School of Engineering, McMaster University, Canada, May 2001
- Panel Organizer, Panel on Software Research Agendas, International Conference on Software Engineering, Toronto, Canada, May 2001
- Workshop Organizer, Software Inspections, EuroStar 2001 Conference, Stockholm, Sweden, November 2001
- Organizer of Workshop, EuroSTAR 2001 Conference, Stockholm, Sweden, Software Inspections, November 22, 2001

#### Steffens, P.:

- Organizing and Publicity Chair, Profes 2001, Kaiserslautern, Germany, September 2001

#### Wieczorek, I.:

- Program Committee Member, Profes 2001, Kaiserslautern, Germany, September 2001
- Program Committee Member, ESCOM 2001
- Program Committee Member, METRICS 2001

## Scientific and Technological Advisory Boards

### Rombach, D.:

- Coordinator, ISERN (International Software Engineering Research Networks), since 1996
- Member Technical Advisory Board (TBR), Government of the State of Rhineland-Palatinate, since 1993
- Member Advisory Board, Otto A. Wipprecht-Stiftung, since 1999
- Member Advisory Board, Arbeitsgemeinschaft der Bayerischen Forschungsverbände, Munich, Germany, since 1999
- Member Scientific Advisory Board, Simula Research Lab, Oslo, Norway, since 2001
- Member Advisory Board, Fraunhofer Center Maryland, College Park, Maryland, USA, since 1998
- Member Advisory Board, Beirat der Stiftung der Gasanstalt Kaiserslautern, Germany, since May 2001

## Keynotes

### Althoff, K.:

"Erfahrungsmanagement am Beispiel der Fraunhofer IESE Experience Factory", ICDM 2001, Industrial Conference Data Mining, Leipzig, Germany, July 2001

### Althoff, K.:

"Process-oriented Knowledge Management in the IESE Experience Factory", ICCBR 01, 4th International Conference on Case-Based Reasoning, Vancouver, Canada, July 30-Aug 2, 2001

### Rombach, D.:

"Experimental Software Engineering: Building a Research Community", Australian Software Engineering Conference (ASWEC) 2001, Canberra, Australia, August 2001

### Rombach, D.:

"Software Quality Management: Key for Business Competitiveness", Net-Object Days 2001, Erfurt, Germany, September 2001

### Rombach, D.:

"Guaranteed Software Quality", Profes 2001, Kaiserslautern, Germany, September 2001

### Rombach, D.:

"eXtreme Programming: The Role of Inspection and Testing", EuroSTAR 2001, Stockholm, Sweden, November 2001

### Rombach, D.:

"Software Maintenance - Old Sins and New Challenges", IEEE International Conference on Software Maintenance, Florence, Italy, November 2001

## Presentations

### Althoff, K.:

"Lernen und Wissen in einer vernetzten Gesellschaft", Talk, GI-Workshop "Lernen, Lehren, Wissen und Adaptivität" (LLWA'01), Dortmund, Germany, October 2001

### Althoff, K.:

"Experience Management", Talk, Technical University Ilmenau, Ilmenau, Germany, September 2001

### Althoff, K.:

"Informationsmanagement versus Wissensmanagement – Versuch einer Abgrenzung", Talk, Technical University Ilmenau, Ilmenau, Germany, September 2001

### Althoff, K.:

"Erfahrungsmanagement am Beispiel der Software Engineering Domäne: Experience Factory und Erfahrungsbasierte Systeme", Talk, University of Trier, Trier, Germany, March 2001

### Althoff, K.:

"Wissensmanagement im Software Engineering: Experience Factory und Fallbasierte Informationssysteme", Talk, University of Essen, Essen, Germany, January 2001

### Anastasopoulos, M.:

"Software Architekturen für Produktlinien", Industrieseminar, ABB, Minden, Germany, February 2001

### Anastasopoulos, M.:

"Implementing Product Line Variabilities", Presentation, SSR 2001, Toronto, Canada, May 2001

### Atkinson, C.:

"Systematic Quality Attainment through Component-based Product Line Engineering", Talk, SQM 2001, Bonn, Germany, April 2001

### Atkinson, C.:

"Component-based Product-Line Engineering with UML", Talk, Compaq, Nice, France, April 2001

- Atkinson, C.:**  
"Systematic Quality Attainment through Component-based Product Line Engineering", Talk, University of Calgary, Calgary, Canada, September 2001
- Atkinson, C.:**  
"Component-based Product Line Engineering with UML", Talk, University of Calgary, Calgary, Canada, September 2001
- Atkinson, C.:**  
"Developing and Applying Component-based Model-driven Architectures in Kobra", Talk, EDOC 2001, Seattle, USA, September 2001
- Atkinson, C.:**  
"Component-based Product Line Engineering with UML", Talk, Carleton University, Ottawa, Canada, October 2001
- Atkinson, C.:**  
"The Essence of Multi-lever Meta Modeling", Talk, UML 2001, Toronto, Canada, October 2001
- Atkinson, C.:**  
"Component-based Product Line Engineering with UML", Talk, University of Mannheim, Mannheim, Germany, October 2001
- Atkinson, C.:**  
"Component-based Product Line Engineering with UML", Talk, Bitcom Forum, Frankfurt, Germany, November 2001
- Atkinson, C.:**  
"Component-based Product Line Engineering with UML", Tutorial, OMG UML-Forum 2001, Tokyo, Japan, March 2001
- Atkinson, C.:**  
"Component-based Product Line Engineering: The Kobra Approach with UML", Tutorial, Net-Object Days 2001, Erfurt, Germany, September 2001
- Atkinson, C.:**  
"Component-based Product Line Engineering with UML", Tutorial, Informatik 2001, Vienna, Austria, September 2001
- Bayer, J.:**  
"Separating Concerns in Product Line Engineering", Presentation, Workshop Aspektorientierung, Paderborn, Germany, May 2001
- Bayer, J.:**  
"Introducing Traceability to Product Lines", Presentation, International Workshop, Bilbao, Spain, October 2001
- Bayer, J.:**  
"Systematic Model-driven Development in Kobra", Presentation, ICSSEA 2001, Paris, France, December 2001
- Becker-Kornstaedt, U.:**  
"Software Process Technology Transfer: Using a Formal Process Notation to Capture a Software Process in Industry", Workshop, EWSPT 8, Witten, Germany, June 2001
- Becker-Kornstaedt, U.:**  
"Erstellung eines Vorgehensmodells Software-Prozessmodellierung - Konzepte und Anwendung", Training, Allianz, Stuttgart, Germany, August 2001
- Becker-Kornstaedt, U.:**  
"Towards Systematic Knowledge Elicitation for Descriptive Software Process Modeling", Presentation, Profes 2001, Kaiserslautern, Germany, September 2001
- Birk, A.:**  
"Strategien für das Wissensmanagement in Software-Organisationen", Talk, 6. SQM, Bonn, Germany, April 2001
- Bomarius, F.:**  
"Vorschlag einer i&m e-Commerce Strategie", Talk, i&m Annual General Meeting, Arbeitskreis Neue Medien, Magdeburg, Germany, June 2001
- Bunse, C.:**  
"Component-Based Application Engineering in Research and Practice", Workshop, Informatik 2001, Vienna, Austria, September 2001
- Bunse, C.:**  
"Implementation of Component-based Systems by Systematic Refinement and Translation Steps", Talk, WTUML 2001, Genoa, Italy, April 2001
- Decker, B.:**  
"Integrating Business Process Descriptions and Lessons Learned with an Experience Factory", Presentation, Workshop für Geschäftsprozess-orientiertes Wissensmanagement, Konferenz Wissensmanagement (WM2001), Baden-Baden, Germany, March 2001
- Decker, B.:**  
"Corporate Information Network CoIN: The Fraunhofer IESE Experience Factory", Presentation, Workshop Wissensmanagement und e-Business, GI Annual Meeting, Vienna, Austria, September 2001
- Decker, B.:**  
"Corporate Information Network (CoIN): Experience Management at IESE", Presentation, KnowTech 2001, Dresden, Germany, November 2001
- Decker, B.:**  
"The Integrated Corporate Information Network CoIN: A Comprehensive, Web-based Experience Factory", Presentation, 3<sup>rd</sup> International Workshop on Learning SW Organizations, LSO2001, Kaiserslautern, Germany, September 2001
- Differding, C.:**  
"Adaptive Measurement Plans for Software Development", Defense of Ph.D. Thesis, University of Kaiserslautern, Computer Science Department, Kaiserslautern, Germany, April 20, 2001
- Differding, C.:**  
"Quality assurance", Industry Seminar, Robert-Bosch GmbH, Stuttgart, Germany, January to March 2001
- Differding, C.:**  
"Der Ruf nach IT-Fachkräften", Presentation, 5-Year Anniversary IESE, Kaiserslautern, Germany, March 8, 2001

**Eberle, M.:**

"Kompetenz und Qualifizierung – Chancen und Trends in der Weiterbildung für IT-Professionals", Presentation, STI Annual Meeting 2001, Kaiserslautern, Germany, November 2001

**Freimut, B.:**

"Investigating the Impact of Reading Techniques on the Accuracy of Different Defect Content Estimation Techniques", Presentation, 7th International Software Metrics Symposium, London, UK, April 2001

**Freimut, B.:**

"An Industrial Case Study of Implementing Software Risk Management", Presentation, 8th ESEC, Vienna, Austria, September 2001

**Freimut, B.:**

"Qualität von Anfang an: Messbare Qualitätsverbesserung durch die Inspektion von Anforderungsdokumenten am Beispiel Allianz Lebensversicherungs AG", Industry Seminar, STI Annual Meeting, Kaiserslautern, Germany, September 2001

**Freimut, B.:**

"Software Defect Measurement to Prevent Defects and Control Software Projects", Industry Seminar, MIKKO – Seminar, VTT, Oulu, Finland, April 2001

**Groß, H.-G.:**

"A Prediction System for Evolutionary Testability Applied to Dynamic Execution", Talk, ICSE 2001, Toronto, Canada, May 2001

**Haas, A.:**

"Kompetenzerwerb in KMUs – Das Qualifizierungsmodell für KMUs", Presentation, STI Annual Meeting 2001, Kaiserslautern, Germany, November 2001

**Hamann, D.:**

"Automatische Prozessmodellierung mit Spearment/EPG, basierend auf dem Referenzmodell des ISO/IEC TR 15504 Standards", GI-Workshop, Modellierung 2001, Bad Lippspringe, Germany, March 2001

**Hamann, D.:**

"Erstellung eines Vorgehensmodells Software-Prozessmodellierung - Konzepte und Anwendung", Training, Allianz, Stuttgart, Germany, August 2001

**Hamann, D.:**

"Zertifizierung zum SPICE (ISO 15504) und BOOTSTRAP Assessor: Überprüfung und Verbesserung Ihrer Software-Organisation", SWA Seminar, Cologne, Germany, February 2001 und Frankfurt/Main, Germany, June 2001

**Hartkopf, S.:**

"Integration von Expertenmeinung, Messdaten und Erfahrungen in das Risikomanagement", Talk, 4. Fachtagung Management und Controlling von IT-Projekten, Glashütten, Germany, March 2001

**Hebestreit, C.:**

"Berufsbildorientierte IKT-Weiterbildung - Arbeitsprozessorientierte Weiterbildung in der IT-Branche", Workshop, Chancen IT-Weiterbildung und Aufstiegsqualifizierung, Initiative D21, BMWI, bbw, bitkom, Berlin, Germany, September 2001

**Hübsch, V.:**

"via-it: Die Virtuelle IKT-Akademie Rheinland Pfalz", Presentation, STI Annual Meeting 2001, Kaiserslautern, Germany, November 2001

**Jedlitschka, A.:**

"Using Case-Based Reasoning for User Modeling in an Experience Management System", Talk, GI-Workshopwoche "Lernen-Lehren-Wissen-Adaptivität" (LLWA 01), Dortmund, Germany, October 2001

**John, I.:**

"Requirements Engineering für Produktlinien" Presentation, GI-Fachgruppentagung, Langen, Germany, November 2001

**Kamsties, E.:**

"An Empirical Investigation of the Defect Detection Capabilities of Requirements Specification Languages", Talk, EMMSAD 2001, Interlaken, Switzerland, June 2001

**Kamsties, E.:**

"Detecting Ambiguities in Requirements Documents Using Inspections", Talk, WISE 2001, Paris, France, July 2001

**Kamsties, E.:**

"Surfacing Ambiguity in Industrial Requirements Documents", Talk, University of Waterloo, Waterloo, Canada, August 2001

**Kamsties, E.:**

"An Empirical Investigation of the Defect Detection Capabilities of Requirements Specification Languages", Talk, University of Waterloo, Waterloo, Canada, August 2001

**Kamsties, E.:**

"Component-based Product Line Engineering with UML", Talk, Conquest 2001, Nuremberg, Germany, September 2001

**Knauber, P.:**

"Schnelle Systematische Entwicklung von Internet-Anwendungen", Talk, Software Engineering für E-Commerce-Projekte, University for Applied Sciences of Trier, Birkenfeld, Germany, December 2001

**Knauber, P.:**

"Produktivitätssteigerung in der Software Entwicklung", Presentation, 5-Year Anniversary IESE, Kaiserslautern, Germany, March 2001

**Knauber, P.:**

"Scoping of Software Product Lines", Workshop, Product Family Development, Dagstuhl, Germany, April 2001

**Knauber, P.:**

"Planung und Realisierung von Software-Produktlinien", Talk, Component Developers' and Users' Forum (CDUF), Frankfurt, Germany, June 2001

**Knauber, P.:**

"Quantifying Product Line Benefits", Talk, PFE-4 Conference, Bilbao, Spain, October 2001

**Knethen von, A.:**

"Anforderungsverfolgung für leicht änderbare Software-Systeme", Presentation, STI Annual Meeting 2001, Kaiserslautern, Germany, November 2001

**Laqua, R.:**

"KobrA Meets Classic Component Technology", Informatik 2001, GI Annual Meeting, Vienna, Austria, September 2001

**Laitenberger, O.:**

"Garantierte Qualität - Anspruch industrieller Software-Entwicklung", Presentation, 5-Year Anniversary IESE, Kaiserslautern, Germany, March 8, 2001

**Laitenberger, O.:**

"Enhancing the Quality of UML-Artifacts using Systematic Inspection Technologies", Talk, NRC, Ottawa, Canada, May 2001

**Laitenberger, O.:**

"Systematic Improvement of Technical Reviews in Large-scale Embedded Systems Development", Talk, WISE 2001, Paris, France, July 2001

**Laitenberger, O.:**

"The Systematic Adaptation of Perspective-based Inspections to Software Development Projects", Talk, WISE 2001, Paris, France, July 2001

**Laitenberger, O.:**

"Das ViSEK-Projekt: Aufbau einer Empirisch-basierten Erfahrungsdatenbank für Software Engineering", Talk, Informatik 2001, Vienna, Austria, September 2001

**Muthig, D.:**

"An Incremental Strategy is Key to a Successful Introduction of Product Line Engineering", Presentation, ICSE 2001, Toronto, Canada, May 2001

**Muthig, D.:**

"Introduction to Software Reuse", Seminar, Software Reuse in Practice, STI e.V., Kaiserslautern, Germany, June 2001

**Muthig, D.:**

"Transfer of Reuse Technology", Seminar, Software Reuse in Practice, STI e.V., Kaiserslautern, Germany, July 2001

**Muthig, D.:**

"Design and Testing in a Reuse Context", Seminar, Software Reuse in Practice, STI e.V., Kaiserslautern, Germany, July 2001

**Muthig, D.:**

"Development for Reuse: A Case Study", Seminar, Software Reuse in Practice, STI e.V., Kaiserslautern, Germany, September 2001

**Muthig, D.:**

"Transfer of Product Line Technology into Industry", Presentation, Netobjectdays, Erfurt, Germany, September 2001

**Muthig, D.:**

"Systematic Integration of Web-Services through Domain Analysis", Presentation, STI Annual Meeting, Kaiserslautern, Germany, November 2001

**Muthig, D.:**

"Component-based Product Line Engineering", Industry Seminar, Application Development: Software Product Lines, IHK Erfurt, Erfurt, Germany, November 2001

**Muthig, D.:**

"Component-based Product Line Engineering with UML", Tutorial, Netobjectdays, Erfurt, Germany, September 2001

**Muthig, D.:**

"Component-based Product Line Engineering with UML, Tutorial, GI-Conference, Vienna, Austria, September 2001

**Muthig, D.:**

"Model-driven Product Line Implementation", Industry Seminar, Generative Programming, University of Applied Sciences of Kaiserslautern, Zweibrücken, Germany, October 2001

**Nick, M.:**

"How to Go Online with an Experience Base", Presentation, Konferenz für Professionelles Wissensmanagement (WM2001), Baden-Baden, Germany, March 2001

**Nick, M.:**

"Erfahrungsmanagement und Weiterentwicklung von Erfahrungsdatenbanken", Invited Talk, University of Leipzig, Department of Economic Science, Leipzig, Germany, July 2001

**Nick, M.:**

"Acquiring and Using Maintenance Knowledge to Support Authoring for Experience Bases", Presentation, ICCBR 2001, Vancouver, Canada, July 30 - August 2, 2001

**Nick, M.:**

"Development, Evaluation, and Maintenance of Experience Management Systems", Invited Talk, University of Calgary, Department of Computer Science, Calgary, Canada, August 2001

**Nick, M.:**

"Computer-supported Reuse of Project Management Experiences with an Experience Base", Presentation, 3<sup>rd</sup> International Workshop on Learning Software Organizations, LSO2001, Kaiserslautern, Germany, September 2001

**Nick, M.:**

"Ein fallbasierter Ansatz für die Computer-gestützte Nutzung von Erfahrungswissen bei der Projektarbeit", Presentation, 5. Internationale Tagung Wirtschaftsinformatik 2001 (WI 2001), Augsburg, Germany, September 2001

**Nick, M.:**

"Sie wussten nicht, dass Herr Müller das so gemacht hatte? - Erfahrung ist Geld", Presentation, STI Annual Meeting 2001, Kaiserslautern, Germany, November 2001

**Ochs, M.:**

"Produktivitätssteigerung in der Software-Entwicklung", Presentation, 5-Year Anniversary IESE, Kaiserslautern, Germany, March 8, 2001

**Ochs, M.:**

"A Method for Efficient Measurement-based COTS Assessment and Selection - Method Description and Evaluation Results", Presentation, METRICS 2001, London, UK, April 2001

**Ochs, M.:**

"Purchase-based Software Development - Ein integrierter Ansatz (Buy-IT)", Presentation, SQM 2001, Bonn, Germany, April 2001

**Paech, B.:**

"Panel Discussion: Women@Work", Hamburg, Germany, July 2001

**Paech, B.:**

"Aufgabenorientierte Software-Entwicklung für Portale", Talk, University of Augsburg, Augsburg, Germany, April 2001

**Paech, B.:**

"Verbesserung von Requirements Engineering Prozessen", Talk, GI Symposium, Bielefeld, Germany, April 2001

**Paech, B.:**

"Requirements Engineering als Bindeglied zwischen IT-Anwendung und Software-Entwicklung", Talk, University of Kaiserslautern, Kaiserslautern, Germany, April 2001

**Paech, B.:**

"Requirements Documents as a Means of Communication: Proposal and Open Questions", Talk, University of Saarbrücken/Dagstuhl, Wadern, Germany, May 2001

**Paech, B.:**

"Developing Guidance and Tool Support for Rationale-based Use-Case-Specifications", Talk, CAISE 2001, Interlaken, Switzerland, June 2001

**Paech, B.:**

"Aufgabenorientierte Software-Entwicklung betrieblicher Informationssysteme", Talk, Technical University Cottbus, Cottbus, Germany, July 2001

**Paech, B.:**

"Engineering Style Software Development – Roadmap 2002-2003", Talk, Technical University Munich, Munich, Germany, July 2001

**Paech, B.:**

"Wissensbasierte Software-Entwicklung betrieblicher Informationssysteme", Talk, Technical University Munich, Munich, Germany, September 2001

**Paech, B.:**

"Integrierte Anforderungsspezifikation und Qualitätssicherung am Beispiel von Steuergeräten im Automobilbau", Talk, Informatica Feminale, Furtwangen, Germany, September 2001

**Paech, B.:**

"Wissensbasierte Software-Entwicklung", Talk, University of Innsbruck, Innsbruck, Austria, October 2001

**Paech, B.:**

"Software-Qualität durch Requirements Engineering", Talk, University of Heidelberg, Heidelberg, Germany, November 2001

**Paech, B.:**

"Use Cases in der Anforderungsanalyse", Talk, STI Annual Meeting, Kaiserslautern, Germany, November 2001

**Paech, B.:**

"Wissensmanagement in der Software-Entwicklung", Workshop, Software Trends 2001, Luzern, Switzerland, September 2001

**Pfahl, D.:**

"Ein integrierter Ansatz für simulationsgestütztes Lernen zur Unterstützung von Prozess- und Projekt-Management in Software Organisationen", Ph.D. Defense, University of Kaiserslautern, Kaiserslautern, Germany, October 2001

**Pfahl, D.:**

"An Experiment for Evaluating the Effectiveness of Using a System Dynamics Simulation Model in Software Project Management Education", METRICS 2001, London, UK, April 2001

**Pfahl, D.:**

"System Dynamics as an Enabling Technology for Learning in Software Organisations", Presentation, SEKE 2001, Buenos Aires, Argentina, June 2001

**Pfahl, D.:**

"Learning and Improving with System Dynamics", Tutorial, Profes 2001, Kaiserslautern, Germany, September 2001

**Punter, T.:**

"Experimentation in Software Engineering", Esernet Project Kick-off, Esernet Consortium, Kaiserslautern, Germany, September 2001

**Punter, T.:**

"Software Bemessungen mit GQM in KMU", Tutorial, DASMA MetriKon 2001, Dortmund, Germany, October 2001

**Punter, T.:**

"Sind Empirische Studien in Software Engineering möglich und notwendig?", Workshop, Software Engineering Meets Practice, Technical University Chemnitz, Chemnitz, Germany, November 2001

**Punter, T.:**

"Software Measurement with GQM", Tutorial, Federal University of Santa Catarina, Florianopolis, Brazil, November 2001

**Rombach, D.:**

"Forschungs- und Qualifikationskompetenz Software Engineering", Presentation, Visit of Chancellor Schröder, Kaiserslautern, Germany, January 2001

**Rombach, D.:**

"German Software Development Scene: Labor Shortage and Outsourcing", Workshop: Global Software Outsourcing: The Solution to the IT Skills Gap?, Anglo-German Foundation, Berlin, Germany, March 2001

**Rombach, D.:**

"Software Quality Management: Key for Business Competitiveness", Talk, Intershop SE GmbH, Jena, Germany, March 2001

**Rombach, D.:**

"Software Inspections, Reviews and Walkthroughs", Status Report, The NSF Impact Project, New York, USA, March 2001

**Rombach, D.:**

"Research Directions", Talk, SEC-Meeting (Software Experience Center Consortium), Seattle, Washington, USA, April 2001

**Rombach, D.:**

"Software Inspections, Reviews and Walkthroughs", Talk, Panel of the NSF Impact Project, International Conference on Software Engineering, Toronto, Canada, May 2001

**Rombach, D.:**

"Models for Successful Research-Industry Collaboration", Talk, Sydney Business Community Leaders, Sydney, Australia, August 2001

**Rombach, D.:**

Director's Report, 6th Fraunhofer IESE Advisory Board Meeting, Kaiserslautern, Germany, September 14, 2001

**Rombach, D.:**

"Analysis and Evaluation of Software Development in Germany", Talk, 2nd ITEA Symposium, Berlin, Germany, October 2001

**Rombach, D.:**

"Software-Maintenance - Old Sins and New Challenges", Talk, SQRL Seminar Series, Hamilton, Canada, December 2001

**Rombach, D.:**

"Software Maintenance - Old Sins and New Challenges", Talk, McMaster University, Hamilton, Canada, December 2001

**Ruhe, G.:**

"Garantierte Qualität - Anspruch industrieller Software-Entwicklung", Presentation, 5-Year Anniversary IESE, Kaiserslautern, Germany, March 8, 2001

**Schlich, M.:**

"Zwischen Wettbewerbsdruck und Qualitätserfordernis", Presentation, 5-Year Anniversary IESE, Kaiserslautern, Germany, March 8, 2001

**Schlich, M.:**

"Vom Chaos der Anforderungen und typischen Qualitätsproblemen in kleinen Unternehmen – Lösungen aus Projekten", Presentation, STI Annual Meeting 2001, Kaiserslautern, Germany, November 2001

**Schmid, K.:**

"Comprehensive Product Line Scoping", Industry Seminar, Product Line Software-Entwicklung, IHK Erfurt, Erfurt, Germany, September 2001

**Schwarz, R.:**

"NIXE™ – Ein Werkzeug für UNIX-Sicherheitsrevisionen", Talk, Stuttgarter E-Business-Tage 2001, Innovations-Workshop, Stuttgart, Germany, November 2001

**Wieczorek, I.:**

"Using Public Domain Metrics to Estimate Software Development Effort", Talk, METRICS 2001, London, UK, April 2001

**Zettel, J.:**

"LIPE: A Lightweight Process for E-Business Startup Companies based on Extreme Programming", Presentation, Profes 2001, Kaiserslautern, Germany, September 2001

## Memberships in Industrial Advisory Boards

**Rombach, D.:**

- Head, Scientific Advisory Board, SWA Software Akademie AG, Kaiserslautern, Germany, since 1998
- Member Advisory Board, Market Maker AG, Kaiserslautern, Germany, since 2001
- Member Advisory Board, Bauer and Partner AG - The Business and Technology Group Europe, Kreuzlingen, Switzerland, since 2001
- Member Advisory Board, Q-Labs, Copenhagen, Denmark, since 1996
- Member Advisory Board, Professional Spirit Ltd., Reading, UK, since 1999
- Member Steering Committee, SEC Software Experience Center Project, since 1998

## Memberships in Professional Associations

- ACL - Association for Computational Linguistics
- ACM – Association for Computing Machinery
- DASMA - German Software Metrics and Effort estimation association
- DGI - Deutsche Gesellschaft für Informationswissenschaft und Informationspraxis e. V.
- EAMT - European Association for Machine Translation
- GI – Gesellschaft für Informatik
- IEEE – Institute of Electrical and Electronics Engineers, Inc., Computer Society (D. Rombach: Senior Member)
- IMA - Institute of Mathematics and its Applications
- Nesma - Dutch Software Metrics User Association
- Spider - Dutch Software Process Improvement Network
- Tekom – Fachverband für technische Kommunikation und Dokumentation

## Books

**Althoff, K.-D.;** Feldmann, R.; Müller, W. (eds.):  
Advances in Learning Software Organizations. Third International Workshop, LSO 2001 - Proceedings.  
Berlin : Springer-Verlag, 2001  
(Lecture Notes in Computer Science 2176)  
ISBN 3-540-42574-8

**Atkinson, C.;** **Bayer, J.;** **Bunse, C.;** **Kamsties, E.;** **Laitenberger, O.;** **Laqua, R.;** **Muthig, D.;** **Paech, B.;** **Wüst, J.;** **Zettel, J.:**  
Component-based Product Line Engineering with UML.  
London: Addison-Wesley, 2001  
(Component Software Series)  
ISBN 0-201-73791-4

**Bomarius, F.;** **Komi-Sirviö, S.** (eds.):  
Third International Conference on Product Focused Software Process Improvement. Profes 2001 - Proceedings.  
Berlin: Springer-Verlag, 2001  
(Lecture Notes in Computer Science 2188)  
ISBN 3-540-42571-3

**Vierimaa, M.;** **Ronkainen, J.;** **Salo, O.;** **Sandelin, T.;** **Tihinen, M.;** **Freimut, B.;** **Parviainen, P.:**  
Mikko Handbook. Comprehensive Collection and Utilization of Software Measurement Data.  
Oulu, VTT Technical Research Center of Finland, 2001  
(VTT Publications 445)  
ISBN 951-38-5869-3

## Articles in Books

**Birk, A.;** **Rombach D.:**  
A Practical Approach to Continuous Improvement in Software Engineering.  
In: **Wieczorek, M.J., Meyerhoff, D.B.** (eds.): Software Quality.  
Heidelberg: Springer-Verlag, 2001.

## Articles in Journals

**Althoff, K.-D.;** **Bergmann, R.;** **Branting, K.:**  
The Third International Conference on Case-based Reasoning (ICCBR'99).  
In: AI magazine 22 (2001), 1, pp. 116-118

**Becker-Kornstaedt, U.:**  
Descriptive Software Process Modeling - How to Deal with Sensitive Process Information.  
In: Empirical Software Engineering 6 (2001), 4, pp. 353-367

**Birk, A.:**  
Wissensmanagement zum besseren Verständnis von Software-Engineering-Technologien.  
In: KI - Künstliche Intelligenz (2001), 3, pp. 66-68

**Briand, L.;** **Bunse, C.;** **Daly, J.:**  
A Controlled Experiment for Evaluating Quality Guidelines on the Maintainability of Object-oriented Design Documents.  
In: IEEE Transactions on Software Engineering 27 (2001), 6, pp. 513-530

**Bunse, C.:**  
Systematische Implementierung Objekt-orientierter Systeme durch wieder-verwendbare Muster.  
In: KI - Künstliche Intelligenz (2001), 2, pp. 57-59

**Groß, H.-G.:**

A Prediction System for Evolutionary Testability Applied to Dynamic Execution Time Analysis.  
In: Information and Software Technology 43 (2001), 14, pp. 855-862

**Knauber, P.;** **Succi, G.:**  
Perspectives on Software Product Lines. Report on First International Workshop on Software Product Lines. Economics, Architectures, and Implications: Workshop No15 at 22nd International Conference on Software Engineering (ICSE).  
In: ACM SIGSOFT Software Engineering Notes 26 (2001), 2, pp. 29-33

**Laitenberger, O.:**  
Cost-effective Detection of Software Defects through Perspective-based Inspections.  
In: Empirical Software Engineering 6 (2001), 1, pp. 81-83

**El Emam, K.;** **Laitenberger, O.:**  
Evaluating Capture-Recapture Models with Two Inspectors.  
In: IEEE Transactions on Software Engineering 27 (2001), 9, pp. 851-864

**Laitenberger, O.;** **El Emam, K.;** **Harbich, T.:**  
An Internally Replicated Quasi-Experimental Comparison of Checklist and Perspective-based Reading of Code Documents.  
In: IEEE Transactions on Software Engineering 27 (2001), 5, pp. 387-421

**Nick, M.;** **Althoff, K.-D.;** **Tautz, C.:**  
Systematic Maintenance of Corporate Experience Repositories.  
In: Computational Intelligence. An International Journal 17 (2001), 2, pp. 364-386

**Pfahl, D.;** **Klemm, M.;** **Ruhe, G.:**  
A CBT Module with Integrated Simulation Component for Software Project Management Education and Training.  
In: The Journal of Systems and Software 59 (2001), 3, pp. 283-298

1) Names of Fraunhofer IESE and FC-MD members appear in bold.



Friedewald, M.; Rombach, D.; Stahl, P.; Broy, M.; Hartkopf, S.; Kimpeler, S.; Kohler, K.; Wucher, R.; Zoche, P.: Software-Entwicklung in Deutschland. Eine Bestandsaufnahme.  
In: Informatik Spektrum 24 (2001), 2, pp. 81-90

Broy, M.; Hartkopf, S.; Kohler, K.; Rombach, D.: Germany: Combining Software and Application Competencies.  
In: IEEE Software 18 (2001), 4, pp. 93-95

Kobitzsch, W.; Rombach, D.; Feldmann, R.: Outsourcing in India.  
In: IEEE Software 18 (2001), 2, pp. 78-86

Briand, L. C.; Wüst, J.; Lounis, H.: Replicated Case Studies for Investigating Quality Factors in Object-oriented Designs.  
In: Empirical Software Engineering 6 (2001), 1, pp. 11-58

## Published Dissertations

**Birk, A.:**  
A Knowledge Management Infrastructure for Systematic Improvement in Software Engineering.  
Stuttgart: Fraunhofer IRB Verlag, 2001 (Ph.D. Theses in Experimental Software Engineering, Vol. 3)  
ISBN 3-8167-5880-0

**Bunse, C.:**  
Pattern-Based Refinement and Translation of Object-Oriented Models to Code.  
Stuttgart: Fraunhofer IRB Verlag, 2001 (Ph.D. Theses in Experimental Software Engineering, Vol. 2)  
ISBN 3-8167-5613-1

**Differding, C.:**  
Adaptive Measurement Plans for Software Development.  
Stuttgart: Fraunhofer IRB Verlag, 2001 (Ph.D. Theses in Experimental Software Engineering, Vol. 6)  
ISBN 3-8167-5908-4

**Kamsties, E.:**  
Surfacing Ambiguity in Natural Language Requirements.  
Stuttgart: Fraunhofer IRB Verlag, 2001 (Ph.D. Theses in Experimental Software Engineering, Vol. 5)  
ISBN 3-8167-5903-3

**Pfahl, D.:**  
An Integrated Approach to Simulation-Based Learning in Support of Strategic and Project Management in Software Organisations.  
Stuttgart: Fraunhofer IRB Verlag, 2001 (Ph.D. Theses in Experimental Software Engineering, Vol. 8)  
ISBN 3-8167-6066-X

**Punter, H. T.:**  
Doelgericht Beoordelen van Software.  
Eindhoven: 2001  
ISBN 90-386-0863-2

**Tautz, C.:**  
Customizing Software Engineering Experience Management Systems to Organizational Needs.  
Stuttgart: Fraunhofer IRB Verlag, 2001 (Ph.D. Theses in Experimental Software Engineering, Vol. 4)  
ISBN 3-8167-5881-9

**Wieczorek, I.:**  
Improved Software Cost Estimation. A Robust and Interpretable Modeling Method and a Comprehensive Empirical Investigation.  
Stuttgart: Fraunhofer IRB Verlag, 2001 (Ph.D. Theses in Experimental Software Engineering, Vol. 7)  
ISBN 3-8167-6033-3

## Contributions to Conference Proceedings

Brandt, M.; Ehrenberg, D.;

**Althoff, K.-D.; Nick, M.:**

Ein fallbasierter Ansatz für die Computergestützte Nutzung von Erfahrungswissen bei der Projektarbeit. In: Buhl, Hans Ulrich (Hrsg.) u.a.: Information Age Economy. 5. Internationale Tagung Wirtschaftsinformatik 2001. Heidelberg: Physica-Verlag, 2001, pp. 251-264

Feldmann, R.; **Althoff, K.-D.:**

On the Status of Learning Software Organizations in the Year 2001. In: Althoff, Klaus-Dieter (ed.) u.a.: Advances in Learning Software Organizations. 3rd International Workshop, LSO 2001 - Proceedings. Berlin: Springer-Verlag, 2001, pp. 2-6

**Anastasopoulos, M.; Gacek, C.:**

Implementing Product Line Variabilities. In: ACM SIGSOFT Software Engineering Notes Vol. 26, 2001, No. 3, pp. 109-117

**Atkinson, C.; Bayer, J.; Bunse, C.;**

**Kamsties, E.; Laitenberger, O.;**

**Laqua, R.; Muthig, D.; Paech, B.;**

**Wüst, J.; Zettel, J.:**

Component-based Software Engineering. The Kobra Approach. In: Arbeitskreis Software-Qualität Franken e.V.: CONQUEST 2001. 5th Conference on Quality Engineering in Software Technology - Proceedings. 2001, pp. 247-252

**Atkinson, C.; Bayer, J.; Bunse, C.;**

**Kamsties, E.; Laitenberger, O.;**

**Laqua, R.; Muthig, D.; Paech, B.;**

**Wüst, J.; Zettel, J.:**

Model-driven Component-based Product Line Engineering. A Natural Synergy.

In: Bauknecht, Kurt (ed.) u.a.;

Österreichische Computergesellschaft (OCG) u.a.: Informatik 2001. Wirtschaft und Wissenschaft in der Network Economy. Visionen und Wirklichkeit. Band 2: Tagungsband der GI/OCG Jahrestagung 2001.

Vienna: Österreichische Computer Gesellschaft, 2001, pp. 808

**Atkinson, C.; Kühne, T.:**

The Essence of Multilevel Metamodeling.

In: Gogolla, Martin (ed.): The Unified Modeling Language. 4th International Conference, UML 2001 - Proceedings: Modeling Languages, Concepts, and Tools.

Berlin: Springer-Verlag, 2001, pp. 19-33

**Atkinson, C.; Bayer, J.; Bunse, C.;**

**Muthig, D.:**

Systematic Model-driven Development in Kobra.

In: 14th International Conference Software and Systems Engineering and their Applications. ICSSEA 2001 - Proceedings Vol. 1. Paris, 2001, p. 8

**Atkinson, C.; Bunse, C.; Laqua, R.:**

Kobra Meets Classic Component Technology.

In: Bauknecht, Kurt (ed.) u.a.; Österreichische Computergesellschaft (OCG) u.a.: Informatik 2001. Wirtschaft und Wissenschaft in der Network Economy. Visionen und Wirklichkeit. Band 2: Tagungsband der GI/OCG Jahrestagung 2001.

Vienna: Österreichische Computer Gesellschaft, 2001, pp. 850-855

**Atkinson, C.; Paech, B.; Reinhold, J.;**

**Sander, T.:**

Developing and Applying Component-based Model-driven Architectures in Kobra.

In: IEEE Computer Society: 5th IEEE International Enterprise Distributed Object Computing Conference. EDOC 2001 - Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 212-223

**Bayer, J.; Widen, T.:**

Introducing Traceability to Product Lines.

In: European Software Institute (ESI): 4th International Workshop on Product Family Engineering. PFE-4. Bilbao, 2001, pp. 399-406

**Becker-Kornstaedt, U.; Neu, H.;**

**Hirche, G.:**

Software Process Technology Transfer. Using a Formal Process Notation to Capture a Software Process in Industry. In: Ambriola, Vincenzo (ed.): Software Process Technology EWSPT 2001.

Berlin: Springer-Verlag, 2001, pp. 63-76

**Becker-Kornstaedt, U.:**

Towards Systematic Knowledge Elicitation for Descriptive Software Process Modeling.

In: Bomarius, Frank (ed.) u.a.: 3rd International Conference on Product Focused Software Process Improvement. Profes 2001 – Proceedings. Berlin: Springer-Verlag, 2001, pp. 312-325

**Biffi, S.; Gutjahr, W.:**

Influence of Team Size and Defect Detection Technique on Inspection Effectiveness.

In: IEEE Computer Society: 7th International Software Metrics Symposium. Metrics 2001 - Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 63-75

**Biffi, S.; Halling, M.:**

Investigating Reinspection Decision Accuracy Regarding Product-Quality and Cost-Benefit Estimates.

In: 25th Annual International Computer Software and Applications Conference COMPSAC 2001 - Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 87-96

**Biffi, S.; Freimut, B.;**

**Laitenberger, O.:**

Investigating the Cost-Effectiveness of Reinspections in Software Development.

In: IEEE Computer Society: 23rd International Conference on Software Engineering. ICSE 2001.

Los Alamitos: IEEE Computer Society, 2001, pp. 155-164

Halling, M.; Grünbacher, P.; Biffi, S.: Tailoring a COTS Group Support System for Software Requirements Inspection.

In: IEEE Computer Society: 16th IEEE International Conference on Automated Software Engineering, ASE 2001 - Proceedings.

Los Alamitos: IEEE Computer Society, 2001, pp. 201-208

Birk, A.; Hartkopf, S.; Müller, W.: Strategien für das Wissensmanagement in Software-Organisationen.

In: SQS Software Quality Systems AG: 6. SQM-Kongress. Software Qualitätsmanagement. Bonn, 2001, p.11

Bunse, C.; Atkinson, C.: Implementation of Computer-based Systems by Systematic Refinement and Translation Steps.

In: Whittle, Jon (ed.) u.a.: WTUML: Workshop on Transformations in UML. WTUML 2001- Proceedings. Genua, 2001

Decker, B.; Jedlitschka, A.: The Integrated Corporate Information Network iCoIN: A Comprehensive, Web-Based Experience Factory.

In: Althoff, Klaus-Dieter (ed.) u.a.: Advances in Learning Software Organizations. 3rd International Workshop, LSO 2001 - Proceedings. Berlin: Springer-Verlag, 2001, pp. 192-206

Decker, B.; Althoff, K.-D.; Nick, M.; Tautz, C.:

Integrating Business Process Descriptions and Lessons Learned with an Experience Factory.

In: Schnurr, Hans-Peter (Hrsg.) u.a.: Professionelles Wissensmanagement. Erfahrungen und Visionen. Aachen: Shaker, 2001, pp. 54-58

Differding, C.:

Reuse of Measurement Plans Based on Process and Quality Models.

In: Althoff, Klaus-Dieter (ed.) u.a.: Advances in Learning Software Organizations. 3rd International Workshop, LSO 2001 - Proceedings. Berlin: Springer-Verlag, 2001, pp. 207-221

Freimut, B.; Hartkopf, S.; Kaiser, P.; Kontio, J.; Kobitzsch, W.:

An Industrial Case Study of Implementing Software Risk Management.

In: Gruhn, Volker (ed.): Proceedings of the Joint 8th European Software Engineering Conference (ESEC) and 9th ACM SIGSOFT Symposium on the Foundations of Software Engineering (FSE-9). New York: ACM Press, 2001, pp. 277-287

Freimut, B.; Laitenberger, O.; Biffi, S.:

Investigating the Impact of Reading Techniques on the Accuracy of Different Defect Content Estimation Techniques.

In: IEEE Computer Society: 7th International Software Metrics Symposium. Metrics 2001 - Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 51-62

Freimut, B.; Hartkopf, S.; Kaiser, P.: Integration von Expertenmeinungen, Messdaten und Erfahrungen in das Risikomanagement.

In: Richter, Rainer (Hrsg.): 4. Fachtagung Management und Controlling von IT-Projekten. Heidelberg: dpunkt.Verlag, 2001, pp. 153-161

Groß, H.-G.:

A Prediction System for Dynamic Optimization-Based Execution Time Analysis.

In: Harman, Mark (ed.) u.a.: SEMINAL: Software Engineering using Metaheuristic INovative ALgorithms. ICSE 2001 Workshop 8. 2001, pp. 8-14

Hamann, D.; Beitz, A.; Müller, M.; Solingen, R. van:

Using FAME Assessments to Define Measurement Goals.

In: Dumke, R. (ed.) u.a.: New Approaches in Software Measurement. 10th International Workshop, IWSM 2000 - Proceedings. Berlin: Springer-Verlag, 2001, pp. 220-232

Hamann, D.; Becker-Kornstaedt, U.: Automatische Prozessmodellgenerierung mit Spearmint/EPG basierend auf dem Referenzmodell des ISO/IEC TR 15504 Standards.

In: Engels, Gregor (Hrsg.) u.a.: Gesellschaft für Informatik (GI): Modellierung 2001. Workshop der Gesellschaft für Informatik e.V. (GI). Bonn, 2001, pp. 111-120

Jedlitschka, A.; Althoff, K.-D.; Decker, B.; Hartkopf, S.; Nick, M.: Corporate Information Network (COIN): The Fraunhofer IESE Experience Factory.

In: Weber, Rosina (ed.) u.a.: Naval Research Laboratory: Proceedings of the Workshop Program at the Fourth International Conference on Case-Based Reasoning. ICCBR 2001. Washington, 2001, pp. 9-12

Jedlitschka, A.; Althoff, K.-D.: Using Case-based Reasoning for User Modeling in an Experience Management System.

In: Klinkenberg, Ralf (Hrsg.) u.a.: Universität Dortmund. Fachbereich Informatik: LLWA 01 - Tagungsband der GI-Workshopwoche "Lernen - Lehren - Wissen - Adaptivität". Dortmund, 2001, pp. 348-355

John, I.:

Building Domain Models from Legacy Documentation Assets.

In: Net.ObjectDays 2001 - Tagungsband: Offizielle Nachfolge-Veranstaltung der JavaDays, STJA, JIT, DJEK. In Zusammenarbeit mit der GCSE. Ilmenau, 2001, pp. 211-215

- John, I.:**  
Integrating Legacy Documentation Assets Into A Product Line.  
In: European Software Institute (ESI): 4th International Workshop on Product Family Engineering. PFE-4. Bilbao, 2001, pp. 111-122
- Kamsties, E.; Berry, D.M.; Paech, B.:**  
Detecting Ambiguities in Requirements Documents Using Inspections.  
In: Lawford, Mark (ed.) u.a.: 1st Workshop on Inspection in Software Engineering. WISE'01 - Proceedings. Hamilton: Software Quality Research Lab, 2001, pp. 68-80
- Kamsties, E.; Knethen, A. von; Philipps, J.; Schätz, B.:**  
An Empirical Investigation of the Defect Detection Capabilities of Requirements Specification Languages.  
In: Krogstie, John (ed.) u.a.: Proceedings of the Sixth CAISE/IFIP8.1 International Workshop on Evaluation of Modeling Methods in Systems Analysis and Design. EMMSAD'01 : in conjunction with CaiSE 2001. 2001, pp. IX-1-IX-13
- Knauber, P.:**  
Planung und Realisierung von Software-Produktlinien.  
In: Component Developer's & User's Forum 2001 - Conference Proceedings. Troisdorf: 101communications LLC, 2001, pp. 153-156
- Knauber, P.; Bermejo, J.; Böckle, G.; Leite, J.; Linden, F. van der; Northrop, L.; Stark, M.; Weiss, D.M.:**  
Quantifying Product Line Benefits.  
In: European Software Institute (ESI): 4th International Workshop on Product Family Engineering. PFE-4. Bilbao, 2001, pp. 153-161
- Knauber, P.; Succi, G.:**  
Second ICSE Workshop on Software Product Lines: Economics, Architectures, and Applications.  
In: IEEE Computer Society: 23rd International Conference on Software Engineering. ICSE'2001. Los Alamitos: IEEE Computer Society, 2001, pp. 753-754
- Laitenberger, O.; Kohler, K.:**  
The Systematic Adaptation of Perspective-based Inspections to Software Development Projects.  
In: Lawford, Mark (ed.) u.a.: 1st Workshop on Inspection in Software Engineering. WISE'01 - Proceedings. Hamilton: Software Quality Research Lab, 2001, pp. 105-114
- Laitenberger, O.; Leszak, M.; Brunck, W.; Stoll, D.:**  
Systematic Improvement of Technical Reviews in Large-Scale Systems Development.  
In: Lawford, Mark (ed.) u.a.: 1st Workshop on Inspection in Software Engineering. WISE'01 - Proceedings. Hamilton: Software Quality Research Lab, 2001, pp. 115-126
- Laitenberger, O.; Atkinson, C.:**  
Systematic Quality Attainment through Component-based Product Line Engineering.  
In: SQS Software Quality Systems AG: 6. SQM-Kongress. Software Qualitätsmanagement. Bonn, 2001, 10 S
- Muthig, D.:**  
Transfer of Product Line Technology into Industry.  
In: Net.ObjectDays 2001 - Tagungsband: Offizielle Nachfolge-Veranstaltung der JavaDays, STJA, JIT, DJEK. In Cooperation with GCSE. Ilmenau, 2001, pp. 413-415
- Ochs, M.; Pfahl, D.; Chrobok-Diening, G.; Nothhelfer-Kolb, B.:**  
A Method for Efficient Measurement-based COTS Assessment and Selection - Method Description and Evaluation Results.  
In: IEEE Computer Society: 7th International Software Metrics Symposium. Metrics 2001 - Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 285-296
- Ochs, M.; Assmann, D.:**  
Purchase-based Software Development.  
In: SQS Software Quality Systems AG: 6. SQM-Kongress. Software Qualitätsmanagement. Bonn, 2001, p. 16
- Neu, H.; Becker-Kornstaedt, U.; Hirche, G.:**  
Systematische Erfassung und Internet-basierte Darstellung von Software-Entwicklungsprozessen bei Thales.  
In: Conference Folder of 6. SQM-Kongress. Software Qualitätsmanagement. Bonn, 2001
- Nick, M.; Althoff, K.-D.:**  
Acquiring and Using Maintenance Knowledge to Support Authoring for Experience Bases.  
In: Weber, Rosina (ed.) u.a.: Naval Research Laboratory: Proceedings of the Workshop Program at the 4th International Conference on Case-Based Reasoning. ICCBR 2001. Washington, 2001, pp. 38-41
- Nick, M.; Althoff, K.-D.:**  
Engineering Experience Base Maintenance Knowledge.  
In: Althoff, Klaus-Dieter (ed.) u.a.: Advances in Learning Software Organizations. 3rd International Workshop, LSO 2001 - Proceedings. Berlin: Springer-Verlag, 2001, pp. 222-236
- Brandt, M.; Nick, M.:**  
Computer-Supported Reuse of Project Management Experience with an Experience Base.  
In: Althoff, Klaus-Dieter (ed.) u.a.: Advances in Learning Software Organizations. 3rd International Workshop, LSO 2001 - Proceedings. Berlin: Springer-Verlag, 2001, pp. 178-189

- Nick, M.; Althoff, K.-D.; Decker, B.; Tautz, C.:**  
How to Go Online with an Experience Base.  
In: Schnurr, Hans-Peter (Hrsg.) u.a.: Professionelles Wissensmanagement. Erfahrungen und Visionen. Aachen: Shaker, 2001, pp. 147-158
- Pfahl, D.; Angkasaputra, N.; Differding, C.; Ruhe, G.:**  
CORONET-Train: A Methodology for Web-Based Collaborative Learning in Software Organisations.  
In: Althoff, Klaus-Dieter (ed.) u.a.: Advances in Learning Software Organizations. 3rd International Workshop, LSO 2001 - Proceedings. Berlin: Springer-Verlag, 2001, pp. 37-51
- D'Ambra, J.; Jeffery, R.; Pfahl, D.:**  
CORONET: An Australian Software Engineering Experience in Collaborative Research with the European Community.  
In: Grant, Douglas D. (ed.) u.a.: Australian Software Engineering Conference 2001. Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 255-261
- Pfahl, D.; Koval, N.; Ruhe, G.:**  
An Experiment for Evaluating the Effectiveness of Using a System Dynamics Simulation Model in Software Project Management Education.  
In: IEEE Computer Society: 7th International Software Metrics Symposium. Metrics 2001 - Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 97-109
- Pfahl, D.; Ruhe, G.:**  
System Dynamics as an Enabling Technology for Learning in Software Organisations.  
In: 13th International Conference on Software Engineering and Knowledge Engineering. SEKE 2001. Skokie: Knowledge Systems Institute, 2001, pp. 355-362
- Rech, J.; Decker, B.; Althoff, K.-D.:**  
Using Knowledge Discovery Technology in Experience Management Systems.  
In: Klinkenberg, Ralf (Hrsg.) u.a.: University of Dortmund. Department of Computer Science: LLWA 01 - Tagungsband der GI-Workshopwoche "Lernen - Lehren - Wissen - Adaptivität". Dortmund, 2001, pp. 122-129
- Rombach, D.:**  
Guaranteed Software Quality: Keynote Address.  
In: Bomarius, Frank (ed.) u.a.: Third International Conference on Product Focused Software Process Improvement. Profes 2001 - Proceedings. Berlin: Springer-Verlag, 2001, pp. 1-2
- Schlich, M.:**  
Flexible Prozessgestaltung - Kochbuch für kleine und mittlere Unternehmen.  
In: SQS Software Quality Systems AG: 6. SQM-Kongress. Software Qualitätsmanagement. Bonn, 2001, p.18
- Schmid, K.:**  
An Initial Model of Product Line Economics.  
In: European Software Institute (ESI): 4th International Workshop on Product Family Engineering. PFE-4. Bilbao, 2001, pp. 37-47
- Schmid, K.:**  
An Assessment Approach to Analyzing Benefits and Risks of Product Lines.  
In: 25th Annual International Computer Software and Applications Conference COMPSAC 2001 - Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 525-530
- Schmid, K.; John, I.:**  
Product Line Development as a Rational, Strategic Decision.  
In: Schmid, Klaus (ed.) u.a.: Proceedings of the PLEES'01. International Workshop on Product Line Engineering: The Early Steps: Planning, Modeling, and Managing. Kaiserslautern, 2001, p. 4
- Schmid, K.; Geppert, B.:**  
PLEES'01: International Workshop on Product Line Engineering - The Early Steps: Planning, Modeling, and Managing.  
In: Net.ObjectDays 2001 - Tagungsband: Offizielle Nachfolge-Veranstaltung der JavaDays, STJA, JIT, DJEK. In Cooperation with GCSE. Ilmenau, 2001, pp. 376-379
- Schmid, K.; Geppert, B.:**  
PLEES 2001: International Workshop on Product Line Engineering - The Early Steps: Planning, Modeling, and Managing.  
In: Schmid, Klaus (ed.) u.a.: Proceedings of the PLEES'01. International Workshop on Product Line Engineering: The Early Steps: Planning, Modeling, and Managing. Kaiserslautern, 2001, p. 4
- Jeffery, R.; Ruhe, M.; Wiczorek, I.:**  
Using Public Domain Metrics to Estimate Software Development Effort.  
In: IEEE Computer Society: 7th International Software Metrics Symposium. Metrics 2001 - Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 16-27
- Briand, L. C.; Wüst, J.:**  
The Impact of Design Properties on Development Cost in Object-Oriented Systems.  
In: IEEE Computer Society: 7th International Software Metrics Symposium. Metrics 2001 - Proceedings. Los Alamitos: IEEE Computer Society, 2001, pp. 260-271
- Zettel, J.; Maurer, F.; Münch, J.; Wong, L.:**  
LIPE: A Lightweight Process for E-Business Startup Companies Based on Extreme Programming.  
In: Bomarius, Frank (ed.) u.a.: 3rd International Conference on Product Focused Software Process Improvement. Profes 2001 - Proceedings. Berlin: Springer-Verlag, 2001, pp. 255-270

## Fraunhofer IESE Reports

**Bayer, J.; Muthig, D.; Göpfert, B.:**  
The Library System Product Line - A  
KobrA Case Study.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 024.01/E

**Becker-Kornstaedt, U.; Reinert, R.:**  
Using Annotations in an Electronic  
Process Handbook to Systematically  
Incorporate Experience into Processes.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 041.01/E

**Freimut, B.:**  
Developing and Using Defect Classifica-  
tion Schemes.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 072.01/E

**Briand, L. C.; Freimut, B.; Vollei, F.:**  
Using Multiple Adaptive Regression  
Splines to Understand Trends in Inspec-  
tion Data and Identify Optimal Inspec-  
tion Rates.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 062.00/E

**Briand, L. C.; Freimut, B.; Vollei, F.:**  
Using Multiple Adaptive Regression  
Splines to Support Decision Making in  
Code Inspections.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 063.00/E

**Freimut, B.; Laitenberger, O.;**  
**Biffi, S.:**  
Investigating the Impact of Reading  
Techniques on the Accuracy of Differ-  
ent Defect Content Estimation Tech-  
niques.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 061.00/E

**Freimut, B.; Hartkopf, S.; Kaiser, P.;**  
**Kontio, J.; Kobitzsch, W.:**  
An Industrial Case Study of Implement-  
ing Software Risk Management.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 016.01/E

**Freimut, B.; Hartkopf, S.; Kaiser, P.:**  
Integration von Expertenmeinungen,  
Messdaten und Erfahrungen in das  
Risikomanagement.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 012.01/D

**Hamann, D.; Becker-Kornstaedt, U.:**  
Automatische Prozessmodellgenerie-  
rung mit SpearmintTM/EPG basierend  
auf dem Referenzmodell des ISO/IEC TR  
15504 Standards.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 107.00/D

**John, I.; Knauber, P.; Muthig, D.;**  
**Schmid, K.; Widen, T.:**  
Qualifikationen von kleinen und middle-  
ren Unternehmen (KMU) im Bereich  
Software Variantenbildung: Abschluss-  
bericht zum Projekt.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 026.01/D

**Denger, C.; Doerr, J.; Kamsties, E.:**  
Modellierung eines Türsteuergerätes  
mit SCR. Eine Fallstudie im QUASAR-  
Projekt.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 064.01/D

**Denger, C.; Doerr, J.; Kamsties, E.:**  
A Survey on Approaches for Writing  
Precise Natural Language Require-  
ments.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 070.01/E

**Gacek, C.; Knauber, P.; Schmid, K.;**  
**Clements, P.:**  
Successful Software Product Line Devel-  
opment in a Small Organization. A  
Case Study.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 013.01/E

**Laitenberger, O.; Kohler, K.;**  
**Atkinson, C.:**  
Architecture-centric Inspection for the  
Unified Development Process (UP).  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 011.01/E

**Nick, M.; Althoff, K.-D.:**  
Engineering Experience Base Mainte-  
nance Knowledge.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 018.01/E

**Ochs, M.; Solingen, R. van:**  
Making Meetings Work. Discovering  
Success Factors for Software Engineer-  
ing Meetings.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 032.01/E

**Paech, B.; Wieczorek, I.:**  
Mentoring at IESE.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 033.01/E

**Pfahl, D.; Ruhe, G.:**  
System Dynamics as an Enabling Tech-  
nology for Learning in Software  
Organisations.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 025.01/E

**Pfahl, D.; Angkasaputra, N.;**  
**Differding, C.; Ruhe, G.:**  
CORONET-Train: A Methodology for  
Web-Based Collaborative Learning in  
Software Organisations.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 029.01/E

**D'Ambra, J.; Jeffery, R.; Pfahl, D.:**  
CORONET: An Australian Software  
Engineering Experience in Collaborative  
Research with the European Community.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 047.01/E

**Punter, T.:**  
Product Assessments at IESE  
Kaiserslautern, 2001,  
Fraunhofer IESE-Report No. 038.01/E

**Schmid, K.:**  
A Framework for Product Line Quality  
Model Development. The PuLSE-Eco  
Meta Quality Model.  
Kaiserslautern, 2001  
Fraunhofer IESE-Report 047.00/E

**Schmid, K. (ed.); Geppert, B. (ed.):**  
 Proceedings of the PLEES'01. International Workshop on Product Line Engineering: The Early Steps: Planning, Modeling, and Managing.  
 Kaiserslautern, 2001  
 Fraunhofer IESE-Report 050.01/E

**Zettel, J.; Neu, H.; Becker-Kornstaedt, U.; Rombach, D.:**  
 Entwicklung eines Prototypwerkzeugs zur Verwendung von Software-Entwicklungsstandards bei kleinen und mittelständischen Unternehmen. Abschlussbericht.  
 Kaiserslautern, 2001  
 Fraunhofer IESE-Report 075.01/D

**Zettel, J.; Maurer, F.; Münch, J.; Wong, L.:**  
 LIPE: A Lightweight Process for E-Business Startup Companies based on Extreme Programming.  
 Kaiserslautern, 2001  
 Fraunhofer IESE-Report 042.01/E

**Zettel, J.:**  
 Methodological Constraints, Critics, and Technology Acceptance. An Experiment.  
 Kaiserslautern, 2001  
 Fraunhofer IESE-Report 074.01/E

**Zettel, J.:**  
 Methodological Support for Descriptive Software Process Modeling. Consistency Rules in Spearmint™,  
 Kaiserslautern, 2001  
 Fraunhofer IESE-Report 014.01/E

## ISERN Reports

**Laitenberger O.; Kohler K.; Atkinson C.:**  
 Architecture-centric Inspection for the Unified Development Process (UP).  
 Fraunhofer Institute for Experimental Software Engineering, Germany, 2001  
 ISERN-01-01  
 also published as IESE-Report No. 011.01/E

**Pfahl, D.; Ruhe G.:**  
 System Dynamics as an Enabling Technology for Learning in Software Organizations.  
 Fraunhofer Institute for Experimental Software Engineering, Germany, 2001  
 ISERN-01-02  
 also published as IESE-Report No. 025.01/E

**Zettel, J.:**  
 Methodological Constraints, Critics, and Technology Acceptance: An Experiment.  
 Fraunhofer Institute for Experimental Software Engineering, Germany, 2001  
 ISERN-01-04  
 also published as IESE-Report No. 074.01/E

## Postdoctoral Degrees

**Biffli, S.:**  
 Software Inspection Techniques to Support Project and Quality Management.  
 Aachen: Shaker, 2001 (Berichte aus der Softwaretechnik). Also: Vienna, Technical University, Habilitation, 2001  
 ISBN 3-8265-8512-7

## Doctoral Theses

**Differding, C.:**  
 Adaptive Measurement Plans for Software Development, Department of Computer Science, University of Kaiserslautern  
 Advisors: Prof. Rombach, Prof. Richter  
 April 2001

**Kamsties, E.:**  
 Surfacing Ambiguities in Natural Language Requirements, Department of Computer Science, University of Kaiserslautern  
 Advisors: Prof. Rombach, Prof. Berry  
 March 2001

**Knethen von, A.:**  
 Change-Oriented Requirements Traceability Support for Evaluation of Embedded Systems, Department of Computer Science, University of Kaiserslautern  
 Advisors: Prof. Rombach, Prof. Atkinson  
 November 2001

**Münch, J.:**  
 Muster-basierte Erstellung von Software-Projektplänen, Department of Computer Science, University of Kaiserslautern  
 Advisors: Prof. Rombach, Prof. Richter  
 November 2001

**Pfahl, D.:**  
 An Integrated Approach to Simulation-Based Learning in Support of Strategic and Project Management in Software Organisations, Department of Computer Science, University of Kaiserslautern  
 Advisors: Prof. Rombach, Prof. Ehrenberg  
 October 2001

**Wieczorek, I.:**  
 Improved Cost Estimation - A Robust and Interpretable Modeling Technique and a Comprehensive Empirical Investigation, Department of Computer Science, University of Kaiserslautern  
 Advisors: Prof. Rombach, Prof. Briand  
 June 2001

## Diploma Theses

Avieny, Th.:

Konzeption und Implementierung eines Wissensbasierten Ansatzes zur Werkzeugunterstützten Wartung von Erfahrungsdatenbanken, Department of Computer Science, University of Kaiserslautern

Supervisors: **Rombach, D., Nick, M., Decker, B.**  
November 2001

Bella, F.:

Design and Implementation of a Similarity Analysis Between Process Models in Spearmint/EPG, Department of Computer Science, University of Kaiserslautern

Supervisors: **Rombach, D., Zettel, J.**  
June 2001

Bohn, R.:

Perspective Based Navigation for Corporate Information and Service Providing Systems (Intra-Nets), Department of Computer Science, University of Kaiserslautern

Supervisors: **Rombach, D., Bomarius, F.**  
September 2001

Hettesheimer, R.:

Extending a Graph Editor to Enhance Architecture Recovery, Department of Computer Science, University of Kaiserslautern

Supervisors: **Rombach, D., Girard, F.**  
April 2001

Jakob, T.:

Erweiterung einer Börsensoftware um Methoden zur Web-basierten Online-Order. Eine Fallstudie von Reengineering und Architekturanalyse, University of Kaiserslautern

Supervisor: **Girard, F.**  
October 2001

Josten, S.:

Komponentenbasierte Software Entwicklung: Adaption der Kobra-Methode für eingebettete Systeme, Department of Computer Science, University of Kaiserslautern

Supervisors: **Rombach, D., Bunse C.**  
September 2001

Mukasa, K. S.:

Entwurf und Implementation eines Feature Set-orientierten CM Kerns auf Basis einer Versionierbaren Datenbank, Department of Computer Science, University of Kaiserslautern

Supervisors: **Rombach, D., Laqua, R.**  
April 2001

Schwarz, S.:

Web-basiertes Prozessmanagement für SW-Projekte, Department of Computer Science, University of Kaiserslautern

Supervisors: **Rombach, D., Becker-Kornstaedt, U.**  
January 2001

Simon, K.:

Entwurf und Realisierung einer Werkzeugunterstützung für die Sicherheitsüberprüfung von Cisco-Routern, Department of Electrical Engineering, University of Kaiserslautern

Supervisor: **Schwarz, R.**  
September 2001

Wilke, M.:

WIPS - A Web-based Inspection Process Support Tool, Department of Computer Science, University of Kaiserslautern

Supervisors: **Rombach, D., Laitenberger, O.**  
November 2001

## Project Theses

Kurpjuweit, S.:

Requirements and Architecture Based Design of a Tool to Support the Architecture Trade-off Analysis Method.

Supervisors: **Girard, J.-F.; Kazman, R.**  
Kaiserslautern, 2001

Reinert, R.:

Design und Implementierung eines Annotationskonzepts für Elektronische Prozesshandbücher.

Supervisor: **Becker-Kornstaedt, U.**  
Kaiserslautern, 2001



  
Internal**Niniek Angkasaputra**

The Fraunhofer IESE 2001 Award for Project Excellence

**Björn Decker**

The Fraunhofer IESE 2001 Award for Project Excellence

**Gaby Klein**

The Fraunhofer IESE 2001 Award for Infrastructure Excellence

**Doris Langthaler**

The Fraunhofer IESE 2001 Award for Infrastructure Excellence

**Dirk Muthig**

The Fraunhofer IESE 2001 Award for Research Excellence

**Markus Nick**

The Fraunhofer IESE 2001 Award for Research Excellence

**Jens Heidrich**

The Fraunhofer IESE 2001 Award for Thesis Excellence

**Wolfgang Wagenbichler**

The Fraunhofer IESE 2001 Award for Thesis Excellence

  
External**Dr. Isabella Wiczorek**

Best Ph.D. Thesis of the University of Kaiserslautern, "Freundeskreis der Universität Kaiserslautern", November 2001

**Stephan Groß, Dr. Volker Hübsch,****Dr. Reinhard Schwarz**

IT Security Tool NIXE, Innovation Award of Rhineland-Palatinate, December 2001

  
Appointments and Honors**Prof. Dieter Rombach**

Visiting Professor: School of Computer Science and Engineering, Faculty of Engineering, University of New South Wales, Sydney, Australia, since 2001

**Prof. Günther Ruhe**

Professor: University of Calgary, Alberta, Canada, July 2001

**30 January – 02 February 2001**  
 Learntec 2001, 9th European Congress and Trade Fair for Educational and Information Technology, Karlsruhe, Germany

**08 March 2001**  
 5-year Anniversary of Fraunhofer IESE, Celebrated at the *Fruchthalle*, Kaiserslautern, Germany

**22 – 24 June 2001**  
 "Fishing for Fantasy", Fraunhofer IESE participates in the 725-year Anniversary Celebration of the City of Kaiserslautern, Grounds of the Garden Fair, Kaiserslautern, Germany

**10 – 13 September 2001**  
 3rd International Conference on Product Focused Software Process Improvement (Profes 2001), Program Co-Chair: Dr. F. Bomarius, Organizing and Publicity Chair: Petra Steffens, Kaiserslautern, Germany

**12 – 13 September 2001**  
 3rd International Workshop on Learning Software Organizations (LSO). Workshop Chair: Dr. K.-D. Althoff, Kaiserslautern, Germany

**19 – 20 September 2001**  
 Girls' Day at the University of Kaiserslautern, Germany

**20 – 21 September 2001**  
 Conquest 2001, Conference on Quality Engineering in Software Technology, Nuremberg, Germany

**23 - 24 October 2001**  
 Annual Meeting of the Fraunhofer-Gesellschaft, Mainz, Germany

**25 October 2001**  
 Launching ceremony of ViSEK - the Virtual Competence Center for Software Engineering, University of Kaiserslautern, Germany

**12 – 13 November 2001**  
 Annual Meeting of STI – Software Technology Initiative Kaiserslautern Inc., *Kammgarn Cultural Center*, Kaiserslautern, Germany

**12 November 2001**  
 Panel Discussion: "The IT Location Kaiserslautern", with the Minister President of the State of Rhineland-Palatinate, Kurt Beck, organized by the Rheinpfalz newspaper, *Kammgarn Cultural Center*, Kaiserslautern, Germany



IESE contributed to the 725-year Anniversary of the City of Kaiserslautern: a fish sculpture, symbol of Kaiserslautern, was decorated with Fraunhofer colors. Prof. D. Rombach and his team gathering in front of the Institute's fish.



IESE members Nicola Fuchs, Benjamin Federau, and Doris Langthaler (standing from left to right) supervising a tutorial during Girls' Day at the University of Kaiserslautern.



Birgit Buck of Fraunhofer IESE at the IESE booth at the STI Annual Meeting.



The participants of the Profes 2001 Conference in the stadium of the Kaiserslautern soccer team 1. FCK.



Ninie Angkasaputra presenting a tutorial at the 3<sup>rd</sup> International Workshop of Learning Software Organizations (LSO).



Attending the ViSEK Opening Event: State Secretary for Research, Prof. J. Zöllner; Federal Deputy Secretary of Research, Dr.-Ing. U. Thomas; and Prof. D. Rombach (from left to right).



Participating in the Panel Discussion on "The IT Location Kaiserslautern": Prof. D. Rombach, Executive Director of IESE; Kurt Beck, Minister President of the State of Rhineland-Palatinate; moderator Hans-Joachim Redzinski of the *Rheinpfalz* newspaper; Bernhard Deubig, Lord Mayor of the City of Kaiserslautern; and Dr. W. Krüger, CEO of tecmath AG (from left to right).

Die Rheinpfalz, March 9, 2001

# „Glücksfall für Universität und die Region“ Fraunhofer Institut für Experimentelles Software Engineering feiert fünfjähriges Bestehen

Das Kaiserlauterer Fraunhofer Institut für Experimentelles Software Engineering (IESE), das 1996 als erste Fraunhofer-Richtung in Rheinland-Pfalz gegründet wurde, hat gestern in der fruchtbaren sein fünfjähriges Bestehen gefeiert. In mehreren Gesprächsrunden, moderiert von Stefan Schulz-Hausmann, wurde auf einer ein breites Spektrum der Aufgabenstellung des Instituts...



Festveranstaltung zum fünfjährigen Bestehen des Kaiserlauterer Fraunhofer Institutes für Experimentelles Software Engineering (IESE): In der ersten Reihe (von links) Hans-Jürgen Warnecke, Präsident der Fraunhofer-Gesellschaft, Oberbürgermeister Bernhard Daubig, Universitätspräsident Günter Warnecke, Christiane Rorbach, Ministerpräsident Kurt Beck und der Leiter des IESE, Dieter Rorbach.

erminnte Assistentenleiter Dieter Rorbach daran, dass es an der ursprünglichen Idee für Software-Technologien der Kaiserlauterer Universität Kaiserlautern neben zu einem weltweit kompetenzstarken Institut in der Region mit mehr als 100 Mitarbeitern, die sich auf die Entwicklung von Software-Kompetenz in der Region...

Die Rheinpfalz, November 11, 2001

# Die Telekom und VW lassen sich in Kaiserslautern helfen Bei Softwareentwicklung stark - Fraunhofer-IESE auf Wachstumskurs



Sichere Software Am Fraunhofer-Institut für Experimentelles Software Engineering ein großes Thema.

Die Telekom und VW lassen sich in Kaiserslautern helfen. Bei Softwareentwicklung stark - Fraunhofer-IESE auf Wachstumskurs. Die Telekom und VW lassen sich in Kaiserslautern helfen. Bei Softwareentwicklung stark - Fraunhofer-IESE auf Wachstumskurs. Die Telekom und VW lassen sich in Kaiserslautern helfen. Bei Softwareentwicklung stark - Fraunhofer-IESE auf Wachstumskurs.

## Multikultureller Brückenschlag von der Wissenschaft zur Praxis

Spannender Alltag: Arbeiten am Fraunhofer-Institut für Experimentelles Software Engineering

# „Lauterer Erfolgsgeschichte fortsetzen“ Gestern Abend RHEINPFALZ-Forum zum IT-Standort - Beck sieht gute Entwicklungschancen



Ministerpräsident Kurt Beck sieht für Kaiserslautern gute Chancen, sich als Wirtschaftsstandort in der Informationstechnologie (IT) etablieren und international zu etablieren. Beck sagte gestern Abend während einer RHEINPFALZ-Podiumdiskussion, eine gute Basis für die weitere Entwicklung sei vor allem die Verzahnung der Industrie mit Forschung und Hochschulen. Das Forum unter dem Titel „Kaiserslautern auf dem Weg zum Silicon Valley“ bildete den Abschluss einer RHEINPFALZ-Arbeitsreihe über die regionale IT-Entwicklung. Die Veranstaltung im voll besetzten Casino des Kulturzentrums Karweggarte wurde vom Leiter der hiesigen RHEINPFALZ-Redaktion, Hans-Jürgen Rodemski, moderiert. Das rasche Wachstum der IT-Branche in Kaiserslautern beeindruckte Beck als „ebenso überraschend wie herausragend“. Aus den Hochschulen und dem Fraunhofer-Institut habe sich sehr viel entwickelt, sagte der Ministerpräsident. Die richtigen Vorgaben von Land und Staat seien sowohl von der Forschung als auch der Industrie „aufgenommen und umgesetzt“ worden. Der „einen Weg zur Kaiserslautern weitergeben“ zu können, seien optimale Rahmenbedingungen notwendig. Hierzu zählt Beck neben der Attraktivität des Wirtschaftsstandorts auch die



Fünf Mitarbeiter, eingebunden in ein hochmotiviertes Team

Die Rheinpfalz, March 3, 2001

# „Das IESE ist das erste Perpetuum mobile“

## Der Leiter des Fraunhofer-Instituts im RHEINPFALZ-Gepräch - Weiter auf Wachstumskurs

Das Fraunhofer-Institut für Experimentelle Software Engineering (IESE) im Saal in Neustadt hat sich in der vergangenen Woche zu einem internationalen Symposium in Kooperation mit dem Fraunhofer-Institut für Experimentelle Software Engineering (IESE) im Saal in Neustadt...

Die Entwicklung der Software-Industrie ist ein dynamischer Prozess, der sich in den letzten Jahren stark beschleunigt hat. Die Fraunhofer-Organisation hat sich diesem Prozess angepasst und hat das IESE als zentrale Einheit für die Entwicklung von Software-Engineering-Technologien gegründet...



„Kolonien können eine Hochburg im IT-Bereich werden.“ Das ist Prof. Dr. Dieter Rombach, der Leiter des Fraunhofer-Instituts, überzeugt.

... aber - allen schon im 1994-Park - können wir nicht auf eine andere Zahl, die bezeugt, dass das IESE das erste Perpetuum mobile ist. Das Land hat noch 10 Millionen Mark im Rahmen des IESE investiert, aber das wird nicht mehr eingeleitet als wir investiert haben. Wenn Investitionen jeder der durch das IESE bedingten Mark-Investitionen im Jahr 2000 100 Millionen Mark pro Jahr ausmachen, der Software-Akademie angeschuldete akademischen Akademie Investition, haben wir schon schon 100 Millionen Mark auf die Höhe von 100 Millionen Mark im Jahr 2000 - in der ersten Phase. Das zeigt, dass sich Investitionen in innovative Technologie lohnen, weil sie den Wirtschaftswachstum fördern.

Staatsanzeiger für Baden-Württemberg, January 27, 2001

## Virtuelle Akademie für IKT-Weiterbildung

**IAINZ.** Eine Virtuelle Akademie für die Weiterbildung im Bereich der Informatik- und Kommunikationstechnik (IKT) vom Fraunhofer Institut Kaiserslautern mit finanzieller Unterstützung des Landes Rheinland-Pfalz aufgebaut. Wie Wirtschaftsminister Hans-Artur Bauckhage (FDP) in Mainz angekündigt, investiert das Land 3,7 Millionen Mark in ein Internet-Portal für Online-Weiterbildungsange...

## In Lautern entsteht das vierte Fraunhofer-Zentrum

### Erbbaurechtsvertrag für Gelände an der Trippstadter Straße unterzeichnet

Stadt und Fraunhofer-Gesellschaft haben gestern Nachmittag die Erbbaurechtsverträge für ein Fraunhofer-Institut in Kaiserslautern unterschrieben. Das vierte Fraunhofer-Zentrum in Deutschland. Derzeitige Zentren existieren parallel in Stuttgart, Freiburg und Dresden.

Das Gelände umfasst eine Fläche von 20.000 Quadratmetern Größe auf dem ehemaligen Rangierbahnhof. Von dem ehemaligen Rangierbahnhof. Von dem ehemaligen Rangierbahnhof. Von dem ehemaligen Rangierbahnhof. Von dem ehemaligen Rangierbahnhof.

Das Fraunhofer-Institut für Experimentelle Software Engineering (IESE) wird an der Trippstadter Straße 30 eine Fläche von 20.000 Quadratmetern in der Nähe der A 630 errichten. Die Fläche der Fraunhofer-Gesellschaft liegt innerhalb eines zugewiesenen Areal für „Forschung und Lehre“ in direkter Nachbarschaft des bestehenden Zentrums. Die Fläche in der Größe von 20.000 Quadratmetern entstehen, die Mitarbeiter Wohnen in der Nähe ihrer Arbeit. Die Fläche der Fraunhofer-Gesellschaft liegt innerhalb eines zugewiesenen Areal für „Forschung und Lehre“ in direkter Nachbarschaft des bestehenden Zentrums.

## KAISERSLAUTERN KOMPAKT

### Freundeskreis der Uni zeichnet Studenten aus



Ausgezeichnet: Freundeskreis-Vorsitzender Kurt Lechner (rechts) mit Isabella Wiczorek und Markus Glück.

Die virtuelle Akademie für die Weiterbildung im Bereich der Informatik- und Kommunikationstechnik (IKT) vom Fraunhofer Institut Kaiserslautern mit finanzieller Unterstützung des Landes Rheinland-Pfalz aufgebaut. Wie Wirtschaftsminister Hans-Artur Bauckhage (FDP) in Mainz angekündigt, investiert das Land 3,7 Millionen Mark in ein Internet-Portal für Online-Weiterbildungsange...

Das Fraunhofer-Institut für Experimentelle Software Engineering (IESE) wird an der Trippstadter Straße 30 eine Fläche von 20.000 Quadratmetern in der Nähe der A 630 errichten. Die Fläche der Fraunhofer-Gesellschaft liegt innerhalb eines zugewiesenen Areal für „Forschung und Lehre“ in direkter Nachbarschaft des bestehenden Zentrums.

Das Fraunhofer-Institut für Experimentelle Software Engineering (IESE) wird an der Trippstadter Straße 30 eine Fläche von 20.000 Quadratmetern in der Nähe der A 630 errichten. Die Fläche der Fraunhofer-Gesellschaft liegt innerhalb eines zugewiesenen Areal für „Forschung und Lehre“ in direkter Nachbarschaft des bestehenden Zentrums.

Das Fraunhofer-Institut für Experimentelle Software Engineering (IESE) wird an der Trippstadter Straße 30 eine Fläche von 20.000 Quadratmetern in der Nähe der A 630 errichten. Die Fläche der Fraunhofer-Gesellschaft liegt innerhalb eines zugewiesenen Areal für „Forschung und Lehre“ in direkter Nachbarschaft des bestehenden Zentrums.

## Wertschöpfung von 50 Milliarden Mark

### Gemeinsam mit der GfK Marktforschung und dem Fraunhofer IESE

Die Projektgemeinschaft für das Bundesministerium für Bildung und Forschung die Softwareentwicklung in Deutschland. Die Forscher analysierten dabei sowohl die Primärbranche in Deutschland. Die Hersteller, Dienstleister der Informationstechnik und Hersteller von Software-Produkten, die Elektroindustrie, die Telekommunikation sowie Finanzdienstleistungen. Die Projektgemeinschaft für das Bundesministerium für Bildung und Forschung die Softwareentwicklung in Deutschland.

## Studie über die deutsche Softwareindustrie

Nach Berechnungen der Autoren entwickelten derzeit über 20.000 Unternehmen in Deutschland Software und passen diese an Unternehmensbedürfnisse an. Mitarbeiter in vielen Bereichen ein überwiegender Teil des Umsatzes unmittelbar vom Einsatz von Computern abhängig. Beispielsweise steuern Programme heute in der Automobilindustrie nahezu alle Funktionen der Fahrzeuge.

## Freundeskreis der Uni zeichnet Studenten aus

Der Freundeskreis der Universität Kaiserslautern hat am 27. Januar 2001 die diesjährigen Preisträger der „Forschung und Lehre“ in direkter Nachbarschaft des bestehenden Zentrums. Die Fläche in der Größe von 20.000 Quadratmetern entstehen, die Mitarbeiter Wohnen in der Nähe ihrer Arbeit. Die Fläche der Fraunhofer-Gesellschaft liegt innerhalb eines zugewiesenen Areal für „Forschung und Lehre“ in direkter Nachbarschaft des bestehenden Zentrums.

Die virtuelle Akademie für die Weiterbildung im Bereich der Informatik- und Kommunikationstechnik (IKT) vom Fraunhofer Institut Kaiserslautern mit finanzieller Unterstützung des Landes Rheinland-Pfalz aufgebaut. Wie Wirtschaftsminister Hans-Artur Bauckhage (FDP) in Mainz angekündigt, investiert das Land 3,7 Millionen Mark in ein Internet-Portal für Online-Weiterbildungsange...

ATP automatisierungstechnische Praxis, December 2001

### Nationales Kompetenzzentrum für Software Engineering

Dem Software-Standort Deutschland fehlt es nach einer im Jahr 2000 im Auftrag des Bundesministeriums für Bildung und Forschung (BMBF) durchgeführten Umfrage an breit gefächerten professioneller Entwicklungsmethodik. Das neue „Virtuelle Kompetenzzentrum für Software Engineering“ (VISEK) soll hier Abhilfe schaffen. [www.visek.de](http://www.visek.de)

Wirtschaft in Ostwürttemberg, July 2001

### Software-Engineering Kompetenznetzwerk entsteht

Um aktuelle Forschungsergebnisse auf dem Gebiet des Software-Engineering in Deutschland transparent und besser verfügbar zu machen, wurde das Virtuelle Software-Engineering-Kompetenzentrum (VISEK) unter Federführung des Fraunhofer-Instituts für Experimentelles Software-Engineering (IESE) in Kaiserslautern gegründet.

Das Kompetenzzentrum soll die vorhandenen Forschungseinrichtungen der Partner verteile Wissen über Software-Engineering und über Anwendungen wissenschaftlich erheben, gebündelt und der Fornd der Wirtschaft vernetzt zur Verfügung gestellt. Ein Angebot für die etwa 150 Softwareentwickelnden Unternehmen in Deutschland geschaffen werden soll, das jeden zeitlichen Verzug und Verwaltungsaufwand die neuesten Software-Engineering-Techniken des 21. Jahrhunderts einsetzen zu können. Informationen gibt es auf [www.visek.de](http://www.visek.de)

## Infopool für Softwareentwickler

Internet: Virtuelles Kompetenzzentrum für Software Engineering (VISEK) will Standort Deutschland nach vorne bringen



wenden oder viele Fragestellungen werden in verschiedenen Firmen parallel bearbeitet – ein unnötiger Aufwand an Zeit, Geld und Energie. Bei VISEK besteht nun die Möglichkeit, auf Erfahrungen und Entwicklungen anderer zurückzugreifen und so eigene Entwicklungszyklen zu verkürzen, den Ideen-Ansatz auszuwählen und so kostenintensiv zu produzieren. Projektleiter Dr. Ralf Kueppers (IESE) betont, dass VISEK die Softwareentwickler zwar intensiv unterstützen, aber selbst keine eigenen Entwicklungen oder Aufträge anbieten wird. „Wir verstehen uns als Dienstleister von Wissen – nicht als Software-Produzent.“

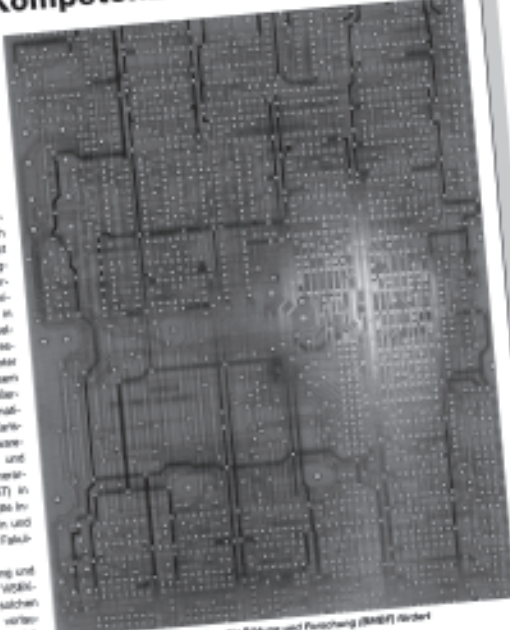
Es ist ein weiter Weg bis zum fertigen Softwareprodukt. Das Kompetenzzentrum Systemanalytiker und Softwareentwickler unterstützen. Foto: Maxime

wicklungen in deutschen Unternehmen schlecht besteht ist. Professor Dieter Rosenbach, Leiter des IESE, weist im Interview auf die wichtigsten Verluste hin: „Wenn Software-Produktionsanstrengungen verloren gehen, ist es höchste Zeit zu handeln.“ Seit vergangener Donnerstag ist das Fraunhofer-Projekt VISEK (Virtuelles Software Engineering Kompetenznetzwerk) das erste direkte Konsequenz aus der Studie ist, online gestartet. Es dient als Webportal.

„Den Firmen wird über das Portal schnell und unbürokratisch Zugriff auf die neuesten und für sie am besten geeigneten Methoden für ingenieurmäßige Softwareentwicklung ermöglicht“, verspricht Peter Stelken, Geschäftsführer von VISEK. Die Studie des BMBF zeigt an, dass der Kenntnisstand in der Branche in vielen Kompetenzfeldern sehr unterschiedlich ist.

### BMBF fördert Kompetenznetzwerk

Die deutsche Forschungslandschaft im Bereich des Software-Engineering ist gut entwickelt. Doch Synergiepotenziale, z.B. in Form der Verknüpfung von Erfahrungen über systematische Sichtungen über systematische Sichtungen über systematische Sichtungen über systematische Sichtungen werden.



Netzwerk: Das Bundesministerium für Bildung und Forschung (BMBF) fördert die Kooperation der Software-Entwickler.

VISEK in the Media

VDI Nachrichten, October 26, 2001

Als Softwareentwicklungs-Standort führt Deutschland eher ein Schattendasein – das virtuelle Kompetenzzentrum VISEK soll diesen Mangel beheben und den Unternehmen geballtes Engineering-Wissen zur Verfügung stellen. Das Problem ist nicht erst gestern bekannt: „Es fehlt eine professionelle Software-Lösungskompetenz und seiner Fachkräftemangel trägt die Softwareproduktion in Deutschland.“ In der Studie, die das Fraunhofer Institut für Experimentelles Software Engineering (IESE) in Kaiserslautern, wies auf dieser Feststellung auf eine Studie, die im Auftrag des Bundesforschungsministeriums zu diesem niederschmetternden Ergebnis kam. Die Studie „Analyse und Evaluation der Software-Entwicklung in Deutschland“, die von der GKZ zusammen mit dem IESE und dem Fraunhofer Institut für Systemtechnik und Innovationsforschung (ISIT) im Auftrag des Bundesforschungsministeriums (BMBF) durchgeführt wurde, belegt, dass es um Software-Techniken und dem Weiterent-

VISEK-Partner  
Fraunhofer IESE

## Wissen für Softwareentwickler

Rund sechs Millionen Euro lässt sich das Bundesministerium für Bildung und Forschung (BMBF) den Aufbau eines „Virtuellen Software Engineering Kompetenzzentrums“ kosten. Es wird in

Kaiserslautern angesiedelt und steht unter der Federführung des Fraunhofer-Institutes für Experimentelles Software Engineering (IESE). Ab 2003 werden rund sechs Millionen deutsche

nehmen, die sich mit Softwareentwicklung beschäftigen, im Stil eines Ingenieurhandbuchs innovative

### Nationale Initiative möchte Wissen bündeln

sch FRANKFURT A.M. Die rund 20 000 Unternehmen, die hierzulande Software entwickeln, sollen künftig schnell und unbürokratisch auf die dafür nötigen Werkzeuge und Methoden zugreifen können. Unter seiner Federführung werde bis Ende 2003 ein virtuelles Kompetenzzentrum aufgebaut, berichtet das Fraunhofer-Institut für Experimentelles Software Engineering (IESE) in Kaiserslautern. Das Projekt mit dem Namen Visek werde mit zwölf Millionen Mark vom Bundesministerium gefördert. Der Wirtschaft wurde über ein Internet-Portal bei der Auswahl der Werkzeuge und Methoden geholfen. Entstehen soll ein in Deutschland bisher einmaliger Pool an Fachwissen und ein Expertennetzwerk. Die durch das vorhandene Know-how Bündelung des vorhandenen Know-how sei bislang beispiellos und stelle eine neue Qualität in der noch mehr oder weniger fragmentierten Forschungslandschaft

... und ähnlich werden. Jetzt Engineering unter Federführung des Fraunhofer IESE in Kaiserslautern. Die virtuelle Software-Engineering-Kompetenznetzwerk (VISEK) in Kaiserslautern ist ein gemeinsames Projekt von Fraunhofer IESE, Fraunhofer ISIT, Fraunhofer IPT und Fraunhofer IAW. Die Studie des BMBF zeigt an, dass der Kenntnisstand in der Branche in vielen Kompetenzfeldern sehr unterschiedlich ist. Die Studie des BMBF zeigt an, dass der Kenntnisstand in der Branche in vielen Kompetenzfeldern sehr unterschiedlich ist. Die Studie des BMBF zeigt an, dass der Kenntnisstand in der Branche in vielen Kompetenzfeldern sehr unterschiedlich ist.

e-Business, May 21, 2001

Elektronik, December 2001

Frankfurter Rundschau, May 5, 2001

Software-Engineering:

# BMBF fördert Kompetenznetzwerk

Unter Federführung des Fraunhofer-Instituts für Experimentelles Software-Engineering (IESE) in Kaiserslautern wurde jetzt das „Virtuelle Software-Engineering-Kompetenzzentrum“ (VISEK) gegründet. Es soll Forschungsergebnisse auf dem Gebiet des Software-Engineering in Deutschland transparent und besser verfügbar machen. An dem Kompetenznetzwerk beteiligen sich außer

für Rechnerarchitektur und Software-technik (FIRST), Berlin, das GMD-Institut für Angewandte Informationstechnik (FIT), St. Augustin, sowie die Technische Universität München, Fakultät für Informatik. Das Bundesministerium für Bildung und Forschung fördert die zum Aufbau eines solchen Kompetenznetzwerkes notwendigen Vorarbeiten und beschleunigt

Objekt Spektrum, April 2001

## Virtuelles Software-Engineering-Kompetenzzentrum

Unter Federführung des Fraunhofer-Instituts für Experimentelles Software Engineering (IESE) soll bis Ende 2003 ein „Virtuelles Software-Engineering-Kompetenzzentrum“ (Visek) aufgebaut werden. Ziel ist es, die in den letzten Jahren

dem das Fraunhofer-Institut für Experimentelles Software-Engineering (IESE) in Kaiserslautern, dem GMD-Institut für Angewandte Informationstechnik (FIT) in Sankt Augustin, der TU München und dem FIRST in Berlin und dort

# Nationale Software-Offensive gestartet

Virtuelles Software-Kompetenzzentrum gestern eröffnet - Engagement von Fraunhofer-Institut gewürdigt

„Der Standort Kaiserslautern wird eine tragende Rolle spielen bei der Ausgestaltung Deutschlands als IT-Standort.“ Das sagte Dieter Rombach, Leiter des Fraunhofer-Instituts für Experimentelles Software-Engineering (IESE), gestern bei der Eröffnung des virtuellen Kompetenznetzwerks für Softwareentwicklung (Visek) an der Universität

Stadt in Rheinland-Pfalz und sagte, dass die Initiative im Vergleich mit dem Fraunhofer-Zentrum, das an der Trüppstadter Straße entsteht, der Standort der Informatik- und Kommunikationstechnologie im ersten Jahrtausend wurde.

Uwe Thomas, Staatssekretär im Bundesbildungsministerium, begrüßte die Initiative und sagte, dass die Initiative im Vergleich mit dem Fraunhofer-Zentrum, das an der Trüppstadter Straße entsteht, der Standort der Informatik- und Kommunikationstechnologie im ersten Jahrtausend wurde.



Gäste bei der Eröffnung des nationalen Kompetenznetzwerks für Softwareentwicklung an der Universität: Vizepräsident Günter Warncke, Oberbürgermeister Bernhard Deubig, der Minister Wissenschaften, Jugend und Sport Uwe Thomas aus Berlin und der Leiter des Fraunhofer-Instituts IESE, Dieter Rombach.

vom Bundesministerium für Bildung und Forschung (BMBF) gefördert. Das Zentrum hat ein Budget von 12 Mill. Euro. Es soll die Zusammenarbeit von Industrie und Forschungseinrichtungen fördern. Ziel ist es, bis Ende 2003 20 Entwicklungsmethoden und -werkzeuge zu beschreiben, zu validieren und zu verbreiten. Zu den Teilnehmern gehören

Die Rheinpfalz, October 26, 2001

## VISEK-Projekt vernetzt Software-Engineering-Kompetenz in Deutschland Nationale Software-Initiative

Unter Federführung des Fraunhofer-Instituts für Experimentelles Software-Engineering (IESE) in Kaiserslautern wird bis Ende 2003 ein Virtuelles Software-Engineering-Kompetenzzentrum (VISEK) aufgebaut. Das 1996 gegründete Institut will Software-Entwickler und Anwender auf aktuelle und künftige informationstechnische Anforderungen vorbereiten. Unter der Leitung von Prof. Dr. Dieter Rombach erarbeiten die IESE-Mitarbeiter Methoden, Verfahren, Methoden und Werkzeuge, die die industrielle Software-Entwicklung auf eine solide ingenieurwissenschaftliche Grundlage stellen.

Ziel des Projektes ist es, den etwa 20.000 softwareentwickelnden Unternehmen in Deutschland den schnellen und unbürokratischen Zugriff auf die neuesten und am besten geeigneten Methoden und Werkzeuge für professionelle Softwareentwicklung zu ermöglichen. Dazu werden Methoden und Werkzeuge aufwändig beschrieben und Erfahrungen mit ihrem praktischen Einsatz erfasst. Im Ergebnis bieten die Kaiserslauterer Projekt-Initiatoren potenziellen industriellen Nutzern über ein nationales „Rechenzentrum“ (in Silke eines Ingenieurhandbuchs) innovative Methoden und Werkzeuge an. Dazu gehören sowohl Unterstützung bei der Auswahl als auch der notwendigen Wissensübertragung beim Einsatz dieser Methoden und Werkzeuge. Die Auswahl erfolgt automatisch über ein Internetportal und wird darüber hinaus ergänzend unterstützt durch Beratungskontakte der angeschlossenen Transferzentren. Dr. Oliver Lattemberger, VISEK-Projektleiter am IESE, kennzeichnet dieses Portal als das A und O für die breite Akzeptanz in Industrie

und Forschung und als einen Forschungsschwerpunkt des Projektes. Neben einem umfangreichen, für Deutschland bisher einmaligen Pool an Fachwissen entsteht als Ergebnis von VISEK auch ein Expertenetzwerk, das für Forschung und Industrie als Ansprechpartner zur Verfügung steht. Während werden die Initiatoren eine Erweiterung des Virtuellen Kompetenznetzwerks um zusätzliche reale Kompetenzzentren sowie um professionelle Consulting-Dienstleistungen für klein- und mittelständische Unternehmen anstreben. Im Rahmen des VISEK-Projekts fördert das Bundesministerium für Bildung und Wissenschaft (BMBF) die zum Aufbau dieses Netzwerkes notwendigen Forschungsmaßnahmen. Für VISEK ist eine enge internationale Kooperation mit vergleichbaren Projekten in Europa und den USA geplant. Die europäische Kooperation wird über das von IESE ebenfalls geförderte europäische „Network of Excellence“ ESERNET koordiniert.

Die Wirtschaftspolitik in Deutschland. Der Minister Wissenschaften, Jugend und Sport Uwe Thomas sagte, mit Visek sei der entscheidende Schritt bei der Schaffung eines eigenen Wissens für die Softwareentwicklung in Deutschland gesetzt worden. Das Land müsse besonders stolz sein auf die Kooperation von Visek mit dem Fraunhofer-Institut

das Signalwirkung habe. Durch seine Arbeit zeichne das Institut nicht nur die Arbeit an, sondern vergrößere an der Softwareentwicklung in der Zahl der Mitarbeiter und sein Engagement in der Weiterbildung auch die Zahl der Menschen, die Software produzieren können. „Wir brauchen in diesem Land“, schloss er ab.

Sieger Zeitung, November 26, 2001

# Deutschland startet breite Software-Offensive

Renommierte Forschungszentren in ein Boot geholt / Dienstleister für Unternehmen

Kaiserslautern. Deutschland will die Entwicklung von Computer-Software eine weltweit führende Rolle spielen. Zu diesem Zweck haben international renommierte Forschungszentren auf dem Gebiet Software Engineering gestern in Kaiserslautern ein gemeinsames nationales Kompetenzzentrum für virtuelle Softwareentwicklung gegründet. Das Zentrum soll die Entwicklung von Software mit 12 Mill. DM (6,1 Mill. Euro) bis Ende 2003 unterstützen. Unter Federführung des Kaiserslauterer Fraunhofer-Instituts Experimentelles Software Engineering soll Methoden- und Anwendungswissen über Softwareentwicklung gebündelt werden und damit beschäftigten 20 000 Unternehmen in Deutschland angeboten werden. Leiter ist der Kaiserslauterer Professor Dieter Rombach. Über das Internetportal visek.de können interessierte Unternehmen Kontakt aufnehmen.

knapp ein Drittel der 20 000 Software entwickelnden Unternehmen in Deutschland dazu ingenieurmäßige Methoden ein. Dabei, so haben verschiedene Studien ergeben, nimmt die Bedeutung und Abhängigkeit von Software in vielen Wirtschaftszweigen immer mehr zu. Vor allem in der Automobilindustrie, der Medizintechnik und im Bankwesen geht ohne aktuelles Software praktisch nichts mehr. „Es ist fünf vor zwölf, wenn wir in Deutschland im Wettbewerb um die wichtigsten Software-Produktionsstandorte nicht verloren gehen“, sagt Rombach. Vom Jahr 2001 bis 2005 werden sich die Softwareumsatzzahlen in Deutschland verdoppeln. Die Softwareentwicklung ist ein Geschäft mit hohem Risiko und hoher Rendite. Die Softwareentwicklung ist ein Geschäft mit hohem Risiko und hoher Rendite. Die Softwareentwicklung ist ein Geschäft mit hohem Risiko und hoher Rendite.

Computer Zeitung, November 11, 2001

# METHODENDEFIZIT Softwareentwickler bekommen Nachhilfe

Kaiserslautern (rr) - Das Virtuelle Software-Engineering (Visek) soll das Methoden- und Anwendungswissen über Softwareentwicklung gebündelt werden und damit beschäftigten 20 000 Unternehmen in Deutschland angeboten werden. Leiter ist der Kaiserslauterer Professor Dieter Rombach. Über das Internetportal visek.de können interessierte Unternehmen Kontakt aufnehmen.

schon Folgen, wie Dieter Rombach, Visek-Koordinator und Leiter des Fraunhofer-Instituts für Experimentelles Software-Engineering, glaubt: „Es ist fünf vor zwölf, wenn wir im Wettbewerb um die wichtigsten Software-Produktionsstandorte nicht verlieren wollen.“ Das mit 12 Millionen Mark geförderte digitale Methodenhandbuch hält Professor Heinrich Mayr, Präsident der Gesellschaft für Informatik, für „essenziell“.



Technikforum VDI-VDE, March 2001

## The Research Organization

The Fraunhofer-Gesellschaft is the leading organization for institutes of applied research in Europe, undertaking contract research on behalf of industry, the service sector and the government. Commissioned by customers in industry, it provides rapid, economical and immediately applicable solutions to technical and organizational problems. Within the framework of the European Union's technology programs, the Fraunhofer-Gesellschaft is actively involved in industrial consortiums that seek technical solutions to improve the competitiveness of European industry.

The Fraunhofer-Gesellschaft also assumes a major role in strategic research: Commissioned and funded by Federal and *Länder* ministries and governments, the organization undertakes future-oriented research projects which contribute to the development of innovations in spheres of major public concern and in key technologies. Typical research fields include communications, energy, microelectronics, manufacturing, transport and the environment.

The global alignment of industry and research has made international collaboration imperative. Furthermore, affiliate Fraunhofer institutes in Europe, in the USA and in Asia ensure contact to the most important current and future economic markets.

At present, the organization maintains 56 research establishments at locations throughout Germany. A staff of some 11,000 – the majority of whom are qualified scientists and engineers – generate the annual research volume of more than 900 million €. Of this amount, over 800 million € is derived from contract research. Research contracts on behalf of industry and publicly financed research projects generate

approximately two thirds of the Fraunhofer-Gesellschaft's contract revenue. The Federal and *Länder* governments contribute one third, as a means of enabling the institutes to work on solutions to problems that are expected to attain economic and social relevance in the next five to ten years.

Fraunhofer scientists specialize in complex research tasks involving a broad spectrum of research fields. When required, several institutes pool their interdisciplinary expertise to develop system solutions.

The Fraunhofer-Gesellschaft was founded in 1949 and is a recognized non-profit organization. Its members include well-known companies and private patrons who contribute to the promotion of its application-oriented policy.



The man behind the name:

### Joseph von Fraunhofer

The Fraunhofer-Gesellschaft owes its name to Joseph von Fraunhofer (1787-1826), the successful Munich researcher, inventor and entrepreneur. Born of a family of modest means, the glass-grinding apprentice Joseph von Fraunhofer

joined the institute for optics headed by privy councillor Joseph von Utzschneider, who put the young researcher in charge of glass manufacturing at the early age of 22. Joseph von Fraunhofer's major developments include new methods of glass production and processing.

The optical instruments he himself developed, such as the spectrometer and the diffraction grid, enabled Fraunhofer to conduct fundamental research in the fields of light and optics. He was the first scientist to measure the spectrum of sunlight and characterize the appearance of the dark absorption strips: the "Fraunhofer lines".

Through his independent, autodidactic work, Joseph von Fraunhofer won great acclaim from industry and government. This prompted the nomination of the former apprentice to a full member of the Bavarian Academy of Sciences.

The organization takes its name from Joseph von Fraunhofer (1787-1826), the successful Munich researcher, inventor and entrepreneur.

## Objectives of the Fraunhofer-Gesellschaft

The Fraunhofer-Gesellschaft maintains an obligation to serve industry, its partner companies, and society at large. Target groups and, thus, beneficiaries of research conducted by the Fraunhofer-Gesellschaft are:

### Industry

Small, medium-sized and multinational companies in industry and in the service sector all profit from contract research. The Fraunhofer-Gesellschaft develops technical and organizational solutions that can be implemented in practice, and promotes applications for new technologies. The Fraunhofer-Gesellschaft is a vital supplier of innovative know-how to small and medium-sized companies who do not maintain their own in-house R&D departments.

### Government and society

Strategic research projects are carried out under contract to national and regional government. They serve to promote the implementation of cutting-edge technology and innovations in fields of particular public interest, such as environmental protection, energy conservation, and health. The Fraunhofer-Gesellschaft, furthermore, participates in technology programs supported by the European Union.



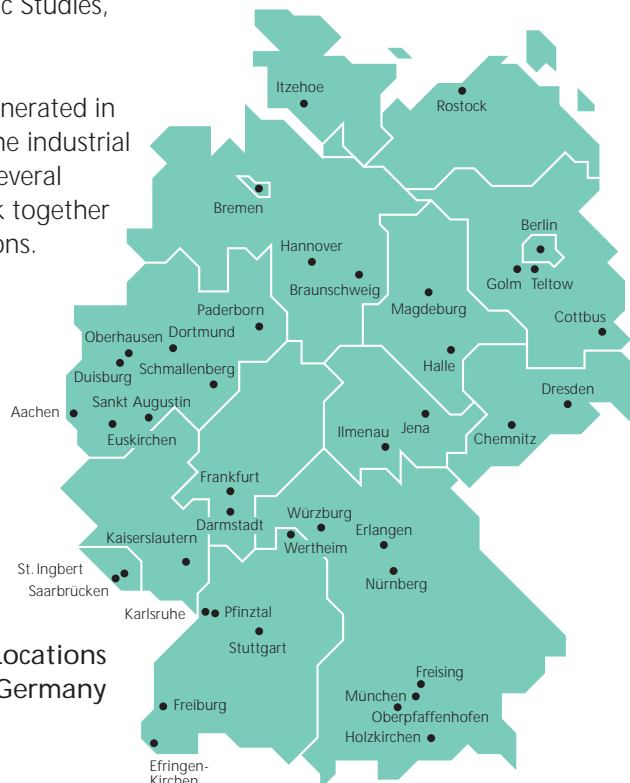
## Research Fields of the Fraunhofer-Gesellschaft

Eight fields form the core of Fraunhofer research:

- Materials Technology and Component Behavior
- Production Engineering and Manufacturing Technology
- Information and Communications Technology
- Microelectronics and Microsystems Technology
- Sensor Systems, Testing and Measurement Technologies
- Process Engineering
- Energy and Building Technology, Environment and Health Research
- Technical and Economic Studies, Information Transfer

Individual solutions are generated in close collaboration with the industrial partner. When required, several Fraunhofer Institutes work together on complex system solutions.

### Fraunhofer Locations in Germany



### Fraunhofer Locations in USA:

Boston, Massachusetts  
College Park, Maryland  
Newark, Delaware  
Pittsburgh, Pennsylvania  
Plymouth, Michigan  
Providence, Rhode Island

## Advantages of Contract Research

Several thousand experts are available for the development of complete systems.

All developments are based on profitability considerations. The Fraunhofer-Gesellschaft collaborates with various renowned companies whose research contracts have resulted in successful products. Modern laboratory equipment and scientific aids such as project management and internationally-linked communications systems enhance the quality of the research work. Detailed project reports, instructions for use, staff training, and complete introduction strategies for new technologies round off the contract research services. Reliability, continuity, and the services of a large organization are available to all companies.

## Collaboration with the Fraunhofer-Gesellschaft

Contract research with the Fraunhofer-Gesellschaft has advantages for all companies. Orders come from all branches of industry and from companies of all sizes. The institutes' facilities are particularly recommended for small businesses who can take advantage of Fraunhofer research when their own capacities are not sufficient to develop on their own the technical innovations necessary to stay competitive.

## Executive Board

(as of December 31, 2001)

Prof. Hans-Jürgen Warnecke, President  
Dr. Dirk Meints Polter, Human Resources, Legal Affairs and International Relations

Prof. Dennis Tschritzis, Knowledge Management and Start-ups/Joint Ventures

Dr. Hans-Ulrich Wiese, Finance

## Address

Fraunhofer-Gesellschaft e.V.

P. O. Box 19 03 39

Leonrodstraße 54

80636 Munich, Germany

Phone +49 (0) 89 1205-01

Fax +49 (0) 89 1205-317

E-Mail [info@zv.fraunhofer.de](mailto:info@zv.fraunhofer.de)

www: <http://www.fraunhofer.de>

### Fraunhofer Locations in Asia:

Beijing, China  
Jakarta, Indonesia  
Singapore  
Tangerang, Indonesia  
Tokyo, Japan

### Fraunhofer Locations in Europe:

Brussels, Belgium

**Fraunhofer Institute for Experimental Software Engineering**  
 Sauerwiesen 6  
 67661 Kaiserslautern  
 Phone +49 (0) 6301 707 100  
 Fax +49 (0) 6301 707 200  
 E-Mail [info@iese.fhg.de](mailto:info@iese.fhg.de)  
<http://www.iese.fhg.de>

**Contact Office at PRE-Park**  
 Competence Center for Software Technology and Continuing Education  
 Luxemburger Str.1+3  
 67657 Kaiserslautern  
 Phone +49 (0) 631 41690 0  
 Fax +49 (0) 631 41690 41  
 E-Mail [schlich@iese.fhg.de](mailto:schlich@iese.fhg.de)  
 Contact Maud Schlich

**Contact Office at the University of Kaiserslautern**  
 Erwin-Schrödinger-Straße  
 Building 57, 4th floor  
 67663 Kaiserslautern  
 Phone +49 (0) 631 205 3329  
 Fax +49 (0) 631 205 3330  
 E-Mail [jerkku@informatik.uni-kl.de](mailto:jerkku@informatik.uni-kl.de)  
 Contact Kristina Jerkku

### How to reach us:

**By car**  
 coming from the west (Saarbrücken) or the east (Mannheim) on highway (Autobahn) A6. Take the exit *Kaiserslautern-West* and follow the signs that read *Lauterecken*. About 500 m after exiting the highway, turn left to *Siegelbach*. Follow the road leading through a forest. Right after entering *Siegelbach*, you turn right at the first junction into the street *Sauerwiesen*. After about 100 m you find IESE on your right-hand side.

**By train**  
 from Kaiserslautern railway station either by taxi (ca. 8 km) or by bus (line RSW 6510, departing from bus stop A/2 at railway station, destination: Siegelbach) to Siegelbach; the stop *Siegelbach Sand* is about 100 m from the institute

**By airplane**  
 Airport Frankfurt/Main, either by train (about 2 hours) or by car (about 1.5 hours)

### How to reach us:

**By car**  
 Highway (Autobahn) A6, exit *Kaiserslautern-Ost*. Follow signs to Kaiserslautern *Stadtmitte* on highway B40 (= Mainzer Straße). After crossing under the Autobahn, turn left in the direction of PRE-Park.  
 Total driving time from A6 exit: approx. 2 minutes

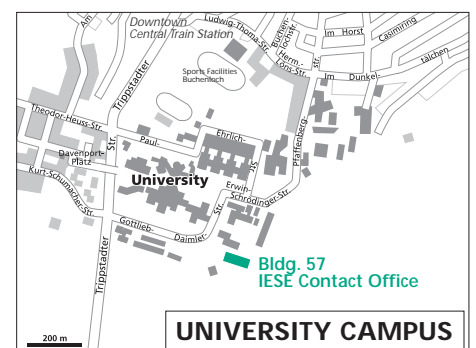
**By train**  
 Take bus no. 2, 5, or 7 from Kaiserslautern railway station to *Schillerplatz* stop, change into bus no. 4, exit at PRE-Park stop. Attention: Not every bus stops at PRE-Park!  
 Total time: approx. 30 minutes

### How to reach us:

**By car**  
 Highway (Autobahn) A6, exit *Kaiserslautern-West*: follow signs to *Pirmasens* on highway B270; after approx. 1 km (1/2 mile) turn right onto *Pariser Straße*, following signs *Universität* and *Stadtmitte*; after approx. 1.5 km (1 mile) you will see a white sign *Universität* on your right. Do not take this right turn, but rather continue for another 50 m, then turn right at traffic light and follow the second sign to *Universität*. The Contact Office is located in Building 57 on the fourth floor.  
 Total driving time from A6 exit: approx. 10 minutes

**By car**  
 Highway (Autobahn) A6, exit *Kaiserslautern-Ost*: Follow signs for *Stadtmitte* on *Mainzer Straße*; then follow signs *Universität* (Bldg. 57, 4th floor).  
 Total driving time from A6 exit: approx. 15 minutes

**By train**  
 Take bus no. 5 from Kaiserslautern railway station, destination *Uni-Wohngebiet*; exit at *Uni-Ost* stop; walk back approx. 300 m in the opposite direction, follow signs to Bldg. 57. The Contact Office is located on the fourth floor.



**Fraunhofer USA Center for  
Experimental Software Engineering**  
University of Maryland  
4321 Hartwick Road, Suite 500  
College Park, MD 20742-3290  
Phone (301) 403-2705  
Fax (301) 403-8976  
E-Mail info@fc-md.umd.edu

**How to reach us:**

**By car**  
Directions from Points North  
Follow I-95 South to the point where it merges with I-495. At this point, follow the signs for Exit #27-Richmond (I-95/495 South). Follow the Exit 27 signs staying to the left so you can take the special Rt.1/College Park exit lane. This will briefly put you back on I-95. Stay to the right and take Exit #25 onto Route 1 South (towards College Park).

For directions from this point on, see "Further directions" on this page!

**Directions from Points South**  
Follow I-95 North to the point where it merges with I-495. At this point, follow the signs for Baltimore (I-95/495 North). Take Exit #25 onto Route 1 South (towards College Park).

For directions from this point on, see "Further directions" on this page!

**By train (15 minute walk)**  
Exit College Park Metro station by turning right after you exit the turnstile and going through a tunnel to Calvert Rd. Take Calvert Rd. for 4-5 blocks to Rt. 1. (Calvert ends there). Cross Rt. 1 and go right a block to Hartwick Rd. Turn right (there's a Kinko's Copy sign on the corner). Our building (4321) is on the left.

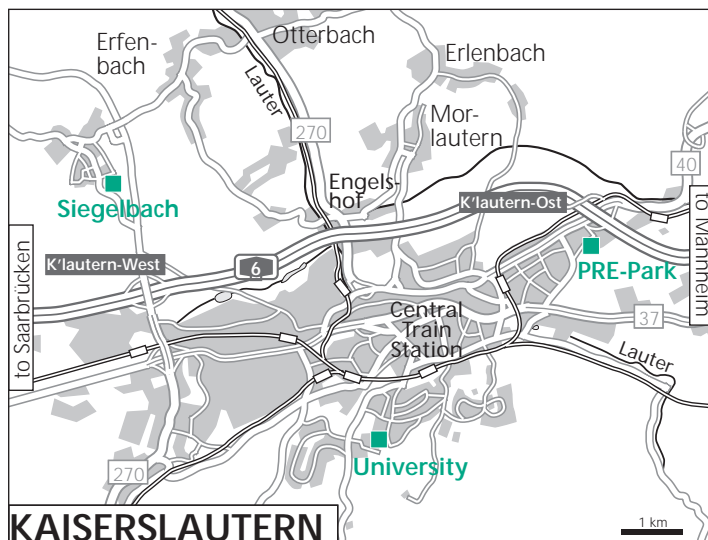
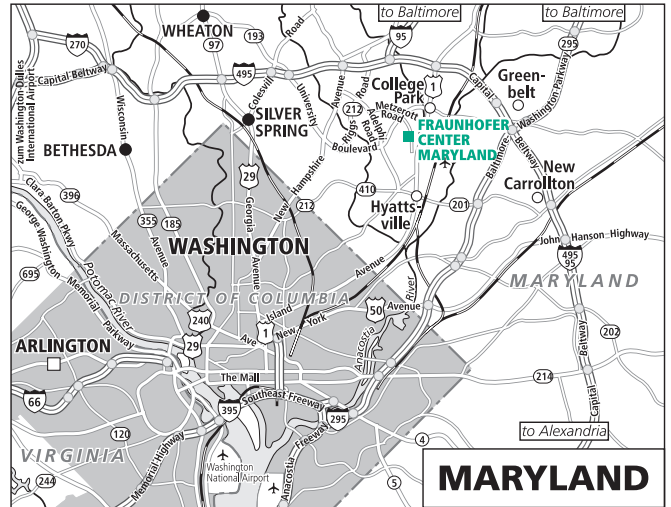
**By plane**  
B.W.I. airport (about 45 minutes by car)  
Exit the airport on I-195 (main road out of airport). In a few miles, take I-95 South towards Washington. From this point, follow directions from Points North.

National Airport (about 90 minutes by car; also a stop on the Yellow Metro line)  
Exit the airport towards I-395 North towards Washington, D.C. Continue on I-395 North to New York Avenue. Turn right onto New York Avenue (US Rt. 50 East) to MD Rt. 295/Baltimore-Washington Parkway for approximately six miles. Stay on BWI Parkway to the exit for Maryland Rt. 193. This is Greenbelt Road/Rt. 193. Take Rt. 193 East to Rt. 1 South.








For directions from this point on, see "Further directions" below!








**Further directions:**  
Stay on Rt.1 South, going past the University of Maryland. After passing the University, there will be 2 stop lights - the 2nd one being Knox Rd. Take the next right after Knox onto Hartwick Rd (there's a Kinko's Copy sign on the corner). Our building (4321) is on the left - turn left past the building into the parking lot and park anywhere.

We're on the 5th floor - directly opposite the elevator.



Global View of Kaiserslautern

|  |            |   |   |
|--|------------|---|---|
| <p> Dial Phone No. +49 (0) 6301 707- ...</p> | <p>100</p> | <p>Prof. Dieter Rombach<br/>Executive Director<br/>rombach@iese.fhg.de</p>  |    |
|  | <p>121</p> | <p>Dr. Frank Bomarius<br/>Director of Operations<br/>Department Head SLI<br/>(Systematic Learning and Improvement)<br/>bomarius@iese.fhg.de</p>                       |    |
|  | <p>121</p> | <p>Holger Westing<br/>Managing Director (acting)<br/>Department Head CS<br/>(Central Services)<br/>westing@iese.fhg.de</p>  |    |
|  | <p>251</p> | <p>Dr. Peter Kaiser<br/>Department Head QPE<br/>(Quality and Process Engineering)<br/>kaiser@iese.fhg.de</p>  |  |
|  | <p>211</p> | <p>Dr. habil. Barbara Paech<br/>Department Head QSD<br/>(Quality Software Development)<br/>Department Head SPL<br/>(Software Product Lines)<br/>paech@iese.fhg.de</p> |  |
|  | <p>151</p> | <p>Dr. Dietmar Pfahl<br/>Department Head CET<br/>(Certifiable Education and<br/>Training in Software Engineering)<br/>pfahl@iese.fhg.de</p>                           |  |

|                                       |      |  |   |
|---------------------------------------|------|--|---|
| Dial Phone No. +49 (0) 6301 707- ...  | 101  | Dorothea Kilgore<br>Secretary to Executive Director<br>kilgore@iese.fhg.de   |    |
|                                       | 239  | Sonnhild Namingha<br>Contact Office FC-MD (USA)<br>Student Exchange Programs<br>namingha@iese.fhg.de   |    |
|                                       | 160  | Petra Steffens<br>Head of Marketing, Public Relations<br>steffens@iese.fhg.de  |    |
|                                       | 169  | Petra Kusche<br>Coordinator New IESE Facilities<br>kusche@iese.fhg.de  |  |
| Dial Phone No. +49 (0) 631 205- ...   | 3329 | Kristina Jerkku<br>Contact Office<br>University of Kaiserslautern<br>jerkku@iese.fhg.de  |  |
| Dial Phone No. +49 (0) 631 41690- ... | 10   | Maud Schlich<br>Head of Competence Center for Software<br>Technology and Continuing Education<br>Luxemburger Str. 1+3<br>67657 Kaiserslautern<br>schlich@iese.fhg.de |  |
|                                       | 10   | Manfred Eberle<br>Contact Continuing Education Programs<br>Luxemburger Str. 1+3<br>67657 Kaiserslautern<br>eberle@iese.fhg.de  |  |

Fraunhofer-Institut für  
Experimentelles Software Engineering  
Sauerwiesen 6

67661 Kaiserslautern

If you want to receive further  
information, please send or fax us  
a copy of this page.

Fax +49 (0) 6301 707 200



## Further Information

- Annual Report 2001 of Fraunhofer IESE, print version
- Annual Report 2001 of Fraunhofer IESE, short version on CD-ROM
- Fraunhofer IESE Seminars, Workshops and other Events
- Overview of Fraunhofer IESE
- The Fraunhofer-Gesellschaft from A-Z
- The Research Institutes of the Fraunhofer-Gesellschaft
- Annual Report of the Fraunhofer-Gesellschaft
- STI Software Technology Initiative
- Please add my address to your Annual Report mailing list
- Please add my address to your press distribution list

A pdf-file of the IESE Annual Report 2001 can also be downloaded at

<http://www.iese.fhg.de>

## Point of Contact

Petra Steffens  
Marketing and Public Relations  
Phone +49 (0) 6301 707 166  
Fax +49 (0) 6301 707 200  
E-Mail [info@iese.fhg.de](mailto:info@iese.fhg.de)



## Return Address

\_\_\_\_\_

Title

\_\_\_\_\_

Last Name, First Name

\_\_\_\_\_

Company

\_\_\_\_\_

Position

\_\_\_\_\_

Department

\_\_\_\_\_

Address

\_\_\_\_\_

Zip Code / City

\_\_\_\_\_

Telephone

\_\_\_\_\_

Fax

\_\_\_\_\_

E-Mail

\_\_\_\_\_

Date and Signature