IESE

Fraunhofer Institut
Experimentelles
Software Engineering

Annual Report 1999


Imprint

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Annual Report of the
Fraunhofer Institute for
Experimental
Software Engineering IESE
1999

Fraunhofer Institute for
Experimental Software
Engineering

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Foreword

In early 1996, the Fraunhofer Institute for Experimental Software Engineering (IESE) was founded in Kaiserslautern and funded for five years initially. 1999 marked the fourth year of continuous growth in industrial and public project income. On 26 October 1999, the Fraunhofer Senate voted to make our institute a permanent member of the Fraunhofer Gesellschaft e.V., effective immediately. This "promotion" was based on a very successful external review of IESE's research competencies and business orientation by a panel of highly renowned experts in 1998, almost four years of successful industry collaborations, and the conviction that the market for software engineering expertise will continue to grow in the future. This decision enables IESE to continue to foster its high-quality international personnel, to become a long-term strategic partner for industrial firms, and to play a growing synergetic role with other Fraunhofer institutes as software increasingly permeates all other Fraunhofer business domains.

The institute grew out of the successful Software Transfer Initiative at the University of Kaiserslautern (STTI-KL), which was founded as a "Transfer Group" under the sponsorship of the Ministry of Economic Affairs, Transportation, Agriculture and Viniculture of the State of Rhineland-Palatinate in 1993. Within four years, IESE has established itself as one of the leading international competence centers for applied research, and has established strategic collaborations with major companies within the telecommunication, automotive and aerospace, banking, insurance and trade sectors. Special attention is given to small and medium-size companies within the State of Rhineland-Palatinate.

Experimental Software Engineering employs experiments of different kinds as instruments for effective software technology transfer. Based on the recognition that well-understood and quantitatively manageable software development and maintenance processes need to be customized to a company's specific business goals and characteristics, new and innovative software technologies need to be carefully evaluated before being transferred into practice. After transfer, they need to be continuously tracked and optimized based on feedback from measurement.

Fraunhofer IESE provides the following products to industrial customers:

- contract research in key software engineering areas
- transfer of innovative software engineering technologies (techniques, methods and tools) into business practice (including their customization)
- build-up of industrial improvement programs
- consulting
- education and training

The most sought after areas for innovative software engineering technologies address

- predictable and certifiable software development (focus on requirements engineering, inspection/ reviews, object-oriented design, measurement-based project tracking)
- reuse-oriented software development (focus on re-engineering/ reverse engineering for reuse, documentation for reuse, incremental inspections/ testing, product line development of software variants)
- project planning and management by data and quality assurance (focus on explicit process modeling, measurement and prediction models)
- process and product assessment (focus on CMM/SPICE-style assessments, security & safety assessments of communications software and electronic commerce applications, quality assessments and certifications of software products)

Major highlights in 1999 (besides our promotion to permanent institute) included the continued build-up and maturation of our personnel, including about 20% international scientists, a strong presence at major international conferences (e.g., SEKE '99) and workshops in core competence areas of the institute, the continued growth and renewal rate of industrial projects, the growth and integration of our U.S. sister organization (FC-MD) thru joint projects such as the SEC project, and the extensive use of SWA Software Akademie AG for professionalizing our education and training offerings to industry. The IESE "Competence Center for Software Technology and Continuing Education" located in the Kaiserslautern Industrial Park (PRE Park) has supported the local efforts to establish a sound software and information technology industry in Kaiserslautern and has resulted in numerous collaborations with local firms. Overall, we see a strong infrastructure for software and IT developing in Kaiserslautern.

Further growth of IESE is only limited by its current location. We are, therefore, eagerly awaiting the construction of our new permanent building. The ideal location - close to the university, with additional space for start-up companies - has been selected. We expect to start the planing process in 2000 and move into our new permanent home by 2002 or 2003.

Finally, I want to stress the high commitment and devotion of ALL employees to the vision and mission of IESE. This commitment and devotion was and will continue to be the basis for our success. The true assets of our institute are not our products but our people. We would like to sincerely acknowledge the active support and guidance we have received from Fraunhofer Gesellschaft e.V. in Munich, the University of Kaiserslautern (especially my colleagues in the Computer Science Department), the City of Kaiserslautern, the State of Rhineland-Palatinate, and our Advisory Board (Kuratorium). Special thanks go to the members of our 1998 External Review Committee whose careful evaluation and recommendations provided not only the basis for our promotion to permanent institute, but also provided valuable stimuli for our future development into the next century.
Finally, I want to express my thanks for the privilege of serving as the Executive Director of such a dynamic and motivated group of people.

This report is intended to provide you with an overview of our research and transfer work in 1999. Together with the distinguished members of our Advisory Board we look forward to continued or new successful collaboration with you in the coming years.

Kaiserslautern, January 2000

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

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Fraunhofer
IESE

Vision and Mission

Over the past decades, software has been introduced into almost all high-tech products and services. None of them can function without software anymore. An increasing number of features of these products and services are implemented in software. Consequently, for the majority of industries, for telecommunication, trade, banking, insurance, and other service domains, competitiveness and market success depend more and more directly upon their software engineering competence.

Our global vision for the field of software and information technology is that software competence will become one of the most valuable assets for all high-tech product and service companies. Such competence has to be built up, managed, and continuously optimized according to well-defined business goals. More and more companies will seek external help in order to align their software competencies with their strategic business goals.

Building of the Fraunhofer Institute for Experimental Software Engineering in Kaiserslautern

The IESE vision within that global vision is to be one of the preferred industrial partners for contract research and transfer of innovative technologies in the area of software engineering. We offer collaboration to companies in all major business sectors, of all sizes, and in all regions worldwide. We want to be recognized as the worldlier lead-ing applied research center in the area of experimental software engineering.

The primary IESE mission is to provide unique and value-adding solutions to our industrial customers by establishing software improvement programs, transferring innovative software technologies, performing cooperative research, conducting studies and assessments, and educating and training 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, and advance the state-of-research in software engineering by evaluating promising new technologies experimentally, developing new technologies based on industrial needs, packaging proven new technologies for specific customer needs, and collecting cost/benefit data demonstrating the benefits of new technologies in practice.

Fraunhofer IESE wants to maintain and continuously improve its standing with industrial partners. Therefore, we continuously monitor our customers' needs, investigate new emerging areas of software engineering, develop promising technologies towards industrial strength, and, finally, transfer them into industrial practice. This enables our industrial customers to build up the needed and sought after software engineering competence in a timely fashion.

Events and Initiatives

The year 1999 was marked by many important events and initiatives at Fraunhofer IESE. Events included the establishment of SWA Software Akademie AG - a start-up company supporting IESE in professionalizing its training and continuing education offerings; the organization of major international conferences such as the 11th International Conference on Software Engineering & Knowledge Engineering (SEKE'99) in Kaiserslautern or PROFES'99 in Oulu, Finland; and the active participation in major research and industrial conferences and exhibitions such as CeBIT'99 in Hannover, SQM'99 in Cologne, or CONQUEST'99 in Nuremberg.

SWA Software Akademie AG

In January 1999, the SWA Software Akademie AG was founded. Barbara Wix, an experienced professional in the area of industrial education and training was attracted to lead the company as CEO. The mission of the company is to provide high-quality re-training of unemployed graduates for the software/IT sector, continuing education for company employees, technology training, hot topic seminars and executive training based on actual demand. The collaboration between IESE and SWA AG works as follows: IESE designs training and education programs for industry and provides the needed software engineering materials. SWA organizes the actual performance of the training and education sessions, using either IESE personnel or third-party personnel as lecturers. In this symbiosis, the industrial customers receive top-quality courses, IESE can focus on its core competencies, and SWA has always access to the latest software engineering materials and experienced lecturers. In 1999, two very successful re-training courses for unemployed social science and liberal arts graduates were held (all graduates received permanent job offers!), several industry programs were launched, and a series of high-quality seminars have been conducted. It is expected that SWA Software Akademie AG has a very successful future - adding to the service portfolio of IESE in the business area of education and training as well as to the development of the labor market in the Kaiserslautern region.

SWA opens new job perspectives in the software industry: graduates from the course for "Object-oriented Developers for Financial Services"

Well prepared for a career as technical authors: graduates from the course for "Software Documentation Specialists"

Ready to inform CeBIT visitors: Dirk Muthig and Peter Rösch at the Fraunhofer IESE booth

CeBIT'99

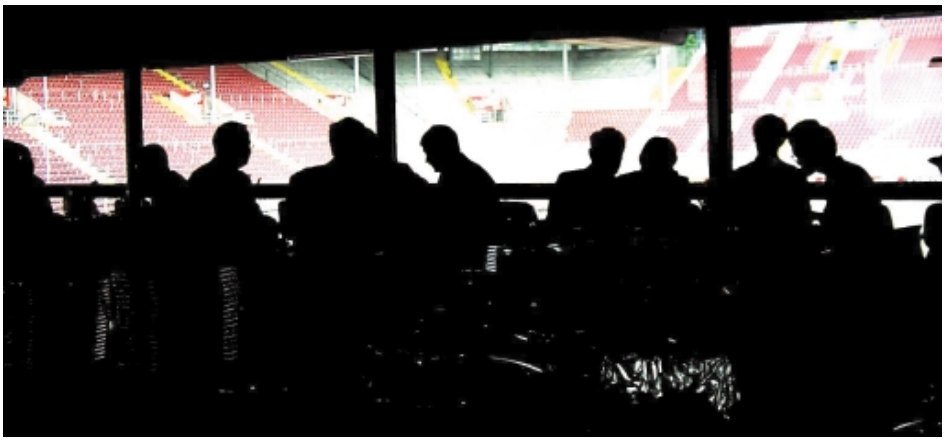
At CeBIT'99, IESE presented its unique range of methods, tools, and services, geared towards optimizing the software development process. The focus was on PuLSE™, COBRA™, SPEARMINT™, and on the offerings in training and education. As an illustration of a fruitful partnership in research and development, the wine information terminal of Markant Südwest Software- und Dienstleistungs GmbH was shown at the IESE booth.

Highlight in e-commerce: The web-based wine terminal of Markant Südwest Software- und Dienstleistungs GmbH, partner of Fraunhofer IESE

SQM'99 Software Quality Management Congress in Cologne: the place where software quality managers come together

SQM'99

SQM is the largest German conference on Software Quality Management with a rapidly growing number of participants. In 1999, 421 persons from industry, research, and consulting attended the conference and exhibition from April 28 to 30 in Cologne. Fraunhofer IESE acted as sponsor and exhibitor (together with STI e.V.) and IESE staff members were part of the program committee and held two conference presentations.



Unusual background for a scientific conference: participants of SEKE'99 inside the stadium of the local soccer team 1. FCK

SEKE'99

The Eleventh International Conference on Software Engineering and Knowledge Engineering (SEKE'99) was held June 17-19 in Kaiserslautern. The purpose of the conference was to bring together experts and practitioners from both industry and academia to share ideas, solutions, and experiences. More than 120 participants from all over the world attended this very successful conference. IESE was very well represented in the variety of activities during the conference (tutorials, panels, paper presentations). Dieter Rombach was the general chair of the conference and Günther Ruhe was the program committee chair of the conference.

International Workshop on Learning Software Organizations

The workshop took place the day before SEKE'99. A total of ten presentations provided an up-to-date and very well received overview on organizational learning issues for about 30 attendees. The workshop was comprised of three sessions, one on Organizational Memories, one on Industrial Experiences of LSO, and one on Process-centered Approaches to LSO. Frank Bomarius organized and chaired the workshop.

Chairman of the SEKE'99 program committee: Dr. Günther Ruhe, Deputy Director of Fraunhofer IESE

PROFES'99

The International Conference on Product Focused Software Process Improvement (PROFES'99) was organized in Oulu, Finland June 22-24, 1999. Prof. Dieter Rombach was the general chair of the conference and Prof. Markku Oivo was the program co-chair. The main theme of PROFES'99 was professional software process improvement motivated by product quality needs. The topics of the conference attracted a lot of industrial participants (62%), which seems to confirm that process and product improvement are very topical issues in industry.

CONQUEST'99

1999 was the third time that the ASQF e.V. (Working Group on Software Quality, a non-profit organization of software professionals) had invited software professionals to the International Conference on Quality Engineering in Software Technology at the Fachhochschule Nuremberg. More than 200 participants listened to lectures in the areas of process models, software process improvement, and metrics. Fraunhofer IESE and STI e.V. participated both as sponsors and as exhibitors at the conference.

Invitation to get in contact with Fraunhofer IESE: booth at CONQUEST'99

Initiatives included the extension of our external network of international research and technology partners. In addition to already existing partners, new collaborations were established with:

More than 200 participants joined CONQUEST '99 in Nuremberg

- Software Productivity Consortium NFP, Herndon, USA, David Card; collaboration research program for advancing the state of the art and practice of object-oriented measurement
- BOOTSTRAP Institute, Oulunsalo, Finland, Peter Bölter; cooperation in the area of software process assessment and improvement
- Carleton University, Department of Systems and Computer Engineering/ Ottawa, Canada, Prof. Lionel Briand; scientific collaboration in the field of software quality and cost engineering
- National Research Council of Canada, Institute for Information Technology, Ottawa, Canada, Dr. Khaled El Emam; scientific collaboration in the field of software inspection, measurement, evaluation of object-oriented technologies and experimentation

SEC Project

Finally, the growing cooperation with our sister organization FC-MD in the USA resulted in the official signing of the SEC project - a consortium consisting of internationally operating companies such as ABB, DaimlerChrysler, Motorola, and Nokia.

The objective of this consortium is the exchange of experiences regarding process improvement and competence building in the software business of these companies. Through periodic workshops, bilateral collaborations between companies and IESE/FC-MD, and build-up of expert networks, these companies expect a significant speed-up of their company-specific improvement activities - without compromising their product-related confidentiality requirements.

IESE/FC-MD organize the consortium, moderate the workshops, and provide software engineering know-how. Through the involvement of IESE and FC-MD, we can support these internationally operating companies globally, but react to culturally different needs locally.

Business Areas

Fraunhofer IESE's mission is to promote experimental software engineering - the best approach for introducing engineering style rigor into business practice. This approach provides customers with measurable facts about their development practices and enables informed decision making. Measurable facts, analysis, and continuous feedback of findings are the engine for goal-oriented continuous improvement and risk-controlled innovation.

We have structured our offers into three clusters comprised of eight business areas:

Software Development

Predictable and Certifiable Software Development:
We help you select, tailor, and continuously improve the software development practices best suited to your organization's needs.

Contact: Dr. Barbara Paech
Phone: +49 (0) 63 01 / 7 07 - 211
Email: paech@iese.fhg.de

Comprehensive Software Reuse:
Our experts in re-engineering and product line development show you the most economical way of carrying your legacy systems into the future and help you evolve existing systems into product lines.

Contact: Dr. Peter Knauber
Phone: +49 (0) 63 01 / 7 07 - 251
Email: knauber@iese.fhg.de

Software Competence Management

Software Process and Product Assessment:
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 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: Dr. Rini van Solingen
Phone: +49 (0) 63 01 / 7 07 - 251
Email: solingen@iese.fhg.de

Accelerated Corporate-wide Learning:
We help you to continuously identify and capture valuable information from processes, products, and people, to assess, manage, and maintain knowledge, and to supply it to your entire organization. When your market demands a technological quantum leap, we help you assess associated risks, evaluate alternatives, and make a smooth transition.

Contact: Dr. Frank Bomarius
Phone: +49 (0) 63 01 / 7 07 - 121
Email: bomarius@iese.fhg.de

Education & Training for Software Professionals:
We help you respond to the demands of technological and organizational evolution. Training and education programs are built to support essential core competencies and products of the institute. A system of modules is offered allowing to tailor these programs to intended job profiles as well as to existing backgrounds.

Contact: Dr. Günther Ruhe
Phone: +49 (0) 63 01 / 7 07 - 151
Email: ruhe@iese.fhg.de

Software Project Management

Project Management by Data:
We help you implement lean practices for planning, tracking, and predicting cost and quality, integrating goal-oriented measurement, assessment, and benchmarking.

Contact: Dr. Rini van Solingen
Phone: +49 (0) 63 01 / 7 07 - 251
Email: solingen@iese.fhg.de

Offerings

Our services enable customers to continuously improve their ability to develop software in a predictable manner. In addition, we provide guidance in purchasing and applying software, ensuring that usage needs are met.

To developers of software, we offer:

- the evaluation of software development practices
- the construction of customized quality improvement systems
- the introduction and optimization of engineering-based, state-of-the-art software development processes and techniques
- support towards development of certifiable software
- preparation for auditing or certification
- continuing training and education for software engineering professionals
- re-education of unemployed scientists and engineers from other domains for a new career in software development

To users of software, we offer:

- help in purchasing commercial off-the-shelf software
- independent support for selecting and evaluating subcontractors
- independent support for monitoring software development contracts

To small and medium-size enterprises (SMEs), we offer:

- individual assistance and products tailored specifically to SME needs

Collaborations

The IESE conducts collaborations with technology providers, technology-transfer customers, and strategic partners. The overall goal is to identify and further develop software engineering technology, and to transfer it into industrial practice in order to increase our customers' competence.

International Research

In the are of international cooperation in applied software engineering research, the International Software Engineering Research Network (ISERN) with about 20 members from research and industry plays a prominent role. ISERN is a forum for applied software engineering research with members from Europe, America, Asia, and Australia. It maintains high-level contacts to leading international companies in the embedded systems domain such as AT&T, Motorola, Nokia, Ericsson, NTT, Matsushita, Hitachi, and DaimlerChrysler.

Publicly-funded Collaborations

Collaborations exist with many publicly-funded consortia aimed at either software engineering technology advancement or dissemination of best practices. Publicly-funded projects can be devoted to research and development as well as technology transfer. Often, additional bilateral industrially-funded collaborations result from performing 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 54 industrial collaborations with 49 companies in 1998 were extended to 85 industrial collaborations with 60 companies in 1999, not including further industrial collaborations in the context of publicly-funded projects.

The cooperation partners of the Fraunhofer IESE range from very large global players to very small 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 but are usually under very tight budget and schedule constraints.

- Small companies that need ready-to-use, evaluated technologies that yield short-term return on investment.

In addition to bilateral collaborations, IESE and FC-MD have jointly started a multinational consortium of international companies - the Software Experience Center (SEC). In the 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 scene as well as other application domains.

Fraunhofer Virtual Institute for Experimental Software Engineering (FVIESE)

Prof. Dr. Basili
Prof. Dr. Rombach

Fraunhofer Institute for Experimental Software Engineering (IESE) Kaiserslautern

Prof. Dr. Rombach
Dr. Ruhe

Dept. 1 Central Services (CS) Würtz	Dept. 2 Quality Software Development (QSD) Dr. Paech	Dept. 3 Software Product Lines (SPL) Dr. Knauber	Dept. 4 Quality and Process Engineering (QPE) Dr. van Solingen	Dept. 5 Systematic Learning and Improvement (SLI) Dr. Bomarius	Dept. 6 Continuing Education and Training (CET) Dr. Ruhe
Administrative Services Halle (in 1999) Henzmann	Requirements Engineering Dr. Paech	Systematic Scoping and Modeling Dr. Knauber	Cost and Quality Engineering Wieczorek	Experience Factory Technology Dr. Althoff	SE Education and Training Dr. Ruhe
Library and Publication Services Göpfert	Software Design Prof. Dr. Atkinson	Software Architectures Dr. Gacek	Process Engineering and Improvement Dr. Dellen	Management of Improvement and Learning Dr. Müller	Company-Specific Education and Training Dr. Ruhe
Technical Services Huber	Inspections and Testing N.N.	Software Reengineering Girard	Quality and Process Support Environments Dr. Rösch (in 1999)	Information Technology Security Dr. Schwarz	Training, Education, and Consulting Center Dr. Hörmann
Programming Services Dr. Rösch (in 1999)	External Relations Services (ER) Prof. Dr. Rombach				
	Marketing/ Public Relations Müller-Klink Steffens	Education and Training Center Eberle	Consulting Center for SMEs Dr. Hörmann	Software Experience Center Projects Dr. Bomarius	Contact Office FC-MD (USA); Student Exchange Programs Namingha	Contact Office University of Kaiserslautern Jerkku

Fraunhofer Center for Experimental Software Engineering, Maryland (FC-MD) College Park, Maryland, USA

Prof. Dr. Basili
Prof. Dr. Zelkowitz

Administration	Technology Development Prof. Dr. Zelkowitz	Applied Research Prof. Dr. Basili	Maryland Consortium Lear	SEC Projects Pajerski	Contact Office IESE (Germany) Wall
Wall					

Organigram as of 12/31/1999

The International Institute

The International Institute for Experimental Software Engineering consists 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, MD, USA. They are both legally independent units under Fraunhofer Gesellschaft e.V. and Fraunhofer USA, Inc., respectively. Together they form the so-called Fraunhofer Virtual Institute for Experimental Software Engineering (FVIESE), coordinated by Prof.'s Basili and Rombach. On the previous page you find the joint organigram indicating major areas of joint emphasis. Both units have contact offices coordinating the daily contacts and exchanges across the Atlantic, project groups cooperating on the SEC project - a consortium project on process improvement with several firms from both sides of the Atlantic -, project groups focusing on local consulting business, and research and technology development departments/ groups. The details of IESE and FC-MD are described in separate sections of this report.

The Fraunhofer IESE

In fall of 1998, Fraunhofer IESE was reorganized reflecting the institute's growth as well as its increased customer focus. The five technical departments are responsible for customer projects and further development of our product portfolio. The Central Services department includes all administrative and support functions for the entire institute. Mission, vision, business areas, products, core competencies and organisation of IESE will continuously be improved according to Fraunhofer strategy process.

Problem-oriented Research and Transfer Departments

Five technical departments comprise the institute's products and competencies in software engineering:

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, and testing and inspections.

Software Product Lines
extends the systematic development of quality software development to the area of families of software systems, i.e., provides methods and tools that allow to analyze (wrt functionality as well as economy of scope), design, and implement a set of variants of software for a given application domain.

Quality and Process Engineering
provides the methods to instrument development processes in such a way that relevant attributes (cost, quality) can be measured and modeled so as to create means for managers and developers to understand, monitor, control, improve, and finally predict their software development processes.

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

Continuing Education and Training
offers education and training for software professionals. The goal is to support life-long learning and further education close to the job for practitioners, and to re-educate unemployed scientists and engineers coming from other domains for a new career in the software business. The department runs also the Competence Center for Software Technology and Training (KSTW) at the PRE-Park in Kaiserslautern.

Advisory Board

Research

Prof. Dr. Victor Basili
Institute for Advanced Computer Science
Department of Computer Science
University of Maryland
USA
Also: Executive Director, Fraunhofer Center - Maryland (FC-MD)

Prof. Dr. Manfred Broy
Institute for Computer Science
Technical University of Munich

Prof. Dr. Jürgen Nehmer
Vice-Chairman of the Advisory Board
Department of Computer Science
University of Kaiserslautern
Also: Member of the German Science Council (Deutscher Wissenschaftsrat)

Prof. Dr. Günter Warnecke
President, University of Kaiserslautern

Industry

Prof. Dr. Ernst Denert
Chairman of the Advisory Board
Speaker of the Management
sd&m GmbH & Co.KG
software design & management AG
also: Vice-President of GI - German Computer Society

Dietmar Freigang
Director, Information Systems
Allianz-Lebensversicherung AG

Günther Plapp
Technical Director
Robert Bosch GmbH
K1

Monika Gonauser
Department Head
Siemens AG
ZFE ST ACS

Wolfgang Jung
Head of Development Center
T-Nova Deutsche Telekom Innovations-gesellschaft mbH
Entwicklungszentrum Süd-West

Franz Mayer
Chairman of the Board of Directors
Markant-Südwest AG

Dr. Michael Strugala
Vice President Development Private Networks
Bosch Telecom GmbH
Dept. UC-PN/EL

Government

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

Dr. Ulrich Müller
Director, Department of Research, Technology, and Media
Ministry of Economic Affairs, Transportation, Agriculture and Viniculture of the State of Rhineland-Palatinate

Dr. Bernd Reuse
Director, Division on Promotion of Information Processing
Federal Ministry of Education, Research, Science and Technology (BMBF)

Budget

Business		
Income	**kDM**	**%**
Industrially-funded projects	5.189	47,1
Publicly-funded projects	1.482	13,5
Other Income	38	0,3
Base Funding (State of Rhineland-Palatinate)	3.499	31,8
Fraunhofer Funds (PROFIL, OEF, SEF)	800	7,3
Sum	**11.008**	**100,0**

Expenses	**kDM**	**%**
Personnel	7.909	71,8
Miscellaneous	3.099	28,2
Sum	**11.008**	**100,0**

Investments		
Income	**kDM**	**%**
Publicly-funded projects	455	33,9
Public Grant (State of Rhineland-Palatinate)	887	66,1
Sum	**1.342**	**100,0**

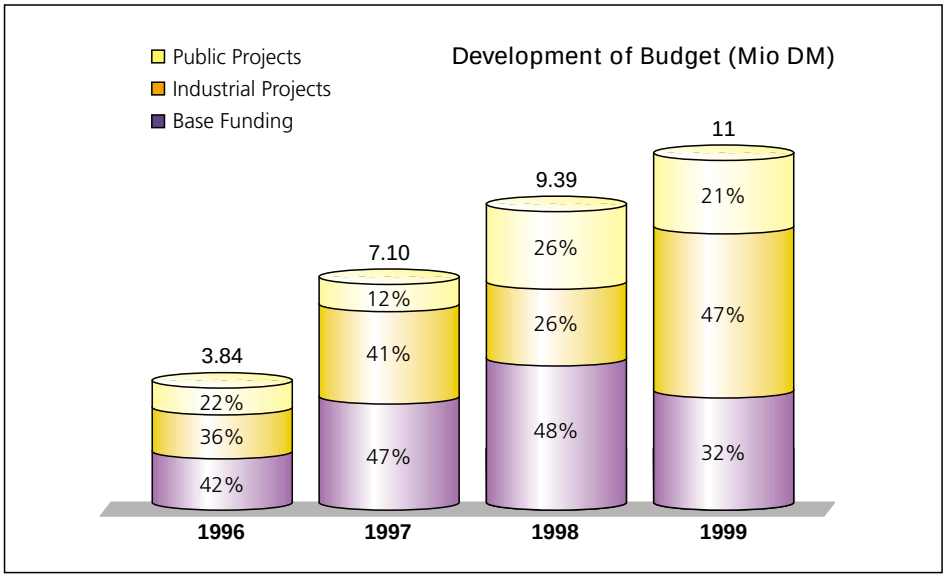
Expenses	**kDM**	**%**
	1.342	**100,0**

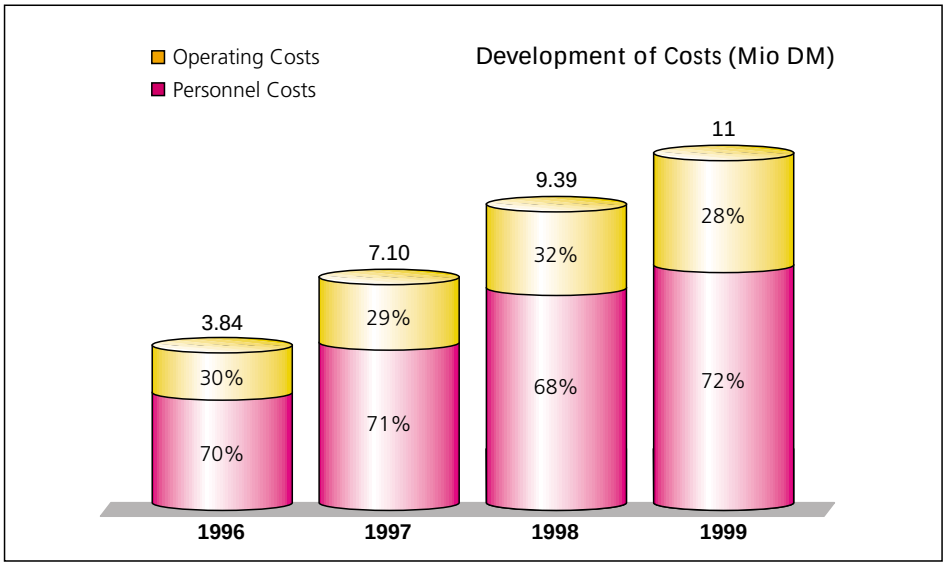
Personnel

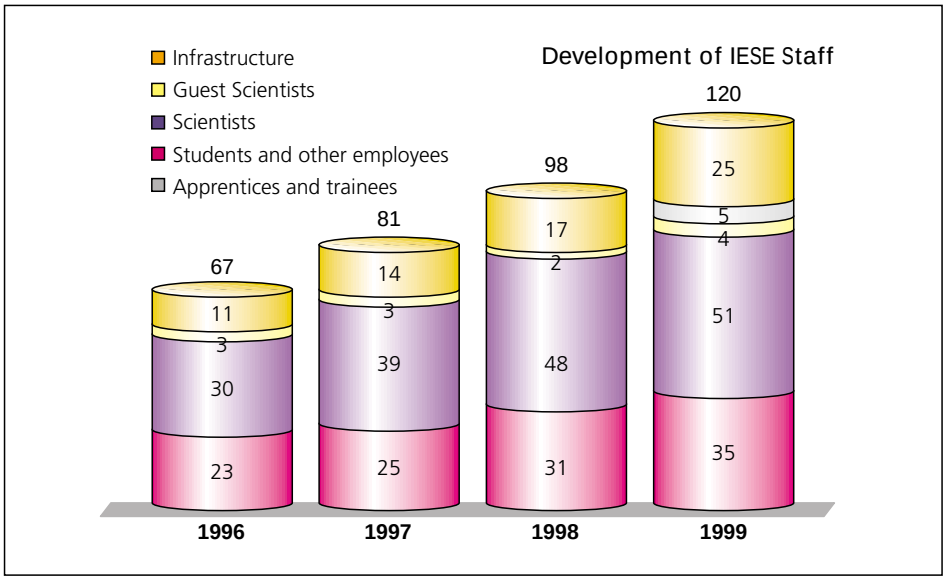
The growth of Fraunhofer IESE in terms of staff was continued throughout 1999. By the end of 1999, the IESE employed 76 full-time employees, 4 guest scientists, 35 students, and 5 apprentices and trainees. Since at any point in time, approximately 20% staff comes from abroad, the institute maintains a unique international flavor. The plan is to grow to about 120 full-time employees by the end of the year 2000.

Personnel	as of 12/31/99
	Number
Scientists	51
Infrastructure	25
Apprentices and trainees	5
Guest Scientists	4
Students and other employees	35
Sum	**120**

Development

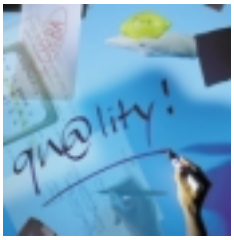


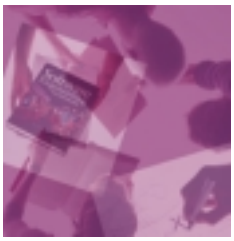




Competence Areas and Projects

Overview






JAVA
C++
CORBA
quality:

Quality Software Development

Quality is a critical property of a software system. The perceived quality of a system depends on the precise nature of the application domain. In the case of safety critical systems, for example, reliability and robustness are crucial aspects of quality, while in the case of a desktop development tool, responsiveness and extensibility are more likely to be of concern. The Quality Software Development (QSD) department develops and validates methods and tools for the cost-effective construction of quality software systems.

A common misconception is that quality can be "tested into" a software system after the bulk of the development work has been completed. In practice, however, defects detected late in the development life-cycle require a significant redevelopment effort. Only through continuous and systematic application of appropriate engineering and design techniques at all stages in the development cycle can quality goals be attained cost-effectively.

The QSD department provides a portfolio of synergistic software engineering techniques that individually, or together, can help significantly improve quality software development in a cost-effective way. One unifying focus of the department is object technology, including the Unified Modeling Language, scenarios, use cases, design rationale, patterns, components, and object-oriented inspections.

The department is organized around the following groups:

Requirements Engineering

A requirements specification is the starting point for any large-scale software development project. Without a good specification it is extremely difficult, if not impossible, to develop quality software. Precise functional and nonfunctional requirements agreed on by all stakeholders must be captured and tracked during software development. This can only be achieved in an incremental process with early quality assurance and feedback treating requirements as the outstanding source of knowledge on system goals and usage.

The group is developing RE-KIT, a portfolio of methods for capturing, validating and managing customer and software requirements with emphasis on participatory design, modeling, knowledge management and their integration into incremental software development. RE-KIT is tailored to specific application domains like information or embedded systems, and evaluated in experiments. Examples include RE-KIT-MAMBO, a method for surfacing ambiguities in requirements documents and RE-KIT-MUC, a method for developing and managing use cases.

Software Design

The process of software design translates the requirements into an executable form that effectively meets the needs and quality goals of the customer. The software design group focuses on the use of key implementation technologies for creating designs that represent the optimal balance between the system requirements (including quality goals) and the constraints of the available or chosen implementation technologies.

Key technologies supported and investigated by the group include object-oriented languages (particularly Java and C++), patterns, including architectural patterns and design patterns, and component technology (esp. CORBA, COM, and JavaBeans).

One major emphasis of the group is on the synergistic interaction of these techniques to support the seamless mapping of requirements into implementation features. To this end, the group is leading the development of the KobrA method, which aims to support systematic object-oriented development using the principles of the Cleanroom approach, and the SORT technique, which enforces clean separation of refinement and translation activities through the provision of refinement and translation patterns.

Inspections and Testing

As a human intensive activity, software development is inherently error prone. To attain adequate quality, therefore, techniques are needed to identify and remove defects in software systems. This group focuses on two complementary defect reduction techniques: inspection and testing, which have been shown experimentally to complement each other. Inspections involve the static examination of software artifacts, 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 much damage. They are consequently applicable in all stages of development, including requirements analysis and design. The group focuses on one particularly powerful form of inspections, perspective-based inspection, based on the concepts of perspective-based reading.

The power of testing is that it is not only capable of uncovering defects in executable software artifacts, but it is also effective in demonstrating that the artifacts have reached a certain required level of quality. Particular foci of the group with respect to testing include the testing of object-oriented artifacts.

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Evaluation of Software Requirements Documents at DaimlerChrysler

The precise description of requirements is one of the key factors for successful software development. This is particularly true in an outsourcing context where procurer and supplier need to gain a common understanding of the system to be built.
As a response to this situation, DaimlerChrysler requirements documents that are part of a contract are subject to a thorough review by project independent verification and validation. Severe time constraints for this review induce the need for the optimization of documents and process.

Objective

The purpose of the study requested by DaimlerChrysler was to get external advice on short-term improvements of a given requirements document, on long-term improvements of similar requirements documents, and on improving the review process itself.

Approach

The Fraunhofer Requirements Assessment and Improvement Method RE-KIT-FRAIME was tailored to the specific context, taking into account that no interaction with the authors of the requirements documents was possible. That meant that quality goals for the documents were derived based on general experiences with procurement situations.

Following the GQM approach, these goals were broken down into specific measurements, and suitable evaluation techniques were determined. These included check lists, traceability analysis, and modeling. The chosen techniques, in particular, reflected the time constraints. The documents were carefully inspected according to the techniques. The results were documented in a detailed report.

Results

Short-term improvements focus on the readability of the documents and the support for acceptance test. Long term improvements involve the company-wide requirements specification standard and its tailoring to specific project contexts and requirements types.

The experiences with the GQM-based derivation of quality goals and evaluation techniques show that it reflects the time constraints on the process particularly well. The improvement suggestions are the basis for further actions at DaimlerChrysler.

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The Characterization of Technical Reviews at Lucent/PRC-ON

Technical reviews (or inspections) provide a proven approach for the detection and correction of defects in artifacts as soon as these artifacts are created. They not only help improve artifact quality but also help development organizations reduce the cost of producing them. This stems from the fact that reviews allow the identification of defects at a stage where they are easier and relatively inexpensive to correct, thereby enabling the development project to avoid additional rework penalties associated with defect detection at later test and integration stages.

Objectives

At Lucent's Product Realization Center for Optical Networking (Lucent/PRC-ON) in Nürnberg, Germany, reviews are an essential element of the standard development process. Today, reviews at Lucent/PRC-ON usually consume between 12% and 18% of the system and software development effort. These costs include quality assurance (i.e., milestone) reviews as well as technical reviews of documents, software sources, and other artifacts of the development process. This investment provides the motivation for constantly monitoring and improving the existing review implementation. For this, a collaboration between Lucent/PRC-ON and Fraunhofer IESE was initiated to characterize the existing review approach and to identify areas where changes in the review procedure are likely to result in an improvement.

Approach

The activities of this collaboration included the participation of Fraunhofer IESE in review meetings, the interview of review participants, and the analysis of collected review data. The participation in review meetings allowed the examination and characterization of the review process as currently performed at Lucent/PRC-ON. Notes were taken on the best practices exhibited in those meetings to make them accessible to a broader audience. The interviews examined the work practices of engineers engaged in technical reviews and helped elicit their experiences. To ensure comparability of the answers, a standardized questionnaire was developed and used to conduct the interviews. Finally, the review data analysis effort provided some insights into the effectiveness of the review approach. Moreover, it allowed the identification of factors that determine review success.

Results

Together, the results of the various activities provided an accurate portrait of the technical review activities at Lucent/PRC-ON. This built a solid foundation for recommendations and suggestions on how to improve the review approach to increase its cost-effectiveness. In addition, the review data analysis effort resulted in planning aids for managers to estimate future review expenditures and in a procedure for quality assurance representatives to perform an in-process evaluation of reviews. The next steps of this project consist of implementing the improvement suggestions and monitoring their impact on the cost-effectiveness of reviews.

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Component Based Application Development - KobrA

(Komponentenbasierte Anwendungsentwicklung)

Component technologies are forecast to have a dramatic impact on the amount of reuse occurring in software development and maintenance. The Gartner Group, for example, estimate that "... by 2003, 70% of new applications will be deployed as a combination of pre-assembled and newly created components integrated to form complex business-systems". Expected benefits of this new approach to software development include reduced time-to-market, reduced development and maintenance costs, and improved quality. However, industrial adoption of the component paradigm is failing to materialize as fast as expected due to the lack of systematic, prescriptive methods for developing, applying and reusing components.

The KobrA project is tackling this problem by developing a method and supporting workbench for component-based software development and maintenance. With an optimal balance of industry partners (Softlab and PSIPENTA) and research institutes (IESE and GMD-FIRST), the BMBF-funded project is focused on providing an innovative, but practical, solution for component-based software engineering. Several key characteristics distinguish the KobrA approach.

First, the approach is "technology independent" in the sense that it can be used with all three major component implementation technologies (CORBA, JavaBeans and COM). This has been achieved by capturing the essential architecture and behavior of a community of components in terms of UML models rather than code in a particular component technology. Figure 1 shows, in general terms, how a component is documented by a suite of UML diagrams.

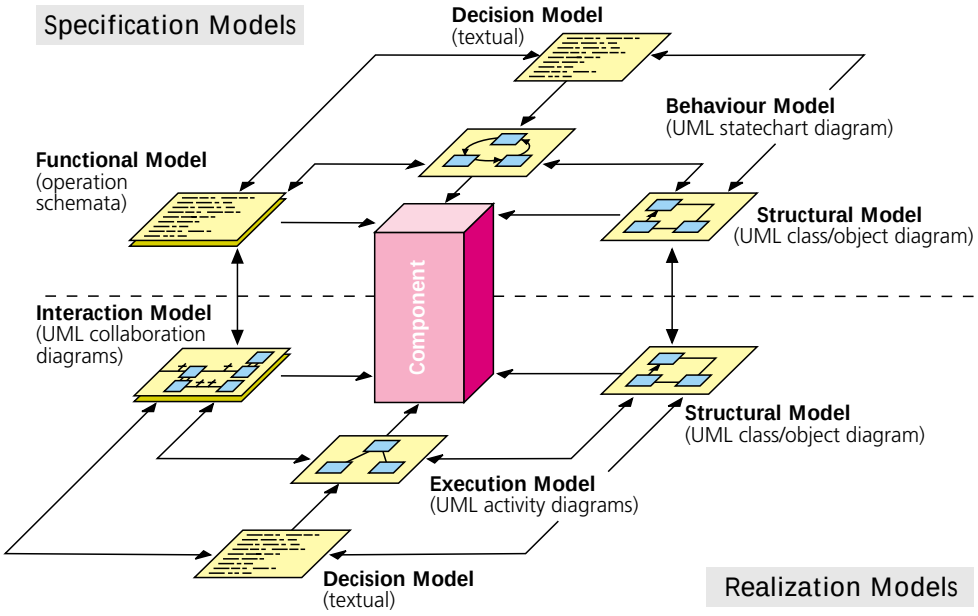

Figure 1: UML-based Component Documentation

The use of the UML has the additional benefit that it enables the supporting KobrA workbench (Figure 2) to be independent of specific CASE tools. By storing and manipulating a vendor-independent representation of the UML models (based on the universal Internet data representation standard XML) the workbench repository is able to interact with any of the leading UML-based CASE tools.

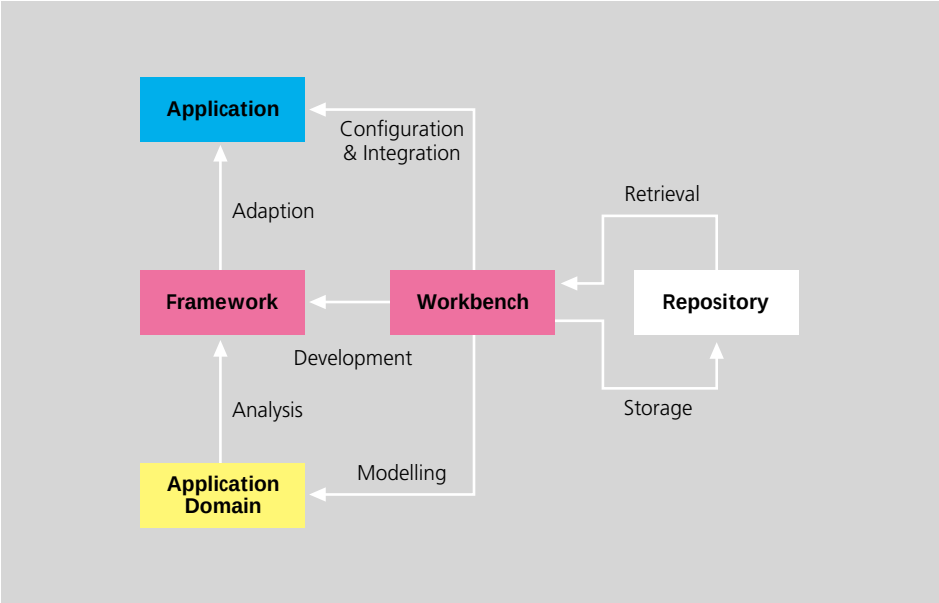

Figure 2:
The KobrA Workbench

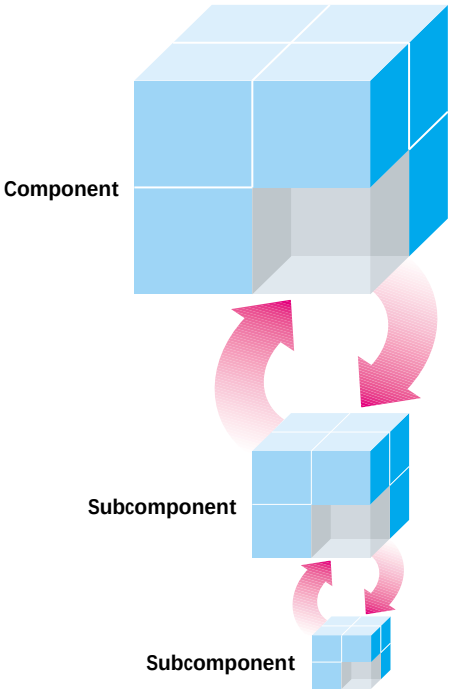

Figure 3: Recursive Development Process

Second, the KobrA method is truly architecture-centric and product driven. In the context of a component-based system, where the architecture is dominated by the composition hierarchy, this means that the development process is oriented towards the elaboration of trees of nested components. From a top-down perspective this gives rise to a method that is recursive (i.e., hierarchical), as illustrated in Figure 3. However, the method is not exclusively top-town. On the contrary, at any stage in the development process, pre-existing components can be inserted into the component tree (see Figure 4), providing a balancing bottom-up style of development.

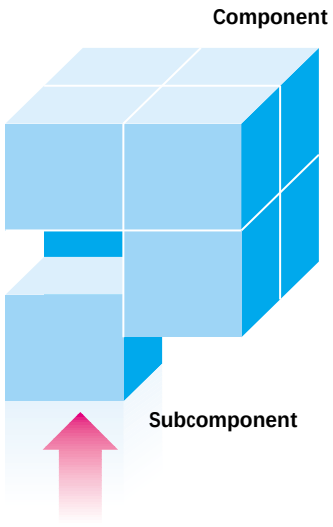

Figure 4:
Bottom up Insertion
of Pre-existing Components

Third, the KobrA approach has built-in support for product lines. As shown in Figure 1 (see page 30), included among the documentation suite for a component are decision models. These are textual models that control the instantiation of a generic component according to the possible resolutions of the variability that exists in a family of related systems. A particular variant is thus identified by a concrete resolution of the decisions at a particular level of abstraction. When the decision models are combined in a hierarchic manner with the component tree, the result is a generic framework.

Finally, KobrA places a major emphasis on quality assurance. In a tree-based product model such as that adopted in KobrA, errors near the top of the tree can have a major impact on the lower parts of the tree. Therefore, it is important to gain as much confidence as possible that the components near the top of the tree are correct before proceeding to those lower down. In KobrA this is achieved through integrated quality modeling and inspection activities.

The KobrA project has provided a unique opportunity for IESE to synthesize several of its major development competencies. In particular, the UML modeling strategy and hierarchical component architecture have been influenced by the SOUND approach, the product line aspects are based on the PuLSE technology, the requirements engineering activities have been influenced by RE-KIT, the implementation activities are based on the SORT approach, and the quality modeling and inspection activities have been evolved from the COBRA and PBR approaches, respectively. The KobrA method itself has been systematically developed and documented using the SPEARMINT™ and EPG approach.

The benefit to IESE customers is an integrated method providing seamless access to several core IESE competencies. When combined with the KobrA workbench, the result is a highly systematic, product-line-oriented approach for the development and maintenance of quality, component-based systems.

1999 marked the end of the first of three phases of the project scheduled to last for three years in total. The main result of this phase was the consolidation and publication of the KobrA Method Handbook. Planned activities for the second phase include dissemination, refinement and elaboration of the KobrA workbench, and generation of a case study.

Partners

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Software Product Lines

The Software Product Lines (SPL) department provides products and services to guide organizations away from one-at-a-time system development to systematic development with large-scale reuse using product lines. One-at-a-time development leads to unnecessary duplication of effort and risky ad hoc reuse when an organization produces numerous related systems.

A product line is a collection of software systems in a business area sharing common functionality. Product line engineering focuses on leveraging these commonalities by building a reuse infrastructure that is used to efficiently and systematically develop members of the product line.

An additional technology area of significant importance to product line engineering is reengineering. In most cases, when an organization converts to product lines they have existing systems with valuable knowledge and reusable assets embedded within them.

Through product line engineering, organizations can reduce their development effort, shorten the time to market for new products, facilitate the maintenance and evolution of products, as well as support the planning and management of product development and maintenance. Additionally, the quality of products can be improved through the reuse of proven high quality assets. These benefits help organizations keep a competitive edge in their markets.

The SPL department consists of three groups:

The Systematic Scoping and Modeling (SSM) and the Software Architecture (ARC) groups focus on the definition and construction of software product lines.

The Software Reengineering group (REE) focuses on support technology for product line engineering in the area of reengineering the knowledge embedded in existing systems.

Systematic Scoping and Modeling

The Systematic Scoping and Modeling group (SSM) focuses on the development of methods for determining the appropriate scope for a product line and for creating, instantiating, and evolving product line models.

The scope of a product line determines which products and which characteristics of the products are to be included in the product line and therefore in the reuse infrastructure built for the product line.

The SSM group focuses on economic scoping processes to overcome weaknesses of existing scoping techniques, which focus mostly on the technical boundaries of a domain. Economic scoping relates the business objectives of an enterprise to the products and their characteristics.

A product line model captures the requirements for all products and characteristics in the product line scope. Modelled are both common and variable requirements. Common requirements are shared by all members of the product line, while variable requirements denote the differences among product line members.

Systematic Scoping and Modeling


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Department Head


Dirk Muthig


Klaus Schmid


Tanya Widen

Our experience has shown that existing domain analysis methods are not sufficiently adaptable to the situations in which they are used. Therefore, the SSM group aims to provide systematic support for customizing the domain modeling process and models. Our solutions cover the complete life-cycle of the product line model, which includes creation, instantiation, and evolution.

Software Architectures

The Software Architectures group (ARC) focuses on the development of methods for creating, evaluating, and instantiating reference software architectures.

A reference software architecture represents a generic architecture for all products in a product line and is engineered around the products' commonalities and variabilities. In contrast to a single-system architecture, a reference architecture includes not only common but also variable parts. Reference architectures are the key to successful software product lines: they define the essential parts of the reuse infrastructure and thus ensure that reused common components and instance-specific components fit together for all members of the product line.

Because of their genericity, the creation and validation of reference architectures is inherently more complex than that of single-system architectures. The complexity is further intensified by the need to be able to derive instance-specific architectures from a generic one in order to actually build individual applications. The ARC group provides customers with state-of-the-art engineering methods to cope with this complexity and thus to build the groundwork for successful product lines.

Software Reengineering

The Software Reengineering group (REE) focuses on supporting product line concepts through exploiting the experience embodied in existing systems. For this purpose, the group is developing technologies to recover architectural and domain-specific information about existing systems.

When these technologies are applied to multiple systems from the same domain, they enable the identification of the similarities and variations among these systems - a key aspect of product line modeling.

In addition, architectural and domain-specific information can be combined with other reengineering technologies to extract valuable assets that can be reused in the development of new variants within the same product line - resulting in significant cost reductions.

In the more traditional field of reengineering, architectural and domain-specific information can provide a better visibility and control over a successful single system, suffering from a growth in maintenance and evolution costs.

Recovering a complete architectural and domain view of a system is not economically realistic. We use the business-driven evolution goals provided by the customer to select what information is actually needed. This leads to cost-effective results for our customers.

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PuLSE- Product Line Software Engineering

The PuLSE approach for product line engineering enables organizations to achieve systematic development with large scale reuse.

A product line is a collection of software systems in a business area sharing common functionality. Product line engineering focuses on leveraging these commonalities by building a reuse infrastructure that is used to efficiently and systematically develop members of the product line.

Product line engineering provides many benefits over one-at-a-time system development including reduced development effort, shorter time-to-market, reduced maintenance effort, as well as better planning and management for product development and maintenance. Additionally, the quality of products can be improved through the reuse of proven high quality assets.

The PuLSE™ method can be characterized as follows:

- PuLSE™ provides a complete framework that covers the whole software product line development life cycle, including infrastructure construction, usage, and evolution.
- PuLSE™ is modular and customizable: It consists of a number of technical components (see below) that can be selected and instantiated in order to satisfy the needs of specific enterprises best.
- PuLSE™ is business oriented. The scope of the product line is centered around business needs, not just the technical or academic boundaries of the domain.

PuLSE™ contains six technical components that provide the technical know-how needed to operationalize the product line development. These are applied throughout the stages of the product line life cycle. The technical components are the following:

- PuLSE-BC is used to baseline the enterprise and customize PuLSE™ accordingly.
- PuLSE-Eco aims at identifying, describing, and bounding a product line by determining its members and their characteristics.
- PuLSE-CDA is used to elicit the requirements for the domain through creation of a product line model.
- PuLSE-DSSA is concerned with the development of a domain-specific architecture.
- PuLSE-I aims at specifying, constructing, and validating single members of the product line.
- PuLSE-EM guides and supports the application of PuLSE™ throughout the product line life cycle.

The technical components are modular and can be applied independently, or together as the complete PuLSE process. Additionally, because of the components' modularity, PuLSE™ can be applied incrementally, component by component, which enables organizations to evaluate produce line engineering without full commitment to adopt it.

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Project Engineering Software Architectures, Processes and Platforms for System Families (ESAPS)

Software system families are strategic business assets. The structuring of systems into system families allows the sharing of development effort within the system family and as such counters the impact of ever-growing system complexity. By building on the combination of experience of the consortium partners, the ESAPS project is in the unique position to make a leap forward in system family technology and practice.

Objective

ESAPS is a European research project, which aims to provide an enhanced system family approach by combining the most promising technologies of the partner companies in the following areas: analysis, definition, and evolution of system families. The project started in June 1999, and will run for two years.

Approach

IESE's goals in ESAPS are to evolve parts of the existing PuLSE™ (Product Line Software Engineering) technology. The main focus is on PuLSE-Eco and PuLSE-DSSA, the technical components for dealing with product line scoping and product line architecting, respectively.

PuLSE-Eco is being evolved to include more GQM (Goal/Question/Metric) aspects improving its information elicitation process, as well as a more sound foundation for its evaluation functions.

PuLSE-DSSA will provide means for analyzing proposed software architectures for potential mismatches, as well as a sound notation for representing reference architectures.

The technology evolved here will be validated with industrial partners, incorporated in the existing PuLSE method, and disseminated accordingly.

Results

The ESAPS results will be five-fold:

1. Enhanced system family engineering processes covering the complete product line life cycle
2. Enhanced system-family engineering techniques and tools
3. Enhanced component-based domain-specific platforms for system families
4. Requirements for engineering tool suppliers to adapt their tools to comply with system family engineering needs (resulting from 1 and 2)
5. Requirements for generic and domain-specific middleware suppliers (resulting from 3)

There will be individual deliverables by partner, as well as three books describing a combined consortium method.

Partners

ESAPS is a large European research project carrying the ITEA label (Eureka Σ 2023 Program, ITEA project 99005). It involves 21 partners, including several universities, some research institutes, a couple of small and medium enterprises, and several large companies. It provides an excellent and unique opportunity for collaboration with other researchers and practitioners in the area.

Some of the non-German partners involved are: Philips, Nokia NRC, Thomson-CSF, the European Software Institute (ESI), INRIA, and the University of Karlskrona/Ronneby. The German consortium consists of Siemens, Bosch, University of Essen, Market Maker, and Fraunhofer IESE. In Germany, the partners are partially funded by the Ministry of Education and Research (BMBF).

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RE-PLACE - Reengineering-Enabled Product Line Architecture Creation and Evolution

Successful software products are often adapted for purposes that become increasingly different from the products' original purposes. Managing the maintenance and evolution of multiple system variants can quickly become a resource-intensive and error-prone task.

The IESE solution is to replace the affected software system by a product line that helps manage various products based on a common core. However, creating the product line from scratch is often not an option because of the investments embodied in the existing systems. In particular, many systems contain expert knowledge or knowledge about business processes that would be lost if such a system was replaced completely.

The RE-PLACE approach allows organizations to transition an existing system to a product line. The investments that were made to build the system are leveraged by reusing key components of the current system in the product line.

Approach

To achieve this goal, RE-PLACE integrates product line engineering and reengineering activities. The RE-PLACE framework in the figure below illustrates the basic concepts of the approach. The activities on both sides are coordinated using a blackboard, a shared workspace, in which common work products are evolved. This enables the exploitation of synergy effects.

Benefits

On top of the benefits associated with the improved maintenance and evolution support of the resulting product line, there are additional benefits of using the RE-PLACE approach as opposed to a complete redevelopment. The effort for rewriting the reused components is saved and the time-to-market for the resulting system is reduced. Furthermore, the risks associated with redeveloping possibly complex components can be avoided.

Application of RE-PLACE

The RE-PLACE approach has been applied in an industrial project with Tecmath GmbH & Co. KG.

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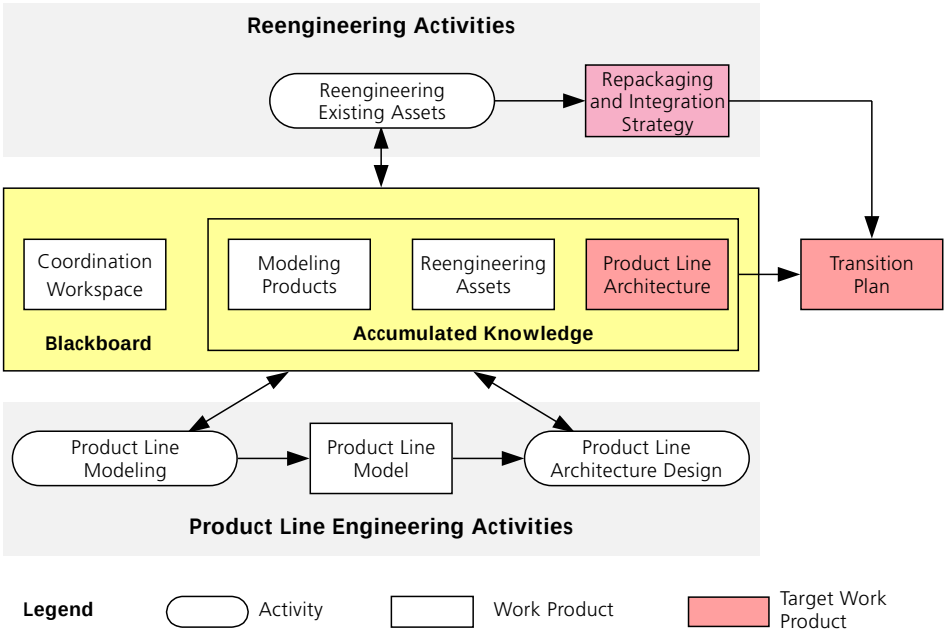

The RE-PLACE Framework

The RAMSIS Project – Applying RE-PLACE to an Industrial System

RAMSIS is a world-leading human modeling system developed by Tecmath GmbH & Co. KG. It provides a model of the human body and is able to perform various analyses on postures and comfort feeling. In the past, the RAMSIS system has been primarily used for ergonomic analysis by the automotive industry, both as a stand-alone tool and integrated into various computer-aided design systems. Now, Tecmath plans to use it in very different application contexts, for example, body measuring for the production of tailor-made clothes.

The current structure of the RAMSIS system, however, makes it difficult to adapt the system to these new contexts. As the initial design of the system kernel dates back to the 1980s, it has evolved over a long period of time, leading to a complex system architecture and many dependencies that are not fully documented. These issues impede the further development of the kernel to address new markets and create maintenance problems.
The option of completely rewriting the kernel was considered but rejected by Tecmath due to the effort and risk involved in redeveloping the kernel's complex mathematical functionality.

Objectives

The purpose of the RAMSIS kernel redesign project was to replace the monolithic, FORTRAN-based RAMSIS kernel with an extensible, object-oriented kernel implemented in C++ while maximizing reuse of existing assets in order to preserve the knowledge embedded in the existing system and reduce the risk of the redevelopment. Due to its extensible and adaptable architecture, this new kernel can then serve as a basis for a family of products that have a shorter time-to-market, a higher flexibility, and a better maintainability.

Approach

The approach used in the project is an instantiation of the RE-PLACE framework, which integrates product line engineering and reengineering activities. The product line engineering activities were based on the PuLSE™ method.

The enactment of the approach consisted of the following three main phases:

- Identification
  The features of the current RAMSIS system were analyzed. The members of the future RAMSIS product line and their required features were identified. At the same time, the existing RAMSIS system was analyzed in order to find reusable components.

- Modeling
  A model of the future RAMSIS product line was produced. Furthermore, an optimized wrapping mechanism for integrating reused FORTRAN components into the new C++ kernel was created.

- Building
  In this phase, the reference architecture of the future RAMSIS kernel was designed. The wrapping scheme was complemented by an integration strategy describing how to transform the reusable components in order to integrate them into the resulting kernel using the wrapping scheme. Finally, the overall transition of the system was described in a transition plan.

Results

The RAMSIS kernel redesign project was completed in mid-1999. Its main results are:

- A product line model describing the RAMSIS product line
- A flexible reference architecture for the new RAMSIS kernel
- A list of reusable components from the current RAMSIS kernel
- A mechanism ("wrapping scheme") to integrate the reused components in the new object-oriented RAMSIS kernel
- An integration strategy describing the transformations to be made to the reusable components
- A transition plan describing the necessary steps to make the transition from the existing system to the product line

These results allow the customer to transition the current RAMSIS system to a product line setup based on the new kernel. Effort estimates indicate that the overall effort for this transition is about 40% less than that for rewriting the RAMSIS kernel.

Partners

Tecmath GmbH & Co. KG

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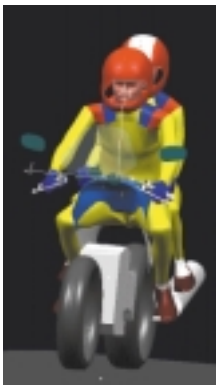

Quality and Process Engineering

The Quality and Process Engineering (QPE) department provides comprehensive support for customers interested in improving their software development and maintenance processes and related products. Our main objective is to increase productivity, reduce time-to-market and improve the quality of software products. The QPE department provides a range of services, including

- elicitation and assessment of the current processes
- support for goal-oriented process improvement and process guidance
- goal-oriented measurement programs to support systematic improvement
- quantitative models for software processes and products to support and improve software development and maintenance
- integrated tool support for process modeling and guidance as well as for measurements

Solutions are driven by industrial needs and methods and technologies are tailored to specific customer needs.

The QPE department is composed of the following three groups.

Process Engineering and Improvement

The aim of the Process Engineering and Improvement group (PEI) is to establish process technology in companies as well as to support companies in introducing techniques to estimate the success of process improvement efforts.

The prerequisite for a successful improvement program is to have a profile of the strengths and weaknesses of the software processes. To achieve this task, the group develops and conducts innovative process assessment techniques based on SPICE and BOOTSTRAP. The group also supports companies in eliciting explicit models of their software processes and in establishing process standards and process guidance.

Once a picture of the company's software development has been established, systematic improvement programs can be set up. The group helps companies in this task by developing goal-oriented measurement programs. They allow for getting feedback on the effect of improvement efforts.

Cost and Quality Engineering

The Cost and Quality Engineering Group (CQE) focuses on ways to build quantitative models aimed at the monitoring, evaluation, and prediction of software attributes such as productivity, maintainability, reliability, and related software risks. This implies the use of measurement, statistical modelling, and many other experimental techniques.

This group helps customers identify important cost and risk factors in their development environment. Based on such analyses, it helps them build cost and risk models in order to help decision making during project bidding and planning.

The QPE group also provides guidance in efficient and effective decision making, combining goal-oriented measurement with rigorous mathematical decision modelling. This covers a wide field of applications, such as make-or-buy decision of commercial of the shelf (COTS) components.

Department Head

Prof. Dr. Markku Oivo (in 1999)

Dr. Rini van Solingen (since 2000)

Cost and Quality Engineering

Isabella Wieczorek

Bernd Freimut

Michael Ochs

Dietmar Pfahl

Jürgen Wüst

Process Engineering and Improvement

Dr. Martin Verlage (left end of 1999)

Dr. Barbara Dellen

Additionally, QPE applies a variety of techniques that help to appropriately plan, control, and evaluate inspection and testing activities. The derived models enable our customers to, for example, predict the error proneness of software components, estimate how many defects remain in a document after inspection, or evaluate the cost-effectiveness of inspections.

CQE can address a wide range of problems through efficient, rigorous, and integrated quantitative techniques.

Quality and Process Support Environments

The goal of the Quality and Process Support Environments (QPS) group is to provide integrated tool support for quality and process management in software projects. The group addresses all tool-related aspects that are relevant for the systematic performance of software projects. In particular, QPS focusses on integrated tools for process modeling, process guidance, measurement planning, data collection, and easy to use data analysis. These different tools are covered by two internal research projects:

SPEARMINT™ (Software Process Elicitation, Analysis, Review and Measurement in an INTegrated Modeling Environment): The SPEARMINT™ tool provides the basis for a variety of process related activities like assisting process understanding by documenting and communicating process models, supporting measurement planning by defining process models, or assisting process assessment by providing reusable process templates. SPEARMINT™ provides a multi-view, graphical tool for capturing large, complex software development processes, and an associated method. SPEARMINT™ captures process models from a variety of different, role-specific perspectives, providing the ability to display process information using a range of different notations. The tool also provides analysis and reporting functions to query and report on the process model. The picture on this page shows a screenshot of the SPEARMINT™ main window.

Smarties (Systematic Measurement Toolset for Improving and Engineering Software Development): The aim of the Smarties project is to provide a reference model against which to set up toolsets for measurement programs. The reference model includes requirements, processes, and concrete interfaces. Smarties supports a defined method based on the principle of goal-oriented measurement (GQM). The method includes operational guidelines and well-defined structures for measurement documents. Smarties provides an integrated framework for tools including measurement planning tools, interactive data collection and presentation tools, and data analysis tools.

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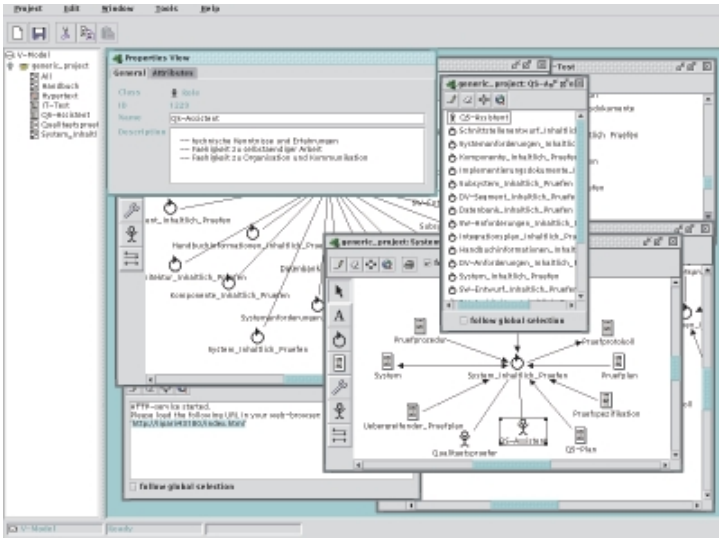

Screenshot of the SPEARMINT™ main window

Quality and Process Support Environments


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Andrew Beitz


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Dr. Peter Rösch (left end of 1999)


Ralf Kempkens


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Fraunhofer IESE Assessment MEthod (FAME)

IT businesses today cannot survive without software process improvement. An assessment is one approach to measuring processes to identify where to start the process improvement initiative. Some other reasons for performing an assessment are: to use the results in marketing the organization, to determine the capability of a supplier organization, to provide feedback on how well the organization is performing, and to identify risks related to software processes within the organization.

Assessments provide a disciplined examination of the software processes within an organization. Assessments result in a measure of which processes are being performed and how well they are being performed.

Objective

Although assessments are widely used within industry there are critical problems that still remain.

There is a strong need from industry to make assessments more cost effective and be more tightly coupled with a process improvement program. One of the enduring challenges in software process assessments is linking the assessment scope to an organization's business focus. Such a linkage would ensure that assessment costs will produce results that can contribute to business objectives for the improvement program.

Another problem faced in industry is that assessment methods typically offer only one type of assessment. In practice, several assessment types are needed because no one assessment can cover all different types of purposes. Without this flexibility, time and effort may be wasted by not focusing on the relevant issues.

Approach

FAME is a stand-alone assessment method that is based on well known assessment methods (i.e. SPICE and BOOTSTRAP), and uses the standard assessment model of the upcoming standard for software process assessment (ISO/IEC 15504). It contains additional features that have been developed through practical experiences from the worldwide SPICE trials and from Fraunhofer IESE research results. The SPICE trials are the most extensive joint effort of Industry, the Public Sector, and Academia to collect and validate process assessment knowledge. Fraunhofer IESE has played a major role in the SPICE project and continues to contribute to the collection and analysis of assessment data. In addition, Fraunhofer IESE supervises the German SPICE trial activities.

Results

FAME is an advanced assessment method that contains features that address the problems faced by industry today in software process assessment. Using FAME has the following benefits:

- focuses on relevant business processes to guide process improvement efforts
- provides a cost-efficient and reliable method to show a better return-on-investment for the improvement program
- provides a tailorable approach for performing assessments
- focuses on the processes to improve while taking into consideration the business needs

- provides an approach that allows an organization to compare its results with similar businesses that is based upon ISO/IEC 15504
- provides a method that is applicable for small to large organizations

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Web-based Process Guidance

Process models play a major role in the software industry. They are extensively used to help obtain ISO certifications, to guide process improvement programs, and to introduce "best practices" into organizations.

In order to make process knowledge available and to learn from best practices, companies develop and maintain process handbooks. A process handbook is a reference document of company-specific processes that provides guidance to process participants in carrying out their tasks. Process handbooks are designed to communicate process knowledge by providing process definitions and guidelines.

To maximize the use and effectiveness of process handbooks, they must be well structured, up-to date, and easily available to all users. Only then are they actually used regularly and considered to be helpful.

The wide availability of Intranet and Internet technology in companies has made Web-based process guides the focal point of interest. These guides overcome the deficiencies of paper-based process handbooks.

Objective

In order to disseminate process knowledge, many organizations maintain printed process handbooks. Paper-based process handbooks are not widely accepted by users. First, it is difficult to find information on complex process structures with many interdependencies in a linearly structured handbook. Second, it is difficult to keep information up-to-date because of the long update cycles of preparing and printing new handbooks.

To increase the acceptance of process guides, they must be easy to use and should facilitate the daily work of the people performing the process.

Approach

Intranet and Internet technology in companies has opened the door for introducing Electronic-based Process Guides (EPGs). Unlike printed handbooks, electronic process guides can be extended to access all relevant process information. Browsing and searching facilities decrease access time to obtain the right information. Key functionality, like storage of process state information, online access to templates and manuals, and links to valuable information on other web sites facilitates people's daily work.

The EPG uses an advanced process modeling tool, called SPEARMINT™. The tool provides an easy and cost effective way for creating and maintaining EPGs. The easy to use graphical interface and consistency checking functionality provided by the tool allow efficient entering and maintenance of the process knowledge. An export facility generates HTML-based EPGs on demand.

Results

The EPG provides a solution for making process knowledge available to users. The efficient access to the right information and the short update cycles of an EPG increase acceptance and use of process handbooks in companies.

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Development of a Procurement Questionnaire for Software Project Cost Analysis

The estimation of cost for software projects is one of the most important and most difficult management tasks. To estimate the cost of a project and its related risks on a reasonable level of accuracy remains a challenge for many companies. A number of problems are common place and may explain the situation. These problems are related to the 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 of a project.

When an organization outsources many software projects, it is possible to accumulate a cost database in a relatively short period of time. However, to collect useful cost data, it is necessary to determine influential factors on cost and risk that are predominant.

DaimlerChrysler AG, Car Development Division subcontracts a lot of software projects. Thus, cost estimation is crucial for them to properly assess incoming bids. In collaboration with Fraunhofer IESE, a procurement questionnaire is defined that serves as a basis to establish a project cost database.

Objective

The main objectives of this study are to:

- Determine the most important cost and risk factors relevant in the DaimlerChrysler procurement context.
- Design a procurement questionnaire based on the most important cost-drivers that is to be completed by DaimlerChrysler suppliers.
- Develop a procedure to assess the cost and risks of incoming bids based on information from the procurement questionnaire and an established cost database.

Approach

In order to determine most important cost and risk factors in a specific context, one has to rely on experts in the application domain. The experts' knowledge is acquired through a survey. Performing a survey enables us to gather the required information very efficiently and accurately.

DaimlerChrysler suppliers are asked to decide about the relative importance of a large number of potential factors impacting project cost. The analysis of the collected data determines what are the most important factors for subcontracted projects in the DaimlerChrysler context.

Based on this, a procurement questionnaire is designed to collect cost-related project data from subcontractors. This questionnaire serves as a basis for the establishment of a cost database that can be used to better estimate the cost for new projects, or assess bids of subcontractors.

To use the established cost database for assessing incoming bids, the information available at the beginning of a project has to be compared to parts of the database. As a lot of uncertainty exists at such an early stage in a project, risk management needs to be incorporated. A combined approach using simulation techniques to account for the uncertainty and analogy-based retrieval of existing data is proposed as a procedure to assess incoming bids. The result of such a procedure is the probability that a bid exceeds a certain price.

Results

The final results of this study include:

- A repeatable process of ranking cost factors regarding their importance
- A list of cost factors most important for the DaimlerChrysler software procurement context
- A procurement questionnaire usable for consistent collection of important cost-related project data across DaimlerChrysler subcontracted projects
- A description of how to use the procurement data for estimating project cost, assessing incoming bids, and benchmarking completed projects

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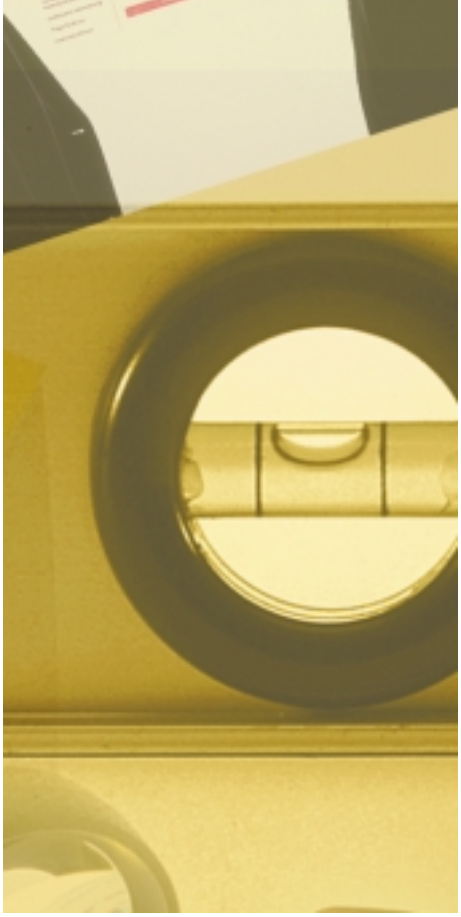

Definition and Validation of a COTS Acquisition Process (CAP)

Commercial-Off-The-Shelf (COTS) software components are becoming more and more important in state-of-the-practice for software and system development. COTS software provides a number of potential benefits and at the same time it raises problems not usually encountered in classical software development. Potential problems originate from the black-box character of COTS components, i.e., the fact that they must be used on an "as is" basis. Therefore, it is desirable to have a well-defined, efficient, reliable, and integrated COTS acquisition process (CAP). To achieve this, a research collaboration between Fraunhofer IESE and Siemens AG has been initiated.

Objective

The objective of the CAP project is to develop, evaluate, and package an instrumented CAP model that helps to:

- Enhance the benefits associated with the use of COTS components, e.g., shorter time-to-market and lower development cost.
- Mitigate the risks of using COTS software components, e.g., lack of vendor support and insufficient reliability.
- Be as efficient and effective as possible in making the decision on whether to develop or purchase a COTS software component with a specific functionality.
- Support the ability to deal with all sizes of COTS software components. These can range from a module with a single, dedicated functionality to complete software applications.

Approach

The CAP project is being conducted in three phases.

During the first phase, a generic version of the instrumented CAP model was defined. It consists of three sub-models:

- An initialization model for adapting the evaluation taxonomy and for setting up the criteria measurement plan.
- An execution model for exploring, evaluating, and selecting suitable COTS software components.
- A model for packaging results such that they can be reused.

The current CAP model includes a comprehensive taxonomy with criteria for COTS software component evaluation and descriptions of techniques for tailoring the criteria taxonomy, estimating the effort for collecting data on the selected criteria, and Multi-Criteria Decision Making (MCDM).

In the second phase, the generic CAP model will be customized to the specific needs of a Siemens business unit and evaluated in one or more pilot applications.

In the third phase, based on the results of the pilot application, the instrumented CAP model will be enhanced and packaged into a handbook.

Results

The final results of this project will include:

- a generic description of the CAP model architecture
- a comprehensive taxonomy of criteria for the evaluation of COTS software components
- a report on the application and evaluation of the suggested CAP model, including a cost/benefit analysis
- a handbook containing the instrumented CAP model, the evaluation taxonomy, recommendations for customizing the CAP model, and a set of checklists and templates supporting the execution of the CAP model

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Systematic Learning and Improvement

The department Systematic Learning and Improvement (SLI) develops and validates methods and techniques for implementing effective organizational learning and goal-oriented continuous improvement in the software area. Following the TQM-based Quality Improvement Paradigm (QIP), we help customers establish a software organization that is able to set quantifiable (improvement) goals, select and take adequate actions towards reaching these goals, measure success, and systematically collect experience to accelerate learning.

Our overall approach is implemented by means of well-defined roles and processes for the software project groups and their improvement support group. The former ones are responsible for performing successful software projects. The latter is concerned with the collection of relevant experience from the software groups, the preparation (i.e., structuring, documentation, and maintenance), and the feedback of experience to leverage the software groups' success.

We call this an Experience Factory (EF). The EF allows tacit knowledge of experts as well as experience hidden in processes and documentation to be made explicit so as to deploy it most effectively throughout the organization.

Experience Factory Technology

Companies that strive to become Learning Organizations often face the problem of information overflow. They do not know how to systematically identify, collect, and package information that would be of benefit if it only were easily accessible at the right place at the right time. It is mandatory to structure information, provide a quick survey of available information, and guide users to useful information.

The Experience Factory Technology (EFT) group is developing the necessary tool support for the Experience Factory. The core of such a tool is the organizational memory, which we call the Experience Base. The Experience Base is integrated with an organization's information network, such as the intranet and data bases. The Experience Base stores diverse types of information, such as lessons learned from projects, best practices, process models, and application know-how in an easy-to-find and ready-to-use form.

We apply Case-Based Reasoning (CBR), which is a methodology that helps to solve problems in a very natural way. CBR emulates expert problem solving behavior: a new problem is solved by adapting solutions from similar past cases. CBR effectively supports knowledge storage and retrieval as well as learning, even for the casual user.

Experience Factory Technology

Dr. Frank Bomarius, Department Head

Dr. Klaus-Dieter Althoff

Markus Nick

Dagmar Surmann

Carsten Tautz

We tightly integrate the Experience Base with existing information sources and we use web technology to make the experience easily accessible.

Management of Improvement and Learning

Innovation, quality, and time-to-market are the three factors that determine competitiveness today. Maintaining a leading edge requires exploration of the most valuable resource in a company - knowledge. The introduction of concepts for Learning Organizations faces many nontechnical problems related to Business Process Improvement and Change Management. Moreover, the acquisition, storage, and distribution of experience still present a lot of open issues on the methodological level.

The Management of Improvement and Learning (MIL) group adapts and develops concepts for Learning Software Organizations based on the general idea of an Experience Factory. We are experts in embedding processes for identification, acquisition, and usage of experience in an organization. Tailored solutions for experience processing are developed in close cooperation with the EFT group and all other groups in the institute. This includes the definition of measures that allow to monitor business process performance and identify weaknesses and problems.

Information Technology Security

In a networked world where frontiers become meaningless and information is just a mouse-click away, protecting a company's information assets while at the same time offering comprehensive response to legitimate requests is vital to survive competition. Current trends toward tele-working and tele-conferencing, the introduction of electronic commerce, and the expanding use of telecommunication services create new opportunities, but also new threats.

The Information Technology Security (ITS) group assists an organization in precisely determining its security requirements, defining adequate security objectives, and closing existing security gaps.

To identify areas where assets are at risk, the organization's security policies are inspected. The IT system under study, its documentation and existing safeguards are reviewed. Guidelines for proper safeguarding and recommendations for the improvement of the organization's basic security strategy are derived from these investigations.

We help to make a Learning Organization safer by protecting its essential assets - the information infrastructure.

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The Software Experience Center

The Software Experience Center SEC™ is a generic consortium set-up that has been conceived jointly by the IESE and its sister institute in the US, the Fraunhofer Center for Experimental Software Engineering, Maryland, as a framework to create SEC consortia.

Mission

SEC consortia are designed to bring together like-minded international companies for the purpose of an open experience exchange and for setting up and performing joint case studies and applied research projects. The main goal is to promote the extension of Learning Organization concepts to the software domain. The intended international set-up is expected to create insight into Learning Organization issues across different cultural environments.

Each SEC consortium provides a forum for its members to share their experience much more effectively than in a conference or workshop. In particular, there will be exchange on successful as well as less successful projects, on setting up and performing improvement programs, and on introducing and running Experience Factories. On a regular basis, the SEC members select topic areas from the software engineering domain that are most relevant to them for investigation within their consortium, thus setting the consortium's focus.

Implementation

Each SEC is a consortium of industrial members plus the Fraunhofer Institutes that together want to act as an Experience Factory. A consortium is governed by a consortium agreement that settles confidentiality issues and regulates the operation of the SEC. A steering committee, comprised of one representative per member, guides the consortium.

The industrial members jointly fund the operations of their SEC consortium and are expected to make a midterm commitment to the consortium. Each SEC comprises six to eight member companies. Each member subscribes to its SEC consortium agreement and in particular to the free mutual exchange of experience within the consortium for the purpose of accelerated learning.

Different SEC consortia do not interfere with one another, that is, confidentiality is guaranteed.

Role of the Fraunhofer Institutes

The Fraunhofer Institutes act as facilitators and bring added value to the SEC consortia. In particular, they:

- run the SEC consortia offices
- plan, coordinate, and execute workshops for the SEC consortia
- contribute tutorials, exploratory technology presentations, and experience reports to the workshops
- collect experience in the course of bilateral projects with members and document it for dissemination within the consortium
- maintain the SEC consortium's Experience Base, which makes the consortium's experience assets accessible to the members
- maintain and provide access to a world-wide network of experts
- deliver on-line services to the members, such as a web site with the SEC Experience Base, and a newsletter

Status

In 1998, Fraunhofer IESE and the Fraunhofer Center for Experimental Software Engineering, Maryland designed and put together the first international SEC. The official start of this consortium was June 1999. More SECs, national as well as international ones, are planned to be assembled in the future.

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Intelligent Process and Quality Management (IPQM)

While Total Quality Management (TQM) and continuous improvement have become standard practice in production oriented industries, the service sector is only recently starting to deploy such methods.

In Germany the health care sector is experiencing heavy pressure to reduce costs and increase efficiency. Yet, methods and tools tailored to this sector are missing.

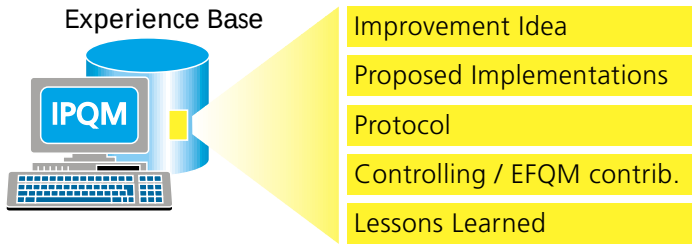
The objective of the IPQM project was to develop a process plus supporting tool to capitalize on the experiences of medical, care, and administrative personnel. Cost as well as achievements - in quantitative as well as qualitative terms - were to be made transparent by the IPQM.

Approach

Fraunhofer IESE and Fraunhofer IPA jointly developed a continuous quality improvement process applicable in the health care sector.

A web-based tool to support this process was developed. It allows capturing improvement ideas, (alternative) plans for implementing the improvements, cost/benefit estimates, and experiences made while implementing the improvements. Thus all steps, decisions, results, and valuable experiences are documented and made available throughout the organization.

The EFQM assessment framework, as defined by the European Foundation for Quality Management, is well known in the health care sector. Hence we chose EFQM as an evaluation scheme to structure and categorize achievements. The IPQM tool allows to link improvement activities with EFQM categories.



IPQM was put on trial in mid '99. We followed a three-stage approach:

- For preparation of field testing we organized a workshop to present and explain the IPQM to Quality Managers from hospitals.
- The Quality Managers then used the system for four weeks to support their daily quality improvement work.
- Finally, we analyzed practical experiences in another workshop.

Results

The implementation of IPQM and its application in several hospitals followed our general approach:

- establishment of a clear strategy, from which measurable goals can be derived and actions for achieving the goals can be devised
- active involvement of the entire work-force in all kinds of quality improvement activities
- documented business processes
- appropriate computer support

Quality Managers were very confident with the IPQM. In particular the use of tailored vocabulary provided by the system and free text made it easy to use.

Assigning activities' results to EFQM criteria was considered a major innovation of the system, since documentation of the achieved improvements is a major requirement in the health care sector. The web-based implementation was another very positive feature of IPQM.

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Information Technology Security Management

Most organizations depend critically on their information technology (IT), its availability and proper functioning. Information processing is vital for many business and production processes. The expanding use of telecommunication services and the growing importance of electronic commerce will further increase dependence on IT in the future.

Although IT is one of the most crucial resources in most enterprises, organizations tend to neglect its inherent risks. With the advent of teleworking and teleconferencing, with the increasing popularity of online services and electronic mail, more and more organizations are forced to gradually open their enterprise networks and to grant the public controlled access to their IT platforms. IT security has now become a major concern for most companies.

Objectives

The Information Technology Security (ITS) group assists your organization in determining its security requirements, defining adequate security objectives, setting up a security policy, and closing existing security gaps.

We help you to make your organization safer by protecting its essential assets – the information infrastructure.

Approach

Fundamental to security management are proper identification of areas where assets are at risk and a clear understanding of the organization's security objectives. It is important to define a corporate IT security policy that summarizes essential security needs and principles. As a first step in our assessment, we inspect existing policy documents. If none exist, we support our client in creating an appropriate policy as a prerequisite to selecting a suitable risk analysis strategy, and to deriving reasonable security plans.

Depending on the target of evaluation, the strategy for risk analysis may require a detailed review of the system, its safeguards, vulnerabilities, and potential threats. In the simple case of a standard IT component, risk analysis may be restricted to standards compliance testing, from which risk valuation immediately follows. We guide your organization in risk assessment according to current best practice. We may also conduct detailed evaluations of specific IT components on behalf of our client.

If risks exceed a given threshold, then additional safeguards are required. The selection of countermeasures may depend on technological, economical, legal, environmental, as well as social factors. We assist clients in choosing appropriate means.

Risk analysis aims at explicitly stating the residual risks and the rationale for proposed additional safeguards. Based on this information, your organization can make a well-founded management decision about adequate security measures.

After the residual risk and the proposed measures have been approved, a security plan must be prepared that details all necessary steps, responsibilities, required tools, and time scales. We support the planning by providing appropriate templates and advice for setting up guidelines and procedures.

Next, we recommend formulating a system policy for the specific target of evaluation. This document should summarize all relevant vulnerabilities, threats, and corresponding risks as well as the rationale for the selected safeguards. Such a component-specific security policy may serve as a template for incremental re-evaluation in case of future component changes or replacements.

Finally, the security plan is implemented. Typically, however, system security is not confined to a single, short-term activity. Maintaining a certain level of security is an ongoing effort.

IT security tends to be a personnel rather than a technological problem. Most security incidents have their roots in a lack of awareness, education, training, or motivation of staff members. Therefore, it is important to educate the employees and explain to them the lurking dangers of poor security standards. We offer seminars on selected topics of IT security issues, but also general awareness programs.

Regular reviews of the system and corporate security policies complement specific security assessments. They aim at continuous improvement of the security management process.

We view corporate security improvement programs as part of more comprehensive organization-wide programs of systematic learning and improvement. The IESE is an expert in implementing such programs based on the Quality Improvement Paradigm and Experience Factory approach.

Project Examples

Security assessments have been conducted for systems of varying type and scale, ranging from simple Worldwide Web Servers to complex, distributed services spanning the public switched telephone network. For Deutsche Telekom we modeled and analyzed security aspects of Telecommunication Management platforms, Intelligent Network services, and Virtual Private Network solutions (among others).

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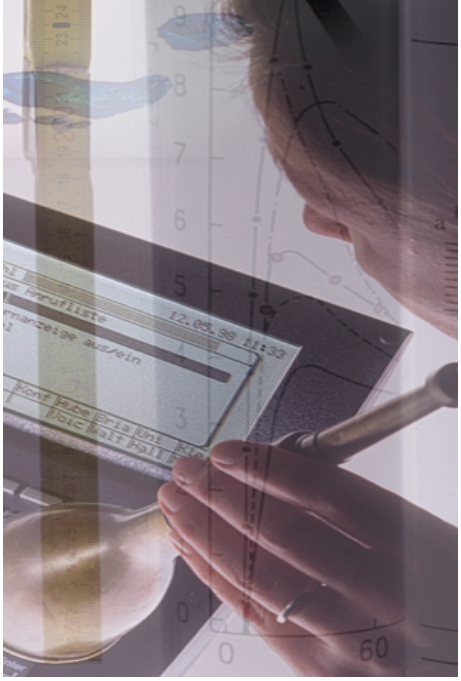


Systematic Improvement Programs

Successful software process improvement must be tailored to the specific goals and needs of a software organization. It requires careful planning, systematic action, and regular evaluation of success. Organizational learning is the key to sustaining the benefit from improvement initiatives.

Systematic improvement programs must deploy customized applications of improvement approaches. Process assessments, for instance, might be integrated with the installation of software measurement programs and the introduction of more productive software technologies. Existing development practices must be transformed. New competencies and organizational entities might be established.

Systematic improvement programs build on four main principles:

- set explicit improvement goals that can realistically be achieved in the software organization
- integrate well-established improvement techniques
- systematically plan, monitor, and control the improvement program
- evaluate improvement success and package the results for future and concurrent improvement initiatives

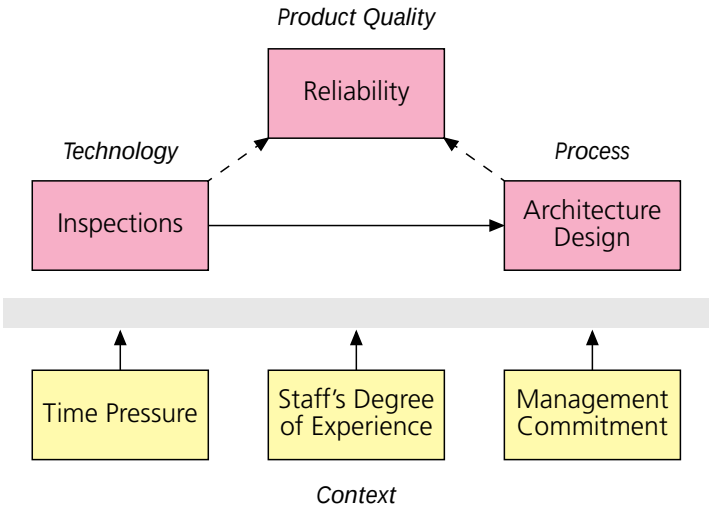
Fraunhofer IESE realizes these principles via three groups of well-established techniques for setting up and running systematic improvement programs:

- continuous improvement cycles following the Quality Improvement Paradigm (QIP; see Figure 1)
- methods for analyzing and benchmarking processes and products, such as ISO/IEC 15504 process assessments, process modeling, and goal-oriented measurement
- technologies and infrastructures for organizational learning and knowledge management in software engineering, according to the Experience Factory (EF) concept

QIP Steps	PROFES Steps
Characterize	1. Verify commitment 2. Identify product quality needs 3. Determine current product quality 4. Determine current process capability
Set Goals	5. Set product improvement goals 6. Determine necessary process changes
Choose Models	7. Describe process changes 8. Set metrics for the process and product 9. Prepare improvement implementation
Execute	10. Implement and monitor improvements
Analyze	11. Evaluate results
Package	12. Update experience base

Figure 1: The steps of the Quality Improvement Paradigm (QIP) and the associated steps of the PROFES improvement methodology

Figure 2: Dependency relations between software development context, technology, process, and product quality for the example "inspections, architecture design, and reliability"



Effective improvement programs are typically a well-customized combination of these three kinds of improvement approaches. The PROFES improvement methodology, for instance, guides the setup of effective improvement programs. PROFES is a product-focused improvement methodology that follows a twelve-step process improvement process (see Figure1). It has been developed in a European applied research project with strong involvement of Fraunhofer IESE. Models of product/process dependence (PPD) help to find those improvement actions that are most important for attaining a required product quality. The principles of PPDs are depicted in Figure 2.

Through many years of experience in systematic improvement, Fraunhofer IESE has accumulated a rich palette of tools and competencies for supporting improvement programs and for assuring their success. The following ones are particularly important:

Drivers and critical success factors of improvement

Fraunhofer IESE has developed effective tools and a strong body of knowledge that help select the right improvement actions for a given software organization. One example is the PROFES repository of PPDs that contains lists of recommended improvement actions for many product quality goals.

Benefit, cost, and risk factors of improvement programs

Fraunhofer IESE is continuously furthering its experience base of improvement benefit, cost models, and risk factors. The PROFES cost/benefit repository, for instance, contains effort models for predicting the effort of process assessments and goal-oriented measurement programs.

Integration of improvement approaches

The PROFES improvement methodology and other methods developed at Fraunhofer IESE combine the strengths of different improvement approaches, such as process assessments, goal-oriented measurement, and process modeling, within one improvement program.

Experience from three industrial software organizations has shown that systematic improvement programs following the PROFES improvement methodology effectively direct improvement efforts toward important, company-specific product quality improvements. The main results from these applications of PROFES are summarized in the following.

Important product quality attributes for Dräger Medical Technology were reliability, fitness for use, and predictability of quality, time, and cost. Several important product quality achievements were reported: On-schedule delivery, functionality being very well in accordance with user needs, a very low number of defects in field tests, and others. Also, a wide spectrum of process improvements was accomplished, demonstrated by a fast process capability increase to level 3 on the BOOTSTRAP scale and by meeting the ISO 9001 criteria.

The product-focused process improvement program at Ericsson Telecom R&D in Finland has focused mainly on reliability and maintainability. One particularly important quality improvement was design quality in terms of fault density. The improvements were attributed to significantly more careful preparation for software inspections and more intense desk checking. Two BOOTSTRAP process assessments have indicated capability level improvements from below 2 to nearly level 3.

The product quality goals for Tokheim, world market leader in systems and services for fuel stations, focused on reliability with additional strict cost and time targets. Achievements were well-structured product architecture, better traceability and analyzability of the product, as well as a very low number of defects. At the same time, the targeted cost reductions were better than planned and product delivery was within the planning limits.

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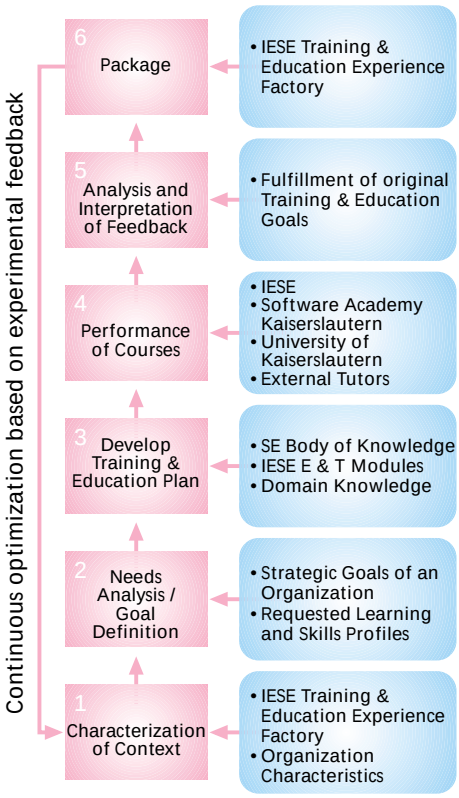
Software
Engineering
Ian Sommerville

Continuing Education and Training

There is no successful technology transfer without preparatory training and education courses. Background, main contents, and implementation of the new technologies have to be explained for all the people involved. This must always be done in the context of the organization. The demand for both specific technology training and professional Software Engineering education is growing significantly. Human resources have become more and more the bottleneck for industrial growth.

The IESE education and training approach is based on a modular system of courses. The different modules can be classified according to the following schema:

- basics for software engineering (e.g., discrete math, logic, algorithms)
- principles and foundations of software product engineering (e.g., information hiding, data abstraction, traceability, reuse)
- principles and foundations of software process engineering (e.g., process modeling, measurement, experimentation, learning)
- techniques, methods and tools for product engineering (e.g., requirements engineering, design, quality assurance)
- techniques, methods and tools for process engineering (e.g., experience packaging, process improvement, quality management)
- empirical results (e.g., case studies, experiments, lessons learned) and industrial experiences for different domains (e.g., telecom, embedded systems, MIS)



IESE supports reuse-based planning and execution of customizable, high-quality education and training modules by adapting the Quality Improvement Paradigm (QIP) approach for software development.

Software Engineering
Education and Training


Dr. Günther Ruhe
Department Head


Manfred Eberle


Ines Grützner

Company-oriented education programs take into account actual and future trends in technology development. The mid-term or long-term education programs are composed of sequences of individual education and training courses. Each of these courses makes a well-defined and measurable contribution to the strategic objectives. They are based on the following principles:

- Existing modules have to be tailored according to the application domain
- Upper exit level of the course must be chosen based on target qualification (e.g., software engineer, tester, developer)
- Lower entry level of the course is chosen based on candidate's qualification
- Synergy with existing company education and training modules
- Integration of external competencies and presenters

IESE offerings are directed both at individuals with different backgrounds and university degrees and at organizations of different size and domain. For all our offerings, web and multimedia technologies are becoming increasingly important. There is great variety in objective, style, and duration of these offerings:

- Tailored training courses that are
  - technology-oriented
  - one to five days in duration
  - at IESE or at the company
  - during working hours
  - complementing transfer of IESE competencies
- Development and realization of company-specific continuing education programs with classification based on
  - contents: competence-/job-oriented
  - duration: varying between three months and two years
  - location: at IESE, at PRE Park, or at company
  - organization: full-time or part-time, inclusion of other players (e.g., university, high-tech companies, other educational institutions)
- Executive management briefings
  - Overviews, tendencies, and most recent results in software engineering technologies are presented for upper executive management of companies

Education, training, and consulting for SMEs.

One example of current activities is a two-day course on various topics related to quality management for software developers and project managers. The course is tailored to the specific needs of a major automotive supplier and will reach the majority of its software engineering workforce.

An example of a different granularity is a qualification program for hardware developers built of several modules. The participants will be provided with the basic skills needed to develop software. The duration of the qualification program is 6 months, 1 to 2 days a week.

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Company-Specific Education and Training

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Training, Education and Consulting Center

Dr. Klaus Hörmann

Markus Müller

Maud Schlich

Stefanie Mahler Secretary

Elke Müller Secretary

Cornelia Streb Secretary

The Competence Center for Software Technology and Training (KSTW)

Within the last 10 years, information and telecommunication technologies grew to be one of the core competencies of the economic area of Kaiserslautern and surroundings. The region has become an attractive location for the booming IT industry: more and more companies are emerging in this area, along with the need for staff with excellent skills in software engineering. Most of these companies are small or medium-sized enterprises (SMEs).

Against this background, it is a strategic goal of the Fraunhofer IESE to

- offer consulting in order to help companies, especially SMEs, to acquire good Software Engineering skills, and,
- to provide professional services in IT training and education, especially in Software Engineering.

Consulting for SMEs

The general objective is to take care of the particular needs of small and medium-sized companies. For this reason, industrial transfer projects for SMEs are conducted and consulting for SMEs is offered. The emphasis of the projects is on consulting with respect to base practices in Software Engineering such as Requirements Engineering, Systematic Testing, Inspections, etc. Projects typically start with a short assessment phase and/or a kickoff workshop and later concentrate on transferring methods into the customer company, training and coaching personnel, and troubleshooting during the application of the new methods in everyday business.

The Consulting Center works in close cooperation with the association "Software Technologie Initiative e.V." (STI) which, by the end of 1999, comprised more than 30 member companies and organizations. In cooperation with STI, a variety of seminars and workshops have been offered. The topics covered in 1999 were Requirements Engineering, Configuration Management, Project Management, Programming Guidelines, Systematic Testing, and Development of OO Systems. The annual STI conference was held in September 1999 within the framework of the international conference CONQUEST, which took place in Nuremberg (Germany) and attracted more than 200 participants.

IT qualification campaign for local companies

In cooperation with WFK (Wirtschaftförderungsgesellschaft Kaiserslautern), a local body to promoting economic growth in Kaiserslautern, the IESE conducted a survey on education and staffing needs of about 200 enterprises in the area of Kaiserslautern. Above all, the survey yielded a remarkable demand for software developers as well as corresponding training needs. Furthermore, the study revealed a training and staffing need for software documentation specialists.

The evaluation of this survey was accomplished with special regard to IT employment opportunities for unemployed non-computer science university graduates. In consequence, several contingencies for full-time re-education courses could be identified, two of which were realized in 1999: one course for documentation specialists in the software domain and one for object-oriented developers in financial services.

The curricula for both courses were set up in interdisciplinary cooperation with practitioners of software engineering, computer science lecturers and educators. From the very beginning, industrial experts in software development were involved in the process.

When creating curricula, our main concern is on skills needed in industrial practice. Therefore, we are questioning for descriptions of those jobs our graduates will actually fulfil when employed. From this basis, we define skills graduates are to possess which lead to the deduction of wider training targets in terms of curricular planning. The curriculum for software documentation specialists is as follows:

They should acquire

- wide basic knowledge and appreciation of software engineering
- comprehensive skills in creating professional text documents
- special skills in creating a complete software documentation
- enhanced knowledge and special skills in dealing with documentation in software engineering
- skills in planning, organizing, monitoring, managing, and optimizing documentation and associated processes
- interpersonal and communicative skills
- practical skills in a typical application area

To put this into practice, the curriculum is divided into four phases:

- learning and training phase I
- project work on software documentation
- learning and training phase II
- work placement including reflection phases

With regard to work placements, we are careful to only choose organizations where candidates have excellent prospects of being employed afterwards.

The curriculum for OO-Developers in financial services has been designed, organized and carried out in direct cooperation with PMS Micado GmbH, a provider of financial services. OO-developers are trained for the process of

- analyzing customer needs and problems
- designing software solutions accordingly
- programming these solutions
- verifying and validating these solutions as well as documenting and presenting the results
- quality assurance within the process

This is realized in four stages, each including a project that comprehends all the phases of the above mentioned process in varying proportions:

- teamwork based object oriented programming
- software projects in network environments
- application development in existing environments
- elaborating client-focused solutions for financial service providers

By involving project work, the course offers an enormous share of about 50% of practical work, consisting of tasks and exercises from industrial practice.

With financial backing from the local Job Center and the European Social Fonds, Fraunhofer IESE carried out these courses for the first time in 1999 in cooperation with SWA AG, a newly founded company for professional training and education. Carefully selected by interviews, 45 participants from a wide variety of disciplines, e.g., biology, law, business administration, and architecture, were admitted to the courses and passed them successfully.

Virtually all graduates have been hired after graduation. In fact, the demand for graduates outsizes the current capacities. The courses as well as the efforts for recruiting new candidates will therefore be continued in 2000.

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COLLEGE PARK

Fraunhofer Center Maryland

Vision and Mission

In 1994, the Fraunhofer Gesellschaft established Fraunhofer USA, with headquarters in Ann Arbor, Michigan, as the mechanism for fostering collaborative activities with research institutions and industries in the United States. Separate centers would be set up in the United States, each center affiliated with both a local American university and one of the Fraunhofer Institutes in Germany.

Preliminary activities establishing the Fraunhofer Center for Experimental Software Engineering, Maryland (FC-MD) began in October, 1997. The first employees were added to the Fraunhofer payroll on January 1, 1998. On February 25, 1998, the Center had its official opening with attendees from Fraunhofer Gesellschaft, the German government, the State of Maryland, and University of Maryland officials.

Now in its second year, the Fraunhofer Center for Experimental Software Engineering, Maryland (FC-MD) is the first Fraunhofer USA unit in the US to specialize in software development and maintenance, with a focus on the use of experimental approaches to introduce innovative techniques into industry. FC-MD is a US, not-for-profit, software engineering applied research and technology transfer organization. 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 software 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 accompanying 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 Maryland-regional companies are all potential clients for FC-MD.

Competencies and Offerings

The Fraunhofer Center for Experimental Software Engineering, Maryland supports organizations committed to research and development in the discipline of software engineering and its enabling technology. It facilitates collaborative activities between these companies and the University of Maryland's Computer Science Department and other academic partners. 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 software 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 software 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 software 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.

- Based on business goals and experimental plans, select pilot projects and provide technology training to study participants. Collect study data (objective measures and subjective impressions) from the projects and analyze the impact of the new technology on both the product and the process.

- 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 transfer new technologies to other projects and divisions.

Scientific and Industrial Activities

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.

1999 was primarily devoted to requirements analysis based on the evaluation of an already existing prototype of EMS and analysis of current commercial systems. A main requirement is for EMS to support highly distributed and fast-paced knowledge intensive software organizations. It will therefore be based on advanced Internet and distributed database technologies as well as state-of-the-art graphical user interfaces. In 2000, the EMS will be populated with

experience packages of interest to the FC-MD's business activities and evaluated locally.

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, which will be useful 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.

Software Experience Center

The goal of the Software Experience Center (SEC) Consortium, a joint project between the Fraunhofer Center and the 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.

Services and communication between members are coordinated by means of an advanced Internet-based "Cooperative Workspace."

In 1999 the SEC project moved from a pre-study phase to being actively supported by member companies. The Consortium is currently composed of three international corporations with significant investments in software development: DaimlerChrysler, Motorola, and ABB. Additional members are being solicited although membership is limited to a maximum of six companies.

In September 1999, the Consortium held the first of its official workshops in Zurich, Switzerland. Members exchanged experience reports on topics ranging from managing subcontractors to creating baselines that help understand an organization's level of effectiveness.

Software Industry Consortium

The goal of the Software Industry Consortium (SWIC) Project, in conjunction with the Maryland Department of Business and Economic Development, is to provide a software engineering resource to assist Maryland organizations in advancing the practices of system and software engineering and in improving the quality of their software related products and services. This is accomplished by: integrating research and experience into practical improvement, creating opportunities to develop and disseminate improvement practices, enhancing the competitiveness of member companies, especially small to mid-size companies, accelerating new software technology adaptation, leveraging member company experience, promoting inter-corporate cooperation of member organizations, and providing training and education.

Return on Investment Model for Software Independent Verification and Validation

Although independent verification and validation (IV&V) of software increases the cost of a project, anecdotal evidence suggests that by using it, the final software product is more reliable and safer, with fewer and less critical errors remaining to be found during operational deployment. IV&V discovers errors earlier in the life cycle, resulting in fewer errors needing to be fixed later, either during development or operation, lowering thus the overall development and operational costs for the software system. IV&V also contributes to process analysis and improvement, increases communication and visibility into the project, and enhances the domain engineering aspect of software development.

The set and amount of IV&V activities applied to a project depend on the application domain, product features (criticality, safety and reliability requirements), development environment (number of contractors, developers' experience and domain knowledge, or budget constraints). The analysis and development of models of IV&V cost and benefits and its return on investment (ROI) for past projects is important for cost prediction and resource allocation purposes for future projects. In order to analyze the requirements for ROI models and to identify the data needed to develop and validate these models, the Goal/Question/Metric (GQM) paradigm is used as a mechanism for defining and evaluating a set of operational goals, using measurement.

For NASA, IV&V was mandated as a means to increase safety of the crew on the space shuttle program. NASA is now interested in determining the costs and benefits, aside from increased safety, from applying this technology. This project started in 1999 with a literature survey of ROI models, their application in software engineering, and cost and benefits of software verification and validation methods and techniques.

For developing and validating the initial version of the IV&V ROI model, NASA development data, such as collected by the NASA IVV Facility and NASA Johnson Space Center on the development of software for the space shuttle program, is being studied.

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 which are necessary for its construction correctly reflect the needs of stakeholders.

The Fraunhofer Center - Maryland 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 documents 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. The 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 is now collaborating with IESE to develop a tutorial aimed at introducing PBR to a wider industrial audience.

A related area that seems to be 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 to create and evaluate a set of reading techniques for OO design inspections. The aim 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. Preliminary results concerning these reading techniques have been presented at well-known conferences such as ICSE 1999 and OOPSLA 1999.

Small Business

Learning Organizations (SBLO)
The goal of the SBLO project is to first develop an approach that integrates the Experience Factory (EF) with the Capability Maturity Model for Software (SW-CMM) and then to tailor it for small businesses. Judicious use of EF concepts along with SW-CMM activities has helped large organizations become learning organizations faster. Experience with large organizations is being leveraged to allow small companies to achieve similar benefits by:

- defining the elements of the EF framework that large companies have used in concert with the SW-CMM
- defining these elements for small and medium-size enterprises (SMEs)
- providing training and guidance for a pilot project
- developing technology transfer materials

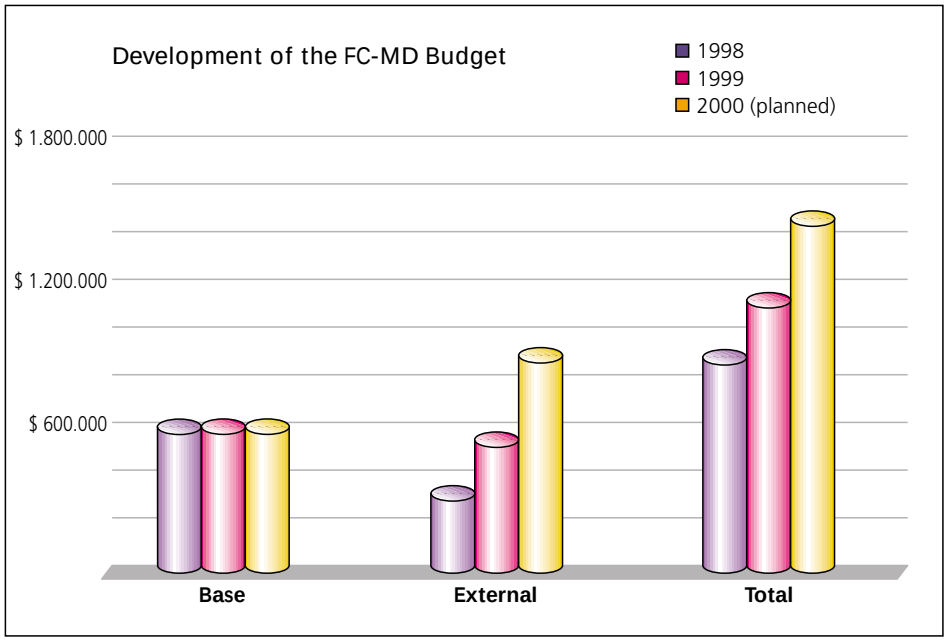
Experience Factory Support

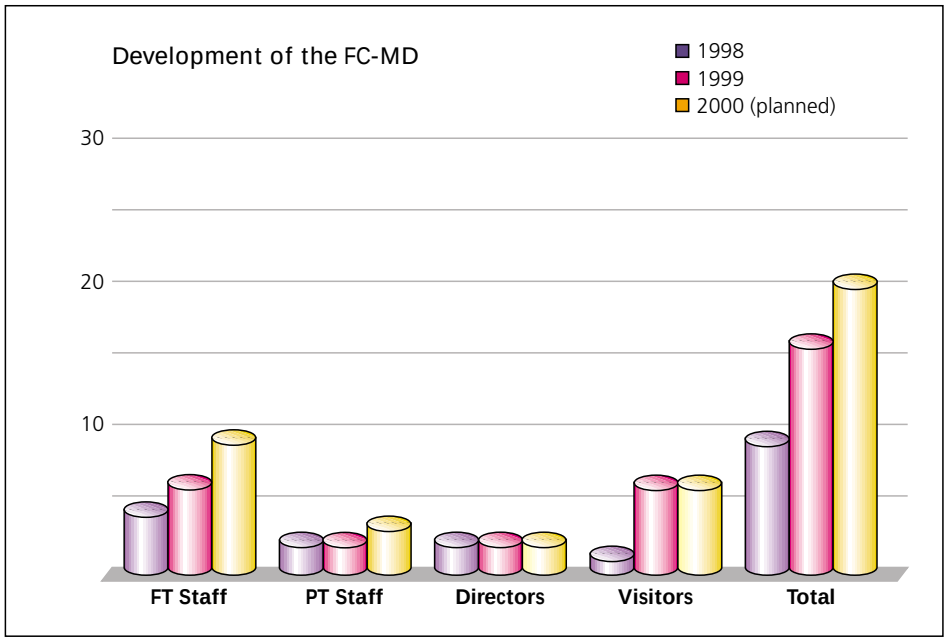
The goal of this activity is to provide direct support for companies in establishing and maintaining Experience Factories locally and corporate-wide. FC-MD is supporting DaimlerChrysler in their application of these concepts at five sites within their company. They are using the experiences captured to create a company-wide Consolidated Experience Factory to share information across the company.

FC-MD in Figures

The Center added two staff members in 1999 and expects to add three more in 2000. We have also hosted a growing number of visiting scientists, professors, and students this year and expect to continue at this level during subsequent years.

The Center generated over 45% of its revenue from new agreements with external government and industry sources in 1999. Next year, the estimate is that 60% of our revenue will derive from these sources.





Steering Committee Members

Dr. Dirk Meints Polter
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Fraunhofer-Gesellschaft

Mr. Richard C. Mike Lewin
Secretary
Maryland Dept. of Business & Economic Development

Professor Dr. Dieter Rombach
Executive Director
Fraunhofer Institute for Experimental Software Engineering

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Dean, College of Computer, Math & Physical Science
University of Maryland

References

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Maryland Department of Business and Economic Development

Research Partners

Bell Labs
Experimental Software Engineering Group, University of Maryland, Maryland
NASA Independent Verification & Validation Facility, West Virginia
Portland State University
Software Engineering Laboratory, NASA Goddard Space Flight Center, Maryland
University of West Virginia

Membership in Professional Organizations

Maryland High Technology Council
Prince Georges County High Technology Business Council
International Software Engineering Research Network (ISERN)

Events

Institute for Advanced Computer Studies Technology Fair, University of Maryland, April 30

FC-MD Steering Committee Meetings, July 14 and December 3

Fraunhofer USA Pre-Board/Board Meeting, December 13-14

Visitors Hosted

Anthony Vernucci, MITRE, January through December

Marcus Ciolkowski, University of Kaiserslautern, January through April

Martin Verlage, IESE, February 4-8

Thomas McGibbon, ITT Industries, Data Analysis Center for Software, February 26

Pankaj Jalote, Infosys Technologies Ltd., March 12

Lutz Prechelt, June 16

Deborah Fontaine, Maryland Department of Economic Development, July 1

Nancy Eickelmann, Linda Rosenberg, NASA, David Raffo, Wayne Harrison, Portland State Univ., July 12-13

Dieter Rombach, IESE Director, July 15-August 1

Marco Habetz, Michael Frey, University of Kaiserslautern, October through December

William Riddle, Brian Nejmah, October 8

Allan Willey, Motorola, November 16

Professional Activities

Victor R. 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 Eng. 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 (IESE), Kaiserslautern, Germany
- Chairman, NSF Workshop on a Software Research Program for the 21st Century, Greenbelt, Maryland, October 15-16, 1998
- Member, NSF Workshop on Scalable Enterprises, Greenbelt, Maryland, April 16-27, 1999

Mikael Lindvall

- Guest Editor for the IEEE Software Special Issue on Process Diversity

Ioana Rus

- Guest Editor for the IEEE Software Special Issue on Process Diversity
- Reviewer for SEPG2000 conference
- Reviewer for Computer Magazine

Forrest Shull

- Program Committee, Fifth Workshop on Empirical Studies of Software Maintenance 1999 (WESS '99)

Marvin V. Zelkowitz

- Program Committee, 11th International Conference on Software Engineering and Knowledge Engineering, Kaiserslautern, Germany, June, 1999
- Program Committee, International Workshop on Web-Based Information Visualization, Florence, Italy, September, 1999
- Program Committee., European Workshop on Software Process Technology, Vienna, Austria, February, 2000
- Series Editor, Advances in Computers, Academic Press, 1994 - present
- Editorial Advisory Board, J. of Computer Languages, 1980 - present
- Editorial Board, J. of Empirical Software Engineering, 1995 - present

Presentations and Tutorials

V. Basili, Chairman, Harlan Mills Symposium, ICSE '99 Conference, Los Angeles, California, May 1999

R. Pajerski, Using Metrics to Manage and Improve Software, ProjectWorld, Boston, MA, May 1999

M. Zelkowitz, The Y2K bug: What is it and do you care?, Mitretek, McLean, VA, June, 1999

V. Basili, "Understanding Software for Use: A Family of Empirical Studies," Third International Memorial Conference: Perspectives of System Informatics, Novosibirsk, Russia, July 6-10, 1999

V. Basili, Keynote address, "Software Improvement Feedback Loops: The SEL Experience," PSQT '99 Conference, Minneapolis, Minnesota, October 5, 1999

V. Basili, Keynote address, "Packaging Reading Techniques," 13th Brazilian Symposium on Software Engineering (SBES '99), Florianopolis, Brazil, October 13-15, 1999

F. Shull, Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA '99), Denver, Colorado, November 1999

Publications

Tesoriero R. and M. V. Zelkowitz: WebME: A Web-based tool for data analysis and presentation, 11th Software Technology Conference, Salt Lake City, UT, May, 1999

Shull, F., Travassos, G., and Basili, V.: Towards Techniques for Improved OO Design Inspections; Workshop on Quantitative Approaches in Object-Oriented Software Engineering, 13th European Conference on Object-Oriented Programming, Lisbon, Portugal, June 1999

Basili, V., Shull, F., and Lanubile, F.: Building Knowledge through Families of Experiments; IEEE Transactions on Software Engineering, July/August 1999

Rus I., Collofello J.: A Decision Support System for Software Reliability Engineering Strategy Selection, COMPSAC, Scottsdale, Arizona, October 1999

Travassos, G., Shull, F., Fredericks, M., and Basili, V.: Detecting Defects in Object-Oriented Designs: Using Reading Techniques to Increase Software Quality; Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA), Denver, Colorado, November 1999

Zelkowitz M. V. (Ed.), Advances in Computers, volumes 48-51, Academic Press, London, 1999


Expense of preparation
Expense of realization
Expense of inspection (hh:mm)
Expense of correction in minutes
Fraunhofer
Institut
Experimentelles
Software Engineering
IESE

Appendix

Overview

Network in Science and Industry

Industrial Partners

- ABB
- AEG Energietechnik GmbH
- Alcatel Alsthom (F)
- Alcatel (F)
- Alcatel-SEL AG
- Allianz Lebensversicherungs-AG
- Axis (S)
- BASF AG
- Bosch Telecom GmbH
- Brose GmbH & Co.
- BSR Consulting
- Combitech Software AB (S)
- DaimlerChrysler Aerospace AG
- DaimlerChrysler AG
- Deutsche Bank AG
- Deutsche Telekom AG
- DLR Deutsches Zentrum für Luft- und Raumfahrt
- Dräger Medical Technology (NL)
- Ericsson (S)
- Ericsson Eurolab Deutschland GmbH
- Ericsson LMF (FIN)
- Ericsson (USA)
- Ernst Informatik GmbH
- ESA European Space Agency
- Etnoteam (I)
- Irish Medical Systems (IRL)
- KoDa Kommunikations und Datentechnik
- Kretz Software GmbH
- Lucent Technologies GmbH
- Markant Südwest Handels AG
- Markant Südwest Software- und Dienstleistungs GmbH
- Market Maker Software AG
- Motorola (USA)
- Nokia NRC (FIN)
- Norwegian Health Informatics (N)
- Philips (NL)
- Psipenta Software Systems GmbH
- Q-Labs Software Engineering GmbH
- Q-Labs, Inc.(USA)
- Robert Bosch GmbH
- Sainco (E)
- Schlumberger RPS (F)
- Siemens AG
- Siemens (A)
- Siemens (N)
- Società Interbancaria per l'Automazione (I)
- Softlab GmbH
- softTECH - Software Technologie GmbH
- Software, design & management GmbH & Co. KG
- tecinno GmbH
- Tecmath GmbH
- Testo GmbH & Co. KG
- Thomson-CSF (F)
- Tokheim (NL)
- Union Fenosa (E)
- Videotronic
- Viva Software GmbH
- VTT Electronics (SF)

National Research Partners

- University of Kaiserslautern, Kaiserslautern, Germany (formal affiliation agreement)
- Center for Learning Systems and Applications (LSA), University of Kaiserslautern, Kaiserslautern, Germany; (IESE is member of LSA)
- Department of Programming Languages and Compilers, Institute of Computer Science, University of Stuttgart, Stuttgart, Germany (formal affiliation agreement)
- GMD First, Berlin, Germany
- Forschungszentrum für Informatik, FZI, Karlsruhe, Germany
- Institute for Manufacturing Engineering and Automation (IPA), FhG IPA, Stuttgart, Germany
- Institute for Image Processing and Applied Informatics e.V., University of Leipzig, Leipzig, Germany
- Knowledge Discovery and Machine Learning, Otto-von-Guericke Universität Magdeburg, Magdeburg, Germany
- Special Research Institute "Development of large Systems with Generic Methods" (SFB 501), University of Kaiserslautern, Kaiserslautern, Germany
- The Research Institute for Validation of AI Systems (VAIS), University of Technology Ilmenau, Illmenau, Germany
- Fernuniversität Hagen, Hagen, Germany
- University of Essen, Essen, Germany
- INRIA Rennes, Lande and Compose Groups, Rennes, France
- Telecommunications and Software Engineering Institute (TSE), Helsinki University of Technology, Helsinki, Finland
- Research in Software Engineering, University of Karlskrona Ronneby, Ronneby, Sweden
- Software Engineering Research Center (SERC), Netherlands
- Eindhoven Embedded Systems Institute (EESI), Eindhoven, Netherlands
- European Software Institute (ESI), Bilbao, Spain
- Technical University of Madrid, Madrid, Spain

International Research Partners

- Center for Advanced Empirical Software Research (CAESAR), University of New South Wales, Sydney, Australia (formal affiliation agreement)
- Center de Recherche Informatique de Montreal (CRIM), Montreal, Canada
- 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, USA (formal affiliation agreement)
- Federal University of Santa Catarina, Florianopolis, Brazil
- Georgia Tech University, Atlanta, Georgia, USA
- GrafP Technologies Inc., Montreal, Quebec, Canada
- Instituto per la Ricerca Scientifica e Technologica (IRST), Trento, Italy (formal affiliation agreement)
- Semantics Designs, Austin, Texas, USA
- Software Engineering Technology Inc. (SET), Knoxville, Tennessee, USA
- Software Engineering Institute (SEI), Carnegie Mellon University, Pittsburgh, Pennsylvania, USA (formal affiliation agreement)
- Swedish Institute of Production Engineering Research (IVF)
- Software Engineering Laboratory (SEL)
- NASA/Goddard Space Flight Center, Greenbelt, Maryland, USA
- Software Technology Transfer Finland, Espoo, Finland
- University of Oulu, Oulu, Finland
- University of Tennessee, Knoxville, Tennessee, USA
- VTT Electronics, Oulu, Finland
- Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands
- Norwegian University of Science and Technology, Trondheim, Norway
- Artificial Intelligence and Machine Learning, University of Wyoming, Laramy, Wyoming, USA
- Department of Computer Science, University of Utrecht, Utrecht, The Netherlands
- Expert Systems Group, Computer Sciences Corporation, St. Leonards, Australia
- Information and Software Engineering, George Mason University, Fairfax, Virginia, USA
- Cooperation Contract, Institute for Representation and Reasoning, University of Edinburgh, Edinburgh, Scotland, UK
- Knowledge Media Institute, Open University, Milton Keynes, United Kingdom
- Northern Ireland Knowledge Engineering Laboratory, University of Ulster, Newtownabbey, Northern Ireland, United Kingdom
- Software Process Support Lab, University of Calgary, Calgary, Alberta, Canada
- Independent Verification and Validation Facility, NASA Ames Research Center, Fairmont, Virginia, USA
- Institut für Informationsverarbeitung und Computergestützte neue Medien (IICM), Technische Universität, Graz, Austria
- Associacao CCG/ZGDV, Centro de Computacao Gráfica, Coimbra, Portugal
- Communiacion Interactiva S.L., Madrin, Spain
- HIGHWARE sarl, La Salvetat Saint-Gilles, France
- Center for Advance Empirical Software Research , University of New South Wales, Sydney, Australia
- Center for Object Technology Applications and Research, Sydney University of Technology, Sydney, Australia
- Joint Research Centre for Advanced Systems Engineering, Macquarie University, Sydney, Australia
- Software Productivity Consortium NFP, Herndon, USA
- George Mason University, Fairfax, Virginia, USA
- Institute for Information Technology, National Research Council of Canada, Ottawa, Canada
- BOOTSTRAP Institute, Oulunsalo, Finland
- Department of Systems and Informatics, University of Florence, Florence, Italy

International Software Engineering Research Network (ISERN)

- Central Research Institute of Electric Power Industry; Japan
- CSIRO; Australia
- DaimlerChrysler Research Center; Germany
- Ericsson Radio Systems AB; Sweden
- Fraunhofer Center Maryland, Maryland; USA
- Fraunhofer Institute for Experimental Software Engineering, Rhineland-Palatinate; Germany
- Lucent Technologies - Bell Laboratories, Illinois; USA
- Lund University; Sweden
- Macquarie University; Australia
- Nara Institute of Science and Technology; Japan
- Norwegian University of Technology & Science; Norway
- NTT Data Corp.; Japan
- Quality Laboratories Sweden AB (Q-Labs); Sweden
- Universita' degli Studi di Roma "Tor Vergata"; Italy
- University of Bari; Italy
- University of Hawaii, Hawaii; USA
- University of Kaiserslautern, Rhineland-Palatinate; Germany
- University of Maryland at College Park, Maryland; USA
- University of New South Wales; Australia
- University of Rome - Tor Vergata; Italy
- University of Strathclyde, Scotland; U.K.
- VTT Electronics; Finland

Visitors hosted

- Prof. Dr. Stan Jarzabek, National University of Singapore, Singapore, January 99-June 99

- Prof. Daniel Berry, University of Waterloo, Computer Systems Group, Waterloo, Ontario, Canada, February 17

- Dr. Allen Dutoit, Technische Universität München, Institut für Informatik, München, Germany, April 8

- Nancy Mead, PH.D., Senior Member of the Technical Staff, Carnegie Mellon University, Software Engineering Institute, Pittsburgh, Pennsylvania, USA, June 5

- Dr. Andrew Brooks, University of Strathclyde, Department of Computer Science, Glasgow, Scotland, September 24

- Dr. Ira Baxter, Vice President, Semantic Designs Inc., Austin, Texas, USA, October 1

- Dr. Marc Kellner, Senior Scientist, SEI, Pittsburgh, PA, USA, October 18-19

Letters from Guest Scientists

Tristen Langley

The Centre for Empirical Software Engineering Research (CAESAR) at the University of New South Wales in Australia has partnered with the Fraunhofer Fraunhofer IESE in sponsoring a research exchange program for students completing degrees in the area of software engineering. I am a student from the University of New South Wales, and I took the opportunity in 1999 to complete a six-month research exchange. In collaboration with the European Space Agency and INSEAD, our team at Fraunhofer IESE conducted research in the area of software development cost estimation. Living and working in Kaiserslautern offered a unique experience. I was able to appreciate a foreign language, culture, and exciting sporting customs - 'football!' Thank you to Dr. Lionel Briand and Isabella Wieczorek from the Fraunhofer Fraunhofer IESE and Professor Ross Jeffery and Dr. Richard Webby from UNSW-CAESAR. The international contribution is a reflection of the enriching research environment that Fraunhofer IESE offers. I have returned to Sydney, and I am working with software and technology project implementations throughout various industries. Thus, the software engineering principles that I have studied have been appreciated in application.

Stan Jarzabek

Sabbatical leave - that is an opportunity to widen professional horizons, fuel research with new ideas, and also get to know new people, make friends, and refresh one's mind in a new environment. As sabbaticals happen in the academician's life only once in 6 years, one must carefully choose the attachment not to waste such an opportunity. I was lucky to spend 6 months of my sabbatical at the Fraunhofer IESE in Kaiserslautern. As a researcher in software engineering, it is critical for me to be in touch with industry and confront ideas with realities of industrial software development. At Fraunhofer IESE, projects are driven by industrial needs, but the solutions Fraunhofer IESE proposes to its industrial partners are based on innovative research ideas. A number of such projects were in the scope of my work, notably Product Line, Reengineering, and Kobra projects (the last one on integrating domain engineering and component approaches). I enjoyed project discussions and informal meetings with many people I met at Fraunhofer IESE. I value their expertise and excellence in work. Thank you Peter Knauber, Colin Atkinson, Jean-François Girard, Martin Würthner, Dirk Mutig and many others for making my sabbatical at Fraunhofer IESE so interesting and fulfilling. And after work, southern Germany is a spectacular area to visit, with many charming, historic towns and with easy access to beautiful regions in neighbouring countries.

Janne Järvinen

VTT Electronics in Oulu, Finland had teamed up with Fraunhofer IESE to do an ESPRIT project PROFES on product focused process improvement. I applied for a year of research exchange, thinking that I could be in closer contact with Fraunhofer IESE's PROFES team and learn one or two things in the world's premier place for experimental software engineering. Well, I was right - except that my year at Fraunhofer IESE expanded to 18 months. It was great seeing how the people participated in making the vision of the institute a reality. This is maybe not so evident for people in their day-to-day work, but having so many people working towards common themes forms a critical mass that is not merely maintaining but also creating new world-class knowledge. For a Finn, the culture in Germany is not so different from Finland, except that in Finland there are fewer convertibles in winter and football stadiums ten times smaller. Perhaps the most surprising elements for me were the vital village communities and the closeness of nature - a good place to live.

Lecturing Assignments at Universities

Althoff, K.:
Lecture:
Constructing Knowledge-Based Systems for Decision Support and Diagnosis
Department of Computer Science
University of Kaiserslautern
Summer Semester 1999

Althoff, K.:
Lecture:
Applications of Case-Based Systems
Department of Computer Science
University of Kaiserslautern
Winter Semester 1999

Atkinson, C.:
Lecture:
Object-Oriented Software Development
AGSE, Department of Computer Science
University of Kaiserslautern
Winter Semester 1998/1999

Atkinson, C.:
Lecture:
Entwicklung von Software Systemen II
AGSE, Department of Computer Science
University of Kaiserslautern
Summer Semester 1999

Atkinson, C.:
Lecture:
Entwicklung von Software Systemen I
AGSE, Department of Computer Science
University of Kaiserslautern
Winter Semester 1999/2000

Atkinson, C.:
Lecture:
Research on object-oriented analysis and design
Department of Computer Science
University of Kaiserslautern
April 1999

Atkinson, C.:
2 lectures:
Object technology Overview
BASF Ludwigshafen
March 16 & 27 1999

Bayer, J.:
1-day lecture:
Architecture Development at IESE: PuLSE-DSSA
In: P. Knauber Product Line Software Engineering Lecture
June 10 1999

Bayer, J.:
1-day lecture:
Instantiation of Product Lines: PuLSE-I
In: P. Knauber Product Line Software Engineering Lecture
July 2 1999

Becker-Kornstaedt, U.:
Lecture:
Documentation Specialist
SWA Software-Akademie Kaiserslautern
June - July 1999

Bunse, C.:
Lecture:
The Unified Modeling Language (UML)
Schneider-Automation
August 1999

Gacek, C.:
Lecture:
Software Architectures - Creation and Representation
University of Kaiserslautern
June 1999

Girard, J.-F.:
Lecture:
Re- and Reverse Engineering
Department of Computer Science
University of Kaiserslautern
Winter Semester 1999

Kamsties, E.:
Lecture:
Documentation Specialist
SWA Software-Akademie Kaiserslautern
March - May 1999

Kamsties, E.:
Lecture:
OO-Anwendungsentwickler
SWA Software-Akademie Kaiserslautern
March - May 1999

Kamsties, E.:
Seminar:
Modeling Embedded Systems with CASE-Tools
AGSE, Department of Computer Science
University of Kaiserslautern & TU Munich
Spring 1999

Kamsties, E.:
2 sessions of lecture:
Requirements Engineering
Department of Computer Science
University of Kaiserslautern
July 1999

Kamsties, E.:
Lecture:
Documentation Specialist
Software-Akademie
August 1999

Kamsties, E.:
Lecture:
OO-Anwendungsentwickler
SWA Software-Akademie Kaiserslautern
September - October 1999

Kamsties, E.:
2-day lectures:
Anforderungspezifikation und Management
SWA Software-Akademie Kaiserslautern
October 1999

Knauber, P.:
Lecture:
Product Line Software Engineering
Department of Computer Science
University of Kaiserslautern
Summer Semester 1999

Knauber, P.:
Lecture:
Re- and Reverse Engineering
Department of Computer Science
University of Kaiserslautern
Winter Semester 1999

Laitenberger, O.:
Lecture:
OO-Anwendungsentwickler
SWA Software-Akademie Kaiserslautern
August 23-25-261999

Müller, W.:
Lecture:
Software Qualitätsmanagement (OO-Anwendungsentwickler)
SWA Software-Akademie Kaiserslautern
August 1999

Paech, B.:
Lecture:
Documentation Specialist
SWA Software-Akademie Kaiserslautern
March - May 1999

Paech, B.:
Lecture:
OO-Anwendungsentwickler
SWA Software-Akademie Kaiserslautern
March - May 1999

Paech, B.:
Lecture:
Requirements Engineering
Department of Computer Science
University of Kaiserslautern
Summer Semester 1999

Paech, B.:
2-day lectures:
Anforderungspezifikation und Management
SWA Software-Akademie Kaiserslautern
October 1999

Rombach, D.:
Lecture:
Software Engineering I
Department of Computer Science
University of Kaiserslautern
Winter Semester 1998/1999

Rombach, D.:
Project Course:
Software Engineering II
Department of Computer Science
University of Kaiserslautern
Winter Semester 1998/1999

Rombach, D., Ruhe, Günther:
Lecture:
Software Engineering II
Department of Computer Science
University of Kaiserslautern
Summer Semester 1999

Rombach, D.:
Seminar:
Qualitäts- und Prozess-Engineering
Department of Computer Science
University of Kaiserslautern
Summer Semester 1999

Rombach, D.:
Proseminar:
Electronic Commerce im Internet
Department of Computer Science
University of Kaiserslautern
Summer Semester 1999

Würthner, M.:
Lecture:
Software Reuse (OO-Anwendungs-entwickler)
SWA Software-Akademie Kaiserslautern
July 1999

Journal Editorships

Briand, L.:
Empirical Software Engineering: An International Journal

El-Emam, K.:
Software Process Newsletter

Rombach, D.:
IEEE Software Magazine

Rombach, D.:
The Journal of Systems and Software

Rombach, D.:
Informatik: Forschung und Entwicklung

Rombach, D.:
International Journal of Software Process: Improvement and Practice

Rombach, D.:
International Journal of Empirical Software Engineering
(Associate Editor for Europe)

Ruhe, G.:
International Journal of Software Engineering and Knowledge Engineering
Special Issue on Knowledge Discovery from Empirical Software Engineering Data (Guest Editor)

Committee Activities

Althoff, K.:

- Co-Speaker, Special Interest Group on Machine Learning of the German Computer Science Society (GI), since 1994
- PC Member, International Conference on Case-Based Reasoning ICCBR, since 1995
- Member, Virtual Research Institute on Validation of AI Systems (VAIS), since 1997
- PC Member, European Workshop on Case-Based Reasoning EWCBR, since 1998
- PC Member, European Conference on Machine Learning ECML, since 1999
- PC Member, German Conference on Knowledge-Based Systems XPS'99, Knowledge Management and Organizational Management, March 1999
- PC Member, International Conference on Software Engineering and Knowledge Engineering SEKE'99, Workshop Learning Software Organization held in conjunction with the SEKE 99, Kaiserslautern, June 1999
- Program Chair, International Conference on Case-Based Reasoning ICCBR'99, July 1999
- PC Member, International Conference on Case-Based Reasoning ICCBR'99, Practical Case-Based Reasoning Strategies for Building Corporate Memories, July 1999
- PC Member, International Conference on Artificial Intelligence IJCAI'99, Automating the Construction of Case-Based Reasoners, August 1999
- Member of the Scientific Advisory Board, tec:inno GmbH Kaiserslautern, since 1999
- Speaker Election Leader, Special Interest Group on Case-Based Reasoning of the German Computer Science Society (GI), April - September 1999
- Management Board Member, German Computer Science Society (GI), Department of Artificial Intelligence, since September 1999
- PhD Committee Member, Department of Computer Science, University of Delft, April 1999

Atkinson, C.:

- General Chair, EDOC '99, 1999
- PC Member, UML '99, 1999

Bomarius, F.:

- Organizer, SEKE'99, Workshop Learning Software Organization held in conjunction with the SEKE 99, Kaiserslautern, June 1999
- PC Member, ICCBR'99, Workshop Case-Based Reasoning Strategies for Building and Maintaining Corporate Memories held in conjunction with the ICCBR '99, Munich
- PC Member, CONQUEST'99

Girard, J.-F.:

- PC Member, ICSM'99 - International Conference On Software Maintenance, since 1999
- PC Member, WCRE99 - Working Conference on Reverse Engineering, since 1998
- PC Member, ECSMR99 - European Conference on Software Maintenance and Reengineering, since 1999

Kamsties, E.:

- Organization Committee Member, Dagstuhl Seminar - Requirements Capture, Documentation and Validation, Requirements Engineering, June 1999

Knauber, P.:

- PC Member, SCI/ISAS '99

Müller, W.:

- PC Member, International Conference on Case-Based Reasoning ICCBR '99, Workshop Case-Based Reasoning Strategies for Building and Maintaining Corporate Memories held in conjunction with the ICCBR '99, Munich, July 1999
- PC Member, Software Engineering and Knowledge Engineering, SEKE'99, Workshop Learning Software Organization held in conjunction with the SEKE 99, Kaiserslautern, June 1999

Oivo, M.:

- PC Co-Chair, International Conference on Product Focused Software Process Improvement (Profes '99)
- PC Member, Eleventh International Conference on Software Engineering and Knowledge Engineering (SEKE '99)

- PC Member, Seventh European Workshop on Software Process Technology (EWSPT-7)

- PC Member, Euromicro '99

- PC Member, European Conference on Software Quality in year 2002

- Organizing Chair, Annual ISERN '99 Meeting, Annual Meeting of the International Software Engineering Network

Paech, B.:

- PC Member, Modellierung '99, March 1999

- PC Member, UML '99, 1999

- Session Chair, HCI '99, Workshop: Synergy of Requirements and User Documentation and Modeling, August 1999

Pfahl, D.:

- PC Member, Software Process Simulation Modeling Workshop (ProSim '99), March - June 1999

Rombach, D.:

- Session Chair, SQM'99, Software Qualitätsmanagement, April 1999

- Steering Committee Member, International Conference on Software Engineering, ICSE'99

- General Chair, Software Engineering and Knowledge Engineering, SEKE'99,16-19 June 1999

- General Chair, Product Focused Improvement for Embedded Software Processes, Profes'99, 22-24 June 1999

- Member, Technologiebeirat, Rheinland-Pfalz, Mainz, since 1994

- Member of the Supervisory Board of the German National Research Center for Information Technology (GMD), since 1996

- Member, Advisory Board of Q-Labs, Oulu, Finland, since 1996

- Head of Scientific Advisory Board, SWA Software Akademie AG, Kaiserslautern, since 1998

- Senior Member, Institute of Electrical and Electronics Engineers (IEEE), since 1996

- Member, Advisory Board of 'Arbeitsgemeinschaft der Bayrischen Forschungsverbünde', München, since 1999

- Member, Scientific Board of EXPO 2000, since 1998

- Member, Stiftungsrat 'Wipprecht', Universität Kaiserslautern, Kaiserslautern

- Steering Committee Member, Metrics '99, Sixth International Symposium on Software Metrics, Boca Raton, Florida, USA

Ruhe, G.:

- PC Member, Profes'99

- PC Chair, SEKE'99

Scott, L.:

- Organising Committee Member, First International Symposium on Constructing Software Engineering Tools, May 1999

Verlage, M.:

- Organization, 6. Workshop der GI-Fachgruppe 5.1.1, "Vorgehensmodelle, Prozessverbesserung und Qualitätsmanagement",19 - 20 April 1999

Tautz, C.:

- Organization Committee Member, International Conference on Case-Based Reasoning ICCBR '99,

- Workshop on Practical Case-Based Reasoning Strategies for Building and Maintaining Corporate Memories, July 27-30 1999

- PC Member, International Journal on Human Computer Studies, Special Issue on Organizational Memory and Knowledge Management, 1999

Key Notes

Knauber, P.:
Can Software Product Lines Pay for Small and Medium-Sized Enterprises?, SCI / ISAS '99, Orlando, Florida, USA, 2 August 1999

Rombach, D.:
Software Experience Factory: Basis für beschleunigte Prozessverbesserung GI-Workshop, 'Vorgehensmodelle', Kaiserslautern, Germany, 19 April 1999

Rombach, D.:
Product Focused Software Process Improvement, PROFES'99, Oulu, Finland, 23 June 1999

Rombach, D.:
Experimental Software Engineering, KKIO'99 Conference, First National Software Engineering Conference, Kazimierz Dolny, Poland, 11-13 October 1999

Rombach, D.:
Experimentation: Engine for Applied Research and Technology Transfer in Software Engineering
NASA's SEL-Workshop, NASA, Greenbelt, USA, 1-3 December 1999

Presentations

Althoff, K.:
An Application Implementing Reuse Concepts of the Experience Factory for the Transfer of CBR System, Know-How, Paper presentation, GWCBR'99/ XPS'99, Würzburg, Germany, 3 April 1999

Althoff, K.:
Using Case-Based Reasoning to Build Learning Software Organizations, Invited Talk, University of Delft, Department of Computer Science Delft, The Netherlands, 6 April 1999

Althoff, K.:
Case-Based Information Systems for Supporting Knowledge Management and Organizational Learning, Invited Talk, University of Leipzig, Leipzig, Germany, 7 May 1999

Althoff, K.:
Knowledge Maintenance, Panel discussion, SEKE'99, Kaiserslautern, Germany, 17 June 1999

Althoff, K.:
Intelligent Retrieval of Software Engineering Experienceware, Paper presentation, SEKE'100, Kaiserslautern, Germany, 18 June 1999

Althoff, K.:
Using Case-Based Reasoning for Supporting Continuous Improvement Processes, Paper presentation, FGML'99/LWA'99, Magdeburg, Germany, 28 September 1999

Atkinson, C.:
Dimension of Component-Based Software Engineering, Presentation, ABB, Heidelberg, 12 November 1999

Atkinson, C.:
Research on OOA/D at the University of Kaiserslautern and IESE, Talk, SD&M, Frankfurt, Germany, 16 April 1999

Atkinson, C.:
Dimension of Component Based Development Conference, WCOP '99 (ECOOP '99), Lisbon, Portugal, 14 June 1999

Bayer, J.:
Transitioning Legacy Assets to a Product Line Architecture, Conference ESEC/FSE '99, Toulouse, France, 06 - 10 September 1999

Becker-Kornstaedt, U.:
Der V-Modell-Guide: Web-basierte Unterstützung eines Prozess-Standards, Talk, GI-Workshop, Gesellschaft f. Informatik, Kaiserslautern, Germany, 20 April 1999

Becker-Kornstaedt, U.:
The V-Modell-Guide: Experience with a Web-based Process Support, Talk, Software Technology and Engineering Practice, Pittsburgh, USA, 1 September 1999

Beitz, A.:
A Business Focus to Assessments, Paper presentation, SPI '99, Barcelona, Spain, 1 December 1999

Beitz, A.:
SPICE Trials Phase 3 Begins, Talk, DIN NI-7, Köln, Germany, 16 September 1999

Beitz, A.:
The SPICE Trials, Talk, DIN NI-7, Köln, Germany, 9 February 1999

Birk, A.:
Methodological Concepts for Product-Focused SPI, Industrieseminar, SPIder Plenary Session on Product-Focused Process Improvement SPIder - The Dutch Software Process Improvement Network, Vught, The Netherlands, 8 February 1999

Birk, A.:
The PROFES Methodology for Product Focused Process Improvement, Conference, Software-Qualitätsmanagement 1999 (SQM'99), Köln, Germany, 29 April 1999

Birk, A.:
Applications of Knowledge Acquisition in Experimental Software Engineering, Workshop, 11th European Workshop on Knowledge Acquisition, Modeling and Management (EKAW'99), Dagstuhl,
Germany, 29 May 1999

Birk, A.:
A Knowledge Management Lifecycle for Experience Packages on Software Engineering Technologies
Workshop, the Workshop on Learning Software Organizations (LSO'99), Kaiserslautern, Germany,
16 June 1999

Birk, A.:
Product-Driven Process Improvement Using PROFES Improvement Methodology, Tutorial, 11th International Conference on Software Engineering and Knowledge Engineering (SEKE'99), Kaiserslautern, Germany, 16 June 1999

Birk, A.:
Studying Large-Scale Processes in Industrial Settings, Workshop, Annual Meeting of the International Software Engineering Research Network (ISERN'99), Oulu, Finland, 20 June 1999

Birk, A.:
A Validation Approach for Product-Focused Process Improvement, Conference, International Conference on Product-Focused Process Improvement (PROFES'99), Oulu, Finland, 23 June 1999

Birk, A., Müller, W.:
Produktbezogenes Verbessern von Software-Entwicklungsprozessen, Industrieseminar, Robert- Bosch Schwieberdingen, Germany, 16 September 1999

Birk, A.:
Benefit and Cost of Goal-Oriented Measurement in Software Engineering, Universitätsseminar, Helsinki University of Technology, Helsinki, Finland, 21 October 1999

Birk, A.:
Steering Software Process Improvement Towards Better Product and Service Quality, Industrieseminar,
Ericsson Finland, Jorvas, Finland, 22 October 1999

Bomarius, F.:
Vorgehensmodelle, Audits, Assessments lösen nicht die eigentlichen Probleme der Software-Entwicklung, Panel discussion, Workshop GI FG 5.1.1, Gesellschaft für Informatik, Kaiserslautern, Germany, April 1999

Bomarius, F.:
From Experience Databases to Learning Software Organizations, Panel discussion, SEKE '99, Workshop Learning Software Organizations, Kaiserslautern, Germany, 18 June 1999

Bunse, C.:
Improving quality of object-oriented software: Systematic Refinement & Translation of models to code Conference 12th international Conference on Software Systems Engineering and their Applications (ICSSEA '99) Paris France Dec. 99

Bunse, C.:
The Normal Object Form: Bridging the gap from Models to Code, Conference, UML '99, Fort Collins, CO, USA, 28-30 Oct. 1999

Freimut, B., Wieczorek, I.:
Cost and Quality Measurement in Practice, Conference Tutorial, QWE '99, Brussels, Belgium, 2 November 1999

Gacek, C.:
IESE's plans for ESAPS, Presentation, D-ESAPS Kickoff Meeting, Siemens, Munich, Germany, 12 August 1999

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Kaiserslautern, Germany, December 1999

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Colin Atkinson
Bestes Grundstudium (ESS II), Universität Kaiserslautern, Kaiserslautern, Germany, Summer Semester 1999

Internal

Manfred Eberle
The Fraunhofer IESE 1999 Award for Project Excellence

Susanne Hartkopf
The Fraunhofer IESE 1999 Award for Project Excellence

Sonnhild Namingha
The Fraunhofer IESE 1999 Award for Infrastructure Excellence

Sabine Peter
The Fraunhofer IESE 1999 Award for Infrastructure Excellence

Andrew Beitz
The Fraunhofer IESE 1999 Award for Research Excellence

Dirk Muthig
The Fraunhofer IESE 1999 Award for Research Excellence

Carsten Buch
The Fraunhofer IESE 1999 Award for Thesis Excellence

Marcel Dörr
The Fraunhofer IESE 1999 Award for Thesis Excellence

Björn Snoek
The Fraunhofer IESE 1999 Award for Thesis Excellence

Chronicle

January 26
Visit of a delegation from South Carolina (Fred Monk, Susanna Auf der Maur, Thomas E. Persons, Craig A. Rogers) at Fraunhofer IESE

February 3
Visit of a delegation of Social Democratic members of the Rhineland Palatinate State Parliament at Fraunhofer IESE

March 18-24
Participation of Fraunhofer IESE in CeBIT '99 in Hannover

April 19-20
Workshop at Fraunhofer IESE: "Vorgehensmodelle, Prozessverbesserung und Qualitätsmanagement"

April 28-30
Participation in SQM'99 Congress "Software-Qualitätsmanagement - Made in Germany" in Cologne

June 16-19
Organization of and participation in "Eleventh International Conference on Software Engineering and Knowledge Engineering" SEKE'99 in Kaiserslautern

June 18-20
Visit of Joseph J. James (Prince George's County Economic Development Corporation) at Fraunhofer IESE

June 22-24
Participation in "International Conference on Product Focused Software Process Improvement", Profes'99 in Oulu, Finland

June 24-25
Participation in "Contact Forum - EURO REGIO PARTNERS'99" in Saarbrücken

June 24-26
Participation in "Innova'99" exhibition in Pirmasens

July 27
Participation in "3rd International Conference on Case-Based Reasoning" - Industry Day in Munich

September 20
Participation in workshop "Software Project Risk Management and Cost Estimation - Essential Components for Success in IT Management" in Fontainebleau, France

September 27-29
Participation in "CONQUEST'99 - Quality Engineering in Software Technology" in Nuremberg

September 28
Visit of Kaiserslautern CDU city council members (J. Deubig, F. Naumann, E. Neumeyer, G. Remler, B. Rosenberger) at Fraunhofer IESE

September 30
Participation in "Kongress der Multimedia-Initiative Rheinland-Pfalz" in Mainz

October 5-6
Meeting of the Fraunhofer Hauptkommission at Fraunhofer IESE (E. Bergner, H. Egner, Prof. Dr. J. Encarnacao, Dr. V. Guyenot, Prof. Dr. W. Hermel, Dr. A. Imbusch, Dr. H. Jung, Prof. Dr. J. Luther, Prof. Dr. F. Meyer-Krahmer, Dr. U. Nobbe, Dr. D.-M. Polter, Prof. Dr. E. Sommer Warken, Prof. Dr. H.-J. Warnecke, Dr. H.-U. Wiese

October 22
Visit of students from the department of computer science student body of Kaiserslautern University at Fraunhofer IESE

Media Coverage

Media Coverage of the Fraunhofer IESE Reports and articles about the Fraunhofer IESE have been published in the following media:

Dpa/lrs
01-15-1999
TV SWR3 RP
03-08-1999
Die Rheinpfalz
01-12-1999
Die Rheinpfalz
01-16-1999
Die Rheinpfalz
01-16-1999
Die Rheinpfalz
01-16-1999
Die Rheinpfalz
01-26-1999
Die Rheinpfalz
01-27-1999
Die Rheinpfalz
02-04-1999
Die Rheinpfalz
02-13-1999
Die Rheinpfalz
02-25-1999
Die Rheinpfalz
04-21-1999
Die Rheinpfalz
11-06-1999
Die Rheinpfalz
11-06-1999
Die Rheinpfalz
11-08-1999

„Softwarequalität zahlt sich aus“

Professor Dieter Rombach, Chef der Fraunhofer-Einrichtung für Experimentelles Software-Engineering, über ein vernachlässigtes Gebiet der IT-Forschung, auf dem Deutschland international mithalten kann.

CW: Rechnen Sie während der nächsten zehn Jahre – vielleicht auch schon kommendes Jahr, wenn die Menschen miterlebt haben, wieviel Ärgernisse das Jahr-2000-Problem in der Praxis verursacht hat – mit einem Umdenken in Sachen Softwarequalität?

Rombach: Manchmal muß ein defekter Krug so lange zum Wasser gehen, bis er bricht. Das gilt auch für mangelhafte Software: Jahr-2000-bedingte Systemzusammenbrüche werden bei industriellen Entscheidern und auch bei den Anwendern zu einem Einstellungswandel führen. Schon jetzt zeigt sich, daß Geschäftsleitungen bei dem Ärger mit dem Jahr-2000-Problem auf die Notwendigkeit gestoßen sind, mehr für eine langfristige Software-Qualitäts-Strategie zu tun. Doch Katastrophen sind das eine, wirtschaftliche Zwänge das andere. Letztlich werden Hersteller von Software, die Value-added-Reseller und die Anwender aufgrund simpler Kosten-Nutzen-Erwägungen erkennen, daß Softwarequalität sich auszahlt.

CW: Und wenn nicht? Was sind die Folgen für Wirtschaft, Gesellschaft und Sicherheit, wenn immer mächtigere Software genauso lausig programmiert wird wie heute?

Rombach: Einerseits gibt es wirtschaftliche Verluste in Milliardenhöhe. Durch schlecht geplante Softwaresysteme entstehen Reibungsverluste in den Betrieben, Anlagen fallen aus, oder es müssen überproportionale Anstrengungen für die Wartung unternommen werden. Wenn sicherheitskritische Systeme versagen, sind Menschenleben gefährdet. Das kann sich kein Softwarehersteller leisten. Die Produkthaftung wird zu einem Wandel führen.

Es geht auch um die gesellschaftliche Akzeptanz gegenüber komplexen technischen Systemen, ohne die unsere moderne Zivilisation nicht auskommt. Es darf nicht dazu kommen, daß nach der Anti-Kernkraft-Bewegung vielleicht eine Anti-Software-Bewegung entsteht. Nicht zuletzt stehen Arbeitsplätze auf dem Spiel. Wenn deutsche Software-Entwickler nicht in der Lage sind, Produkte mit nachweisbarer Qualität zu liefern, gibt es keinen Grund, die Entwicklung nicht in Niedriglohnländer zu verlagern.

CW: Warum hat sich das ingenieursmäßige Vorgehen eigentlich nicht längst durchgesetzt?

Rombach: Die industrielle – also arbeitsteilige, marktorientierte – Entwicklung von Software ist im Vergleich zur gewerblichen Güterproduktion ziemlich jung. Wozu die klassischen Ingenieurswissenschaften über hundert Jahre Zeit hatten, das müssen wir Software-Ingenieure in wenigen Jahren schaffen.

Computerwoche, November 12, 1999

Kobra, übernehmen Sie

Softlab und PSI wollen gemeinsam mit dem GMD Institut FIRST (Forschungsinstitut für Rechnerarchitektur und Softwaretechnik) und dem Institut der Fraunhofer Gesellschaft IESE (Institut für Experimentelles Software Engineering) das Forschungsprojekt KobrA (Komponentenbasierte Anwendungsentwicklung) durchführen. Vom Bundesministerium für Bildung und Forschung erhält man Fördergelder.

Die neuen Techniken sollen entsprechenden Anbietern einen leichteren Marktzugang ermöglichen und Programmierern höhere Effizienz beim Aufbau von Anwendungen.

IX Multiuser Multitasking Magazin, August, 1999

Computerzeitung, June 24, 1999

Programmierte Qualität

Die Exportschlager der deutschen Software sind keine Massenartikel, sondern „eingebaute“ Systemkomponenten. Und die spielen in immer mehr technischen Systemen eine Schlüsselrolle. Jetzt muß das Qualitätsmanagement greifen – dann stehen die Chancen gut, daß die Embedded Systems noch häufiger aus dem Land der Ingenieure geliefert werden.

US-Unternehmen investieren jährlich mehr als 250 Milliarden Dollar in die Beschaffung von Softwareprodukten und Services. Auch deutsche Firmen müssen immer mehr Software in ihre Produkte packen, Software, die sie durchaus nicht immer selbst programmieren: „Für die nicht systemrelevanten Geschäftsprozesse steigt der Anteil von Standardsoftware erheblich, während wettbewerbsrelevante Prozesse durch Individualsoftware unterstützt werden“, betont Gerhard Getto von der Abteilung Prozeßgestaltung im Bereich Forschung und Technologie der Daimler-Chrysler AG in Ulm. „Auch die Realisierung von Individualsoftware wird in der Regel nicht bei uns, sondern in Zusammenarbeit mit Fremdfirmen durchgeführt.“

„Auch die Anlagen- und Verkehrstechnik sind zunehmend softwaredominiert. Hier sind wir in Deutschland als Systemintegratoren Spitze.“

Das bestätigt auch Martin Verlage vom Kaiserslauterer Fraunhofer-Institut für Experimentelles Software-Engineering, kurz IESE: „Weltweiter Verkauf von Software made in Germany läuft selten über ein tolles Programm für den Massenmarkt, sondern viel häufiger in Form von veredelten Produkten. Wenn man heutzutage Fahrzeuge aus den Vereinigten Staaten mit jenen aus Deutschland vergleicht, dann sind letztere eindeutig intelligenter. Warum? Weil sie mehr intelligente Softwarekomponenten enthalten.“

Der Weg über Betaversionen ist nicht gangbar

Führende deutsche und europäische Firmen arbeiten deshalb an einer Verbesserung ihrer Softwareentwicklungsprozesse. Im vom IESE mit initiierten Software Experience Center wird dazu ein reger internationaler Informationsaustausch gepflegt. Denn die deutsche Spitzenstellung ist durchaus nicht frei von Erschütterungen: So hat die Volkswagen AG 35 000 Golf zurückgerufen, weil ein Fehler in der Airbag-Software festgestellt wurde.

„Besitzt eine Organisation eine Strategie und Methoden der Softwarebeschaffung, so können die Risiken erheblich gemindert werden“, hat Daimler-Chrysler-Manager Getto herausgefunden. Erfahrungen, die in Deutschland mit der systematischen Qualitätsverbesserung gesammelt werden, kommen also den Abnehmern hierzulande direkt zugute.

Dabei kann niemand das

...scheidet zunehmend das Qualitätsmanagement über den Erfolg des ...mentelles

REGION SÜDWEST

NR. 260 — SAMSTAG/SONNTAG, 6./7. NOVEMBER 1999

Erstes Fraunhofer-Institut in Rheinland-Pfalz

Ehrgeizige Pläne: Forschungsstätte soll in den nächsten zwei Jahren zum weltweit führenden Kompetenzzentrum für Software-Entwicklung ausgebaut werden

Die Fraunhofer-Gesellschaft gab gestern grünes Licht für die Aufwertung der Fraunhofer-Einrichtung für Experimentelle Software Engineering in Kaiserslautern zum dauerhaften Fraunhofer-Institut.

— Von IRA SCHAIBLE, Kaiserslautern —

Rheinland-Pfalz hat sein erstes Fraunhofer-Institut: Nach drei Jahren Beobachtungszeit wurde die Fraunhofer-Einrichtung für Experimentelles Software Engineering (IESE) in Kaiserslautern am Freitag offiziell zu einem dauerhaften Institut der europaweit größten Organisation für angewandte Forschung aufgewertet. Damit sei eine Garantieerklärung für das Fortbestehen des Instituts über das Jahr 2001 verbunden, teilte das Wissenschaftsministerium gestern mit. Die Forschungsstätte soll in den nächsten zwei Jahren zu einem weltweit führenden Kompetenzzentrum für Software-Entwicklung ausgebaut werden, kündigte IESE-Leiter Professor Dieter Rombach an. „Das ist vor allem eine Frage der Sichtbarkeit."

Die Westpfalz werde sich zu einem der führenden Standorte in Deutschland für Informations-Technologie entwickeln. Die Zahl der IESE-Beschäftigten von derzeit rund 140 Voll- und Teilzeitkräften werde sich in den nächsten Jahren zumindest verdoppeln. Die Informatiker, Elektrotechniker, Wirtschafts-Ingenieure und Maschinenbauer befassen sich Rombach zufolge mit der Entwicklung von Software, die in Produkten und Dienstleistungen steckt wie etwa dem Handy oder dem ABS-System im Auto. Ihr Ziel ist eine garantiert fehlerfreie Software, die Rückrufaktionen ausschließt.

Ein anderer Schwerpunkt ist die Sicherheit beim Electronic Commerce (Internet-Handel). Das Institut verfügt über einen jährlichen Etat von rund elf Millionen Mark, von dem zwei Drittel Projektmittel sind. Zu den Partnern und Kunden der Forscher zählen Rombach unter anderem Daimler-Chrysler, Bosch, Siemens, die Deutsche Bank oder Telekom. „Wir sind aber auch Ansprechpartner für kleinere und mittlere Unternehmen", betont Rombach.

Mit der Aufnahme der Einrichtung als vollwertiges Fraunhofer-Institut hat das Schlusslicht Rheinland-Pfalz mit den anderen Bundesländern gleichgezogen, die alle schon ein Fraunhofer-Institut haben, wie der Sprecher der Gesellschaft (FhG) in München, Franz Miller, berichtet. Wissenschaftsminister Jürgen Zöllner (SPD) und rheinland-pfälzische Forscher haben jedoch schon zum nächsten Qualitätssprung angesetzt: So wird das Institut für Technologie- und Wirtschaftsmathematik in Kaiserslautern im nächsten Jahr ebenfalls in die Fraunhofer-Gesellschaft aufgenommen, wie Miller ankündigt.

Bis 2002 soll es zusammen mit dem IESE in einem Neubau in Kaiserslautern einziehen. Die Westpfalz könnte neben Freiburg, Stuttgart und Dresden mit dem vierten Fraunhofer-Zentrum in Deutschland glänzen, betont IESE-Leiter Prof. Dieter Rombach. Zöllner setzt daneben darauf, dass das Institut für Biotechnologie und Wirkstoff-Forschung an der Universität Kaiserslautern, in die Fußstapfen des IESE treten kann. Derzeit werde es bereits von der Fraunhofer-Managementgesellschaft betreut.

Das IESE allein markiere jedoch bereits einen Qualitätssprung, der eine völlig veränderte Forschungslandschaft in Rheinland-Pfalz charakterisiere, freut sich Zöllner. Damit sei ein jahrzehntelanges wissenschaftspolitisches Ziel erreicht. „Selbst wenn wir nur eines hätten, wäre das schon eine Erfolgsstory."

Neben dem IESE und den beiden Fraunhof-Anwärtern gibt es in Rheinland-Pfalz noch zwei Institute der renommierten Max-Planck-Gesellschaft: für Polymerforschung und für Chemie. Beide haben ihren Sitz in der Landeshauptstadt. Drei Einrichtungen des Landes finden sich unter den 82 anerkannten wissenschaftlichen Einrichtungen, die sich auf der sogenannten Blauen Liste des Wissenschaftsrates finden: Das Forschungsinstitut für öffentliche Verwaltung in Speyer, die Zentralstelle für psychologische Information und Dokumentation an der Universität Trier und das Römisch-Germanische Zentralmuseum in Mainz.

Kaiserslauterer Wochenblatt
02-17-1999
Kaiserslauterer Wochenblatt
03-31-1999
Kaiserslauterer Wochenblatt
10-05-1999
Kaiserslauterer Wochenblatt
11-17-1999

Saarbrücker Zeitung
04-03-1999
Pfälzischer Merkur
03-27/28-1999
Pfälzischer Merkur
03-27/28-1999
Pfälzischer Merkur
11-6/7-1999
Pfälzische Volkszeitung
06-09-1999

Pfälzische Volkszeitung
06-18-1999
Zweibrücker Rundschau
06-10-1999
Westricher Rundschau
06-11-1999
Computer Zeitung
06-24-1999
Bayernkurier
07-31-1999
Computerwoche
09-17-1999
Computerwoche
11-12-1999
Trierischer Volksfreund
11-08-1999
Top Inform
No. 03/1999
Manager Magazin
No. 07/1999
Informationweek
No. 13/1999
Vis-A-Vis
No. 01/1999
Elektronik Journal
No. 03/1999
Elektronik Journal
No. 03/1999
Uni-Spektrum
No. 01/1999
Uni-Spektrum
No. 03/1999
Objekt Spektrum
No. 05/1999
IX Multiuser Multitasking Magazin
No. 08/1999

infoweek, June 10, 1999

TRENDS

Weitere Beiträge:

Software-Änderungen in immer kürzerer Zeit S. 28

Ohne Fehl und Tadel? S. 30

Software-Entwicklung

Qualität ist Trumpf

Der wirtschaftliche Erfolg von Unternehmen hängt von der Software ab. Für die Qualität der Programmsysteme wiederum sind die frühen Phasen der Entwicklung und organisatorische Maßnahmen entscheidend.

Der Stellenwert der Qualitätssicherung entspricht nicht der Bedeutung, die die Software in der Wirtschaft mittlerweile erlangt hat«, konstatiert Günther Ruhe, stellvertretender Leiter der Fraunhofer-Einrichtung für Experimentelles Software-Engineering (IESE) in Kaiserslautern. »In vielen Projekten, die wir in unterschiedlichen Branchen von der Automobilindustrie über die Medizintechnik bis zur Versicherungswirtschaft betreut haben, basieren 70 bis 80 Prozent der Wertschöpfung auf Eigenschaften, die durch Software ermöglicht sind«, berichtet Ruhe. Der Anteil von Software in Produkten und Dienstleistungen wächst stetig, die meisten großen Firmen sind de facto zugleich Software-Häuser. Die funktionalen und qualitativen Anforderungen steigen ständig. Dennoch wird die Bedeutung der Software in den Chef-Etagen noch immer drastisch unterschätzt.

Schnell und billig ist gute Software indes nicht zu haben. Software-Projekte dauern meistens länger als geplant und kosten mehr als ursprünglich veranschlagt. Und nach der Abnahme beginnt sofort die Wartung, da nur zwei Prozent der Programmsysteme genau in der Form ihrer Nutzung ausgeliefert werden. Im laufenden Code sind dann pro Tausend Zeilen im Durchschnitt zwei bis fünf Fehler enthalten, schätzt die Kölner Gesellschaft für Software-Qualitätssicherung (SQS). Bei Standard-Software sieht es nicht viel besser aus.

Die Folgen sind beträchtlich. Die Eröffnung des Flughafens Denver beispielsweise verzögerte sich um 16 Monate, weil die Software-Ingenieure Probleme hatten, die Steuerung des Transportsystems für das Gepäck zu implementieren. Und können geschäftliche Transaktionen nicht durchgeführt werden. Für noch größer als solche direkten Schäden hält Ruhe indes die indirekten. Wegen fehlerhafter Abrechnungen gab die Deutsche Telekom 1996 mehrere Millionen Mark für Öffentlichkeitsarbeit aus, um das ramponierte Image wieder aufzupolieren. Firmen, deren Web-Seiten nicht richtig funktionieren, verlieren ebenfalls an Renommee.

Allgemein gesagt: Unternehmen, die nicht über eine gute Software-Infrastruktur verfügen, fallen in ihrer Wettbewerbsfähigkeit zurück. Eine kurzfristige Kosten-Nutzen-Rechnung im Hinblick auf die Software-Qualität hält Ruhe deshalb für wenig sinnvoll. Schon die Tatsache, daß Aufwendungen für die Qualitätssicherung besonders gerechtfertigt werden müssen, sei bezeichnend. »Es zählt nur, wenn programmiert wird«, charakterisiert van Megen beipflichtend die Stimmung in vielen Firmen.

Methoden und Verfahren zur systematischen Qualitätssicherung stehen nach Einschätzung des Fraunhofer-Instituts IESE jedoch ausreichend zur Verfügung. Allerdings müssen sie an die Bedürfnisse des jeweiligen Unternehmens angepaßt werden. Allein schon die Festlegung, welche Merkmale für gute Software besonders wichtig sind, unterscheidet sich von Branche zu Branche. Für Telekommunikationsfirmen ist derzeit die oberste Priorität, ihre Angebote frühzeitig auf den Markt zu bringen, um Terrain zu besetzen und nicht hinter Wettbewerbern zurückzufallen. Time-to-Market ist für diese Unternehmen deshalb auch bei der Software äußerst wichtig. Notfalls werden dafür bei anderen Kriterien Abstriche gemacht.

Die Qualität zu sichern gilt es in allen Phasen des Software-Lebenszyklus: von der Erfassung der Anforderungen über Analyse und Design, Codierung und Test bis zur Wartung. Zwar umfaßt Software-Qualität zahlreiche Aspekte (siehe Kasten), doch kreist die Diskussion im engeren Sinn um die Vermeidung oder frühzeitige Entdeckung und Behebung von Fehlern. Den frühen Phasen kommt dabei besonders große Bedeutung zu. Denn je später ein Fehler gefunden wird, desto teuerer wird es, ihn auszumerzen.

Ruhe empfiehlt Inspektionen, bei denen die Dokumente aus d

Abweichungen von den ursprünglich formulierten Anforderungen lassen sich so leichter finden, wie das Versicherungsunternehmen Allianz bestätigt.

»Ohne Tools für das Requirements-Management hat man keine Chance, die Informationen bei der Erfassung der Anforderungen konsistent zu halten«, weiß Rudolf van Megen, Geschäftsführer der SQS. Der Anteil dieser Produkte am Gesamtmarkt für qualitätssichernde Software-Produkte dümpelt den Marktforschern von Dataquest zufolge jedoch bei 5 Prozent. Debugger, die die Entwickler während des Codierens benutzen, kommen immerhin auf 15 Prozent. Der Löwenanteil entfällt indes auf Test- und Konfigurationsmanagement-Werkzeuge mit jeweils etwa 40 Prozent Marktanteil.

Qualitätskriterien

Die Anzahl der Fehler pro 1000 Zeilen Code ist ein klarer Maßstab für Software-Qualität, aber nur die Spitze des Eisbergs.

Gute Software muß:

- den Anforderungen der Anwender entsprechen (Funktionalität)
- weitgehend fehlerfrei und immer nutzbar sein (Zuverlässigkeit)
- einfach zu bedienen sein (Benutzerfreundlichkeit)
- hohe Ablaufgeschwindigkeiten und kurze Antwortzeiten garantieren (Performanz)
- leicht zu ändern und anzupassen sein (Wartbarkeit)
- leicht in andere Ablaufumgebungen zu überführen sein (Portierbarkeit)
- schnell fertiggestellt und einsetzbar sein (Time-to-Market)
- möglichst preiswert in Erstellung und Betrieb sein (Kosten)

Mit der Anschaffung von Tools ist es freilich nicht getan. Experten wie van Megen raten den Anwendern dazu, ein übergeordnetes Qualitätsmanagement zu installieren, das die Prozesse organisiert und überwacht. »Jedes Unternehmen sollte eine organisatorische Einheit schaffen, die sich projektübergreifend um Software-Qualität kümmert«, empfiehlt Ruhe. Wichtig sei, Qualitätsmaßstäbe zu vereinbaren und deren Einhaltung sicherzustellen. Formale Zertifizierungen der Software-Entwicklungsprozesse nach den Qualitätssicherungsnormen der ISO h

Uni Spectrum, July, 1999

Software Akademie schließt Informatiker-Lücke

Der Stellenmarkt für Arbeitskräfte im Bereich Software-Engineering ist ausgereizt. Kaum ein Unternehmen kann seinen Personalbedarf an Software-Entwicklern und anderen Mitarbeitern für die Informations- und Kommunikationstechnik decken. Die herkömmlichen Bildungswege und Studienzweige liefern bei weitem nicht genügend Absolventen. Vielfach können Unternehmen die neuesten Technologien gar nicht einsetzen oder bestimmte innovative Projekte nicht starten, weil das Wissen vieler ihrer Mitarbeiter nicht mehr auf dem neuesten Stand ist und neue Mitarbeiter mit dem erforderlichen aktuellen Know how auf dem Markt nicht zu bekommen sind.
Diese Lücke zu schließen, ist eines der Ziele der SWA Software Akademie AG im PRE-Park Kaiserslauterns. Der Gründung Anfang diesen Jahres ging zunächst eine Marktstudie der WFK Wirtschaftsförderungsgesellschaft Kaiserslautern in Zusammenarbeit mit der Fraunhofer Einrichtung für Experimentelles Software-Engineering voraus, die den Bedarf an Mitarbeitern im Bereich Software-Engineering bei Unternehmen der Region ermittelte. Aufgrund der Erkenntnisse aus dieser Studie wurden zwei Lehrgänge konzipiert, deren Inhalte in enger

den. Ziel sollte sein, Absolventen mit dem Wissen zu versorgen, das sie für die erfolgreiche Arbeitsaufnahme in den jeweiligen Unternehmen befähigen würde. Also bedarfsgerecht und aktuell.
Diese beiden Weiterbildungsprogramme richten sich speziell an Akademiker, die in ihrer eigentlichen Studienrichtung bisher keinen Arbeitsplatz finden konnten und be-

reit sind, neue Wege zu be
ten. Das Arbeitsamt Kaisers
fördert bei Erfüllung der
chenden Voraussetzungen
nahme an den Lehrgängen
Das Thema des im Februa
starteten Lehrgangs ist die
dung zum „Software-D
tionsspezialisten“, das des
gonnenen Objektorienti

nischer Studiengänge gute Chancen. Naturgemäß wird eine gewisse Neigung zum Umgang mit Computern und Software erwartet. Mit Hilfe von
überpraktika und realitätsnahen
tiefen die Teil-

Wochenblatt, November 17, 1999

WOCHENBLATT

Bildung mit Perspektive

Erste Absolventen der SWA Software Akademie

attestierte allen Teilnehmern Gruppengeist und hohe Motivation. Jochen Scheide von PMS-Mikado und Professor Dieter Rombach, Vorsitzender des wissenschaftlichen Beirates des SWA, und als Leiter des Fraunhofer Instituts für Experimentelles Software Engineering Hauptinitiator der Qualifikationsmaßnahme, waren sich einig: „Die Fortbildungskurse der Software Akademie zeichnen sich aus durch die Orientierung am Bedarf der Wirtschaft.“ Manfred Eberle, Pädag
Leiter

Frischgeb

HIGH-TECH

Ehrgeizige Pläne im neuen Haus

Erstes Fraunhofer-Institut in Rheinland-Pfalz für Experimentelles Software Engineering

Von IRA SCHAIBLE

KAISERSLAUTERN. (lrs) Die Probezeit ist offiziell zu Ende. Auch Rheinland-Pfalz hat nun ein Fraunhofer-Institut.

Nach drei Jahren Beobachtungszeit wurde die Fraunhofer-Einrichtung für Experimentelles Software Engineering (IESE) in Kaiserslautern am Wochenende zu einem dauerhaften Institut der europaweit größten Organisation für angewandte Forschung aufgewertet.
Damit sei eine Garantieerklärung für das Fortbestehen des Instituts über 2001 verbunden, teilte das Wissenschaftsministerium mit.
Die Forschungsstätte soll in den nächsten zwei Jahren zu einem weltweit führenden Kompetenzzentrum für Software-Entwicklung ausgebaut werden, kündigte IESE-Leiter Professor Dieter Rombach an.
„Das ist vor allem eine Frage der Sichtbarkeit.“ Die Westpfalz werde sich zu einem der führenden Standorte in Deutschland für Informations-Technologie

In Kaiserslautern gab in München

entwickeln. Die Zahl der IESE-Beschäftigten von derzeit rund 140 Voll- und Teilzeitkräften werde sich in den nächsten Jahren zumindest verdoppeln.
Die Informatiker, Elektrotechniker, Wirtschafts-Ingenieure und Maschinenbauer befassen sich Rombach zufolge vor allem mit der Entwicklung von Software, die in Produkten und Dienstleistungen steckt wie etwa dem Handy oder dem ABS-System im Auto. Ihr Ziel ist eine garantiert fehlerfreie Software, die beispielsweise Rückrufaktionen ausschließt.
Ein anderer Schwerpunkt ist die Sicherheit beim Electronic Commerce (Internet-Handel).
Das Institut verfügt über einen jährlichen Etat von rund elf Millionen Mark, von dem zwei Drittel Projektmittel sind.
Zu den Partnern und Kunden der Forscher zählen laut Rombach unter anderem Daimler-Chrysler, Bosch, Siemens, die
Bank oder Telekom.
ch Ansprech-
und mittle-
, betonte

Trierischer Volksfreund, November 08, 1999

Ritterschlag für Software-Schmiede

Kaiserslauterer Institut besteht Fraunhofer-Probezeit mit Bravour

▸ KAISERSLAUTERN (jüm). Die Kaiserslauterer Fraunhofer-Einrichtung für Experimentelles Software Engineering (IESE) hat ihre „Probezeit“ mit Bravour bestanden: Bereits nach drei statt der laut den Regularien eigentlich vorgeschriebenen fünf Jahre wurde der Software-Schmiede jetzt der Status eines unbefristeten Fraunhofer-Institutes verliehen.

Das gestrige Plazet des Fraunhofer-Ausschusses sowie der Beschluss des Fraunhofer-Senates bedeute eine Garantieerklärung für das Fortbestehen des IESE über das Jahr 2001 hinaus, erläuterte der rheinland-pfälzische Wissenschaftsminister Jürgen Zöllner. Damit sei auch eine Anerkennung des wissenschaftlichen und wirtschaftlichen Reifegrades verbunden. Als erste Forschungseinrichtung der Fraunhofer-Gesellschaft in Rheinland-Pfalz könne das IESE jetzt den Titel „Fraunhofer-Institut“ führen. Für Professor Dieter Rombach, den Leiter der Kaiserslauterer „Denkfabrik“, ist die Entscheidung der Fraunhofer-Gremien eine Bestätigung des eingeschlagenen Kurses. Er sehe darin einen Auftrag, noch mehr für die Stärkung der Software-Kompetenzen in allen Bereichen der Gesellschaft zu tun. Die IESE-Forschungsaktivitäten in den Bereichen Innovative Software-Entwicklungstechnologien, Software-Qualitätsmanagement, Sicherheit von Software und Informationstechnik sowie Weiterbildung würden ausgebaut. Auch werde der Weg strategischer Partnerschaften in der Region fortgesetzt. Als Beispiele nannte Rombach unter anderem die Software Akademie Kaiserslautern oder die Markant Software- und Dienstleistungs GmbH.
Derzeit sind nach den Worten des Wissenschaftlers beim IESE 80 Vollzeitstellen angesiedelt. Bis 2001 solle die Mitarbeiterzahl auf 120 Stellen erhöht werden. Der „Ritterschlag“ zum permanenten Fraunhofer-Institut schafft nach Rombachs Überzeugung die institutionelle Grundlage für einen langfristig gesicherten Ausbau des Software-Standortes Rheinland-Pfalz.
Gestartet war das IESE im Februar 1996 mit etwa 20 wissenschaftlichen Mitarbeitern im Kaiserslauterer Technologiepark Siegelbach. Es gelang bald, Software-Unternehmen wie die schwedische Firma Q-Labs zur Ansiedlung in Kaiserslautern zu bewegen. Insgesamt sind bis heute mehr als 400 Arbeitsplätze im Großraum Kaiserslautern entstanden. Die Anfang 1998 erfolgte Gründung eines Schwester-Instituts im US-Bundesstaat Maryland stellt einen weiteren Meilenstein dar: Neueste Methoden und Technologien führender Software-Organisationen werden so auch für den IESE-Kooperationsverbund schnell verfügbar.

Rheinpfalz, June 08, 1999

Software-Ingenieure aus Kaiserslautern auf internationaler Tagung in Paderborn

Fehler finden, aus Fehlern lernen

Experten in Sachen Zuverlässigkeit trafen sich vom 4. bis zum 7. November im westfälischen Paderborn. Auf dem „9. International Symposium on Software Reliability Engineering (ISSRE)" ging es darum, festzustellen, wie man vermeiden kann, daß trotz hohen Entwicklungsaufwandes softwaregesteuerte [illegible] immer wieder zusammenbrechen und große Schäden verursachen. [illegible] Fraunhofer-Einrichtung für Experimentelles Software-Kompetenz-Zentrums,

Isabella Wieczorek beschäftigt sich am Fraunhofer IESE mit Software-Meßmethodik und Kosten-Modellen.

[illegible]agements ist es, Fehler zu [illegible]nd auftretende Fehler mög[illegible]ig zu entdecken und auszu[illegible]heißt, daß nach jedem Ent[illegible]t überprüft werden muß, [illegible]elte Dokument dem Krite[illegible]freiheit genügt. Die Frage [illegible]utet hier: „Haben wir so [illegible]sgeprüft, daß später auf[illegible] keinen unverhältnismä[illegible]fwand bedeuten? Wie [illegible]en nach der Prüfung

[illegible]tfehlerzahl zu bestim[illegible] Zahl der gefundenen [illegible]ntzahl abziehen. Un[illegible] letztere aber unbe[illegible]llerdings mit Captu[illegible] abschätzen. Denn [illegible] man Fische aus ei[illegible]hler zählt, die in ei[illegible]t „schwimmen", [illegible]n Fällen die Ge[illegible]n aus „Stichpro-

[illegible]ollen zuneh[illegible]r Softwareent[illegible] Hilfe werden [illegible]rsehbar und [illegible] daß Bernd [illegible]sen Model[illegible] des Fraun[illegible]ligt waren [illegible]m, Oliver [illegible] SRE letz[illegible]m „Best[illegible]rde. Sei[illegible]em den [illegible]nst-De-

[illegible]ler zu [illegible] Doch [illegible]eent[illegible] Ursa[illegible]hler, [illegible]erar-

ten typischerweise entstehen. Ein Weg, um diese Problematik zu lösen, ist die Einteilung gefundener Fehler in Fehlerklassen, die die wesentlichen Eigenschaften eines Fehlers erfassen.

Eine Fehlerklassifikation taugt aber nur dann etwas, wenn sie so eindeutig ist, daß gleichartige Fehler auch in das gleiche Fach eingeordnet, verschiedenartige dagegen getrennt werden. Mit diesem Thema hat sich Isabella Wieczorek gemeinsam mit Khaled El Emam beschäftigt. Auch sie stammt aus der Software Engineering-Schule, die sich seit 1992 unter Leitung von Prof. Dieter Rombach an der Universität Kaiserslautern entfaltet hat. Nach einer Assistenz in der AG Rombach und der Mitarbeit in der früheren Software Technologie Transfer Initiative STTI gehörte sie zu den ersten, die nach Kaiserlautern-Siegelbach gingen, um hier die Fraunhofer Einrichtung für Experimentelles Software Engineering aufzubauen. Die Ergebnisse, die sie in Paderborn vorstellte, geben dem Softwareentwickler mehr Sicherheit bei der Fehleranalyse. Isabella Wieczorek hat ein häufig benutztes Klassifikationsschema auf seine Trennschärfe untersucht und dabei zum ersten Mal em-

Uni Spectrum, February, 1999

UNTERNEHMEN UND MÄRKTE

Ausbildung vom Feinsten

Der Stellenmarkt macht deutlich, wie verzweifelt die IT-Branche qualifizierte Mitarbeiter sucht. In der Pfalz haben jetzt ein paar Menschen mit der Software-Akademie Kaiserslautern ein zukunftweisendes Projekt gestartet.

Was tut eine Region, wenn sie durch Truppenreduzierung und Strukturprobleme tradierter Industriezweige in eine Krise gestürzt wird? In Kaiserslautern hat man aus der Not kurzerhand eine Tugend gemacht und ein Konversionsprojekt ganz eigener Art ins Leben gerufen: Auf einem ehemaligen Kasernengelände entstand ein 600 000 Quadratmeter großer IKT-Technologiepark. Einer der Schrittmacher auf dem Weg in die Zukunft ist die SWA Software-Akademie AG.

Der Akademiegründung Anfang des Jahres ging eine Marktstudie der WFK Wirtschaftsförderungsgesellschaft Kaiserslautern voraus, die den Bedarf der ortsansässigen Unternehmen ermittelte. Auf dieser Basis und in engster Abstimmung mit den Unternehmen wurde dann das Kursprofil erstellt. Die Studie lieferte auch wichtige Erkenntnisse für die derzeit laufenden Schulungen arbeitsloser Akademiker. Dr. Barbara Jörg von der WFK: „Bei den Vorarbeiten haben alle Beteiligten ideal zusammengespielt. Aus unserer Sicht ist die Software-Akademie die beste Werbung für die Region." Die SWA-Vorstandsvorsitzende Barbara Wix, die viele Jahre Erfahrung aus dem Umschulungsbereich mitbringt, formuliert die Ziele: „Mit der Software-Akademie werden wir dem Arbeitsmarkt in der Region und dem Land Rheinland-Pfalz einen gehörigen Schub geben. Wir haben ermittelt, daß in der Industrie sehr viele Softwareexperten fehlen. Vielfach können Unternehmen die neuesten Technologien gar nicht einsetzen, weil sich das Wissen vieler Mitarbeiter nicht mehr auf dem neuesten Stand ist. Hier decken wir mit unserem Qualifizierungsangebot eine ausgesprochene Lücke."

Speziell an arbeitslose Akademiker richten sich die beiden Weiterbildungsprogramme zum Software-I[illegible]onsspezialisten im Softwarel[illegible] zum OO-Anwendungsentw[illegible]reich Finanzdienstleistunge[illegible] übrigens für Objektorientieru[illegible]technologie. Bei beiden [illegible] haben auch Absolventen n[illegible]

Studiengänge gute Chancen. Naturgemäß wird eine gewisse Affinität zum Umgang mit Computern und Software erwartet. Mit Hilfe von Betriebspraktika und realitätsnahen Industrie-Projekten vertiefen die Teilnehmer das theoretisch erworbene Wissen. Nach Abschluß der zertifizierten Kurse winken den Absolventen sogar bereits feste Arbeitsverträge.

Diese „Arbeitsplatzgarantie" kann deshalb gegeben werden, weil bereits bei der Konzeption der Schulungen intensiv mit den späteren Arbeitgebern zusammengearbeitet wird. Überhaupt zieht sich der Begriff „strikt bedarfsorientiert" wie ein roter Faden durch alle Konzepte und Programme der Software-Akademie. Denn „außer der Qualität ist die Orientierung am Bedarf das Hauptkriterium, mit dem sich die SWA von den vielen anderen Schulungsanbietern unterscheidet", wie SWA-Vorstand Michael Wenk betont. Der Diplomkaufmann zeichnet bei der SWA für den kaufmännischen Part und das Marketing verantwortlich. Wenk weiter: „Seit wir der Öffentlichkeit unser Projekt präsentiert haben, verzeichnen wir ein Feedback ohne Ende. Ein erfreuliches Beispiel ist ein amerikanisches Unternehmen, das einen Standort für seine europäische Zentrale sucht. Seit wir angeboten haben, Mitarbeiter zu beschaffen und mit einem genau auf die Anforderungen abgestimmten Programm zu schulen, ist Kaiserslautern ein möglicher Standort. Darüber hinaus liegen uns Anfragen von Großunternehmen vor, die bei uns Mitarbeiter für die objektorientierte Softwareentwicklung fit machen wollen."

Als Vorsitzender im wissenschaftlichen Beirat sorgt Prof. Dr. Dieter Rombach von der Fraunhofer Einrichtung für Experimentelles Software Engineering für die unternehmensspezifische Schulung und dafür, daß die qualitativ sehr hochwertigen Seminare immer auf dem neuesten Stand der Technik sind. Schließlich ist er nicht nur konzeptionell beteiligt; sein Institut gehört überdies zu den wichtigsten Kompetenz-Providern. Nach den Chancen seiner Absolventen befragt, äußerte Prof. Rombach: „Der Bereich der Sofwareentwicklung verzeichnet erhebliche Zuwächse. In diesem Umfeld gibt es ausgezeichnete Berufschancen auch für Quereinsteiger anderer Fachrichtungen, die sich eine entsprechende Zusatzqualifikation erworben haben. Außerdem entt[illegible] immer mehr interdiszi[illegible] Ein gutes Bei-

Vorsitzender des wissenschaftlichen Beirats der SWA und Leiter der Fraunhofer Einrichtung (IESE) Prof. Dr. Dieter Rombach (M.), SWA-Vorstand Michael Wenk, zuständig für den kaufmännischen Bereich und das Marketing (Mitte). Viele [illegible] Erfahrung aus dem Umschulungsbereich bringt Barbara Wix [illegible]

Vis-A-Vis, January, 1999

„Wir brauchen bis Ende des Jahres Standortentscheidung"

Rombach favorisiert Trippstadter Straße für neues Fraunhofer-Institut

„Wir brauchen bis Ende des Jahres eine Standortentscheidung." Das hat gestern Professor Dieter Rombach, der Leiter des neuen Fraunhofer-Instituts für Experimentelles Software Engineering, in einem RHEIN-PFALZ-Gespräch betont. Durch Beschluss des Senats der Fraunhofer Gesellschaft ist der bisherigen Fraunhofer-Einrichtung der Status eines unbefristeten Fraunhofer-Instituts verliehen worden.

Rombach bezeichnete das Bahngelände an der Trippstadter Straße als bevorzugten Standort für Fraunhofer Institute als Mittler zwischen Hochschule und Industrie. „Das wäre ein Traumstandort für Kaiserslautern", sagte Rombach, der in diesem Zusammenhang auf die fußläufige Verbindung zur Hochschule und die Möglichkeit hinwies, auf dem Gelände neue Firmen anzusiedeln.

Rombach erklärte, es gebe zwar Alternativstandorte wie den PRE-Park oder andere Grundstücke im Umfeld der Universität. „Sie stellen aber nicht die zweite, sondern die dritte, vierte Lösung dar." Der Standort an der Trippstadter Straße würde den Studenten der Universität betriebliche Innovation tagtäglich anschaulich vor Augen führen. „Wir reden immer darüber, dass sich in Deutschland zu wenige Leute selbstständig machen. Selbstständig macht man sich, wenn man erfährt, wie aufregend es sein kann", betonte Rombach die Vorteile des Standorts an der Trippstadter Straße. Dieser positive Effekt ginge an einem anderen, in größerer Entfernung zur Uni liegenden Standort verloren.

Dieter Rombach

Zuversichtlich zeigte sich Rombach, dass es gelinge, bis Ende dieses Jahres eine Lösung am Standort Trippstadter Straße zu finden. Oberbürgermeister Bernhard Deubig habe ihm zugesagt, dass er sich dafür einsetzen werde. Die Finanzierung des Grundstücks geschehe über Stadt oder Land, das Gelände werde dann der Fraunhofer Gesellschaft in Erbpacht zum symbolischen Preis von einer Mark jährlich übergeben, die Baufinanzierung geschehe durch Bund und Land zu jeweils 50 Prozent. Das Institut hat derzeit noch seinen Sitz im Siegelbacher Technologiepark. Hier fiel im Jahr 1996 der Startschuss für die Forschungseinrichtung.

Rombach unterstrich die Bedeutung, die die Umwandlung der Fraunhofer-Einrichtung für Experimentelles Software Engineering zum Institut für die Stadt habe. Damit sei gewährleistet, dass Kaiserslautern nun dauerhaft eine herausragende Kompetenz auf dem Gebiet der Software-Informationstechnologie besitze. Somit seien wichtige Voraussetzungen erfüllt, um die Vision von einem industriellen IT-Standort Kaiserslautern weiter umzusetzen.

Für das nächste Frühjahr wird erwartet, dass auch die Lauterer Fraunhofer-Einrichtung für Techno- und Wirtschaftsmathematik zum Institut erhoben wird. Eine Kommission hatte bereits die Qualifikation dafür bescheinigt. Ins Auge gefasst ist ein Fraunhofer-Zentrum, dass die Institute an einem Standort zusammenführt. In Kaiserslautern würde hiermit das vierte Fraunhofer-Zentrum in Deutschland entstehen. (rdz)

—Südwest

Rheinpfalz, June 06, 1999

The Fraunhofer-Gesellschaft

The Research Organization

The Fraunhofer-Gesellschaft is the leading applied research organization in Germany. A staff of approx. 9,000 are employed at 47 research establishments throughout Germany, most of them scientists and engineers. International collaboration is promoted through Fraunhofer branches in the USA and in Asia. The association's headquarters is in Munich.

One of the primary policy objectives of the Fraunhofer-Gesellschaft is improved information transfer. Companies of all sizes and from all sectors of industry use the Fraunhofer Institutes as external high-tech laboratories for virtually all kinds of development work, for special services, and as expert consultants on organizational and strategic questions. Professional project management and quality management processes lead to concrete results with genuine market value.

In 1998, total expenditure of the Fraunhofer-Gesellschaft reached some DM 1.3 billion, of which nearly DM 1.2 billion related to the contract research sector. Earnings from industry, at over DM 400 million for the first time, covered more than one third of the total funding.

The appellation, Fraunhofer-Gesellschaft, was chosen in reference to the researcher, inventor, and entrepreneur Joseph von Fraunhofer (1787 - 1826), who won widespread acclaim for his scientific and commercial achievements.

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.

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, 1999)

Prof. Hans-Jürgen Warnecke, President
Dr. Dirk-Meints Polter, Personnel and Legal
Dr. Hans-Ulrich Wiese, Finance

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E-Mail: info@iese.fhg.de

Our web server offers up-to-date information about the institute. We invite you to visit our web site at: http://www.iese.fhg.de

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 "Sauer-Wiesen". 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)

Satellite Office at PRE Park Competence Center for Software Technology and Continuing Education

Luxemburger Str. 1+3
D-67657 Kaiserslautern
Phone: +49 (0) 631 41690 13
Fax: +49 (0) 631 41690 41
Email: hoermann@iese.fhg.de
Contact: Dr. Klaus Hörmann

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

Satellite Office at the University of Kaiserslautern

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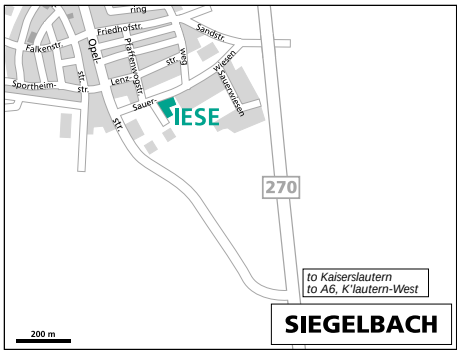
D-67663 Kaiserslautern
Phone: +49 (0) 631 205 3329
Fax: +49 (0) 631 205 3330
Email: jerkku@informatik.uni-kl.de
Contact: Kristina Jerkku

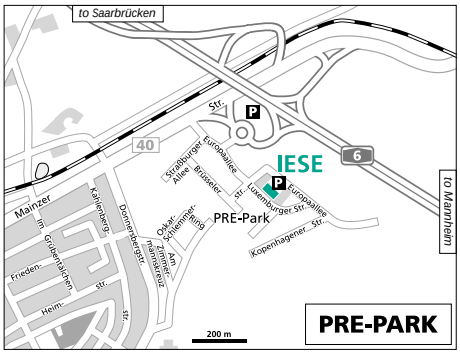
How to reach us:

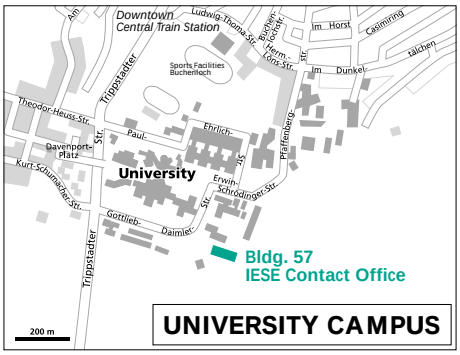
by car
Highway (Autobahn) A6, exit Kaiserslautern-West:
Follow signs to Pirmasens on highway B270; after approx. 1 km (1/2 mile) turn right onto Pariser Straße, following signs "Universität" and "Stadtmitte"; after approx. 1.5 km (1 mile) you will see a white sign "Universität" on your right. Do not 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 Center for Experimental Software Engineering, Maryland (FC-MD)

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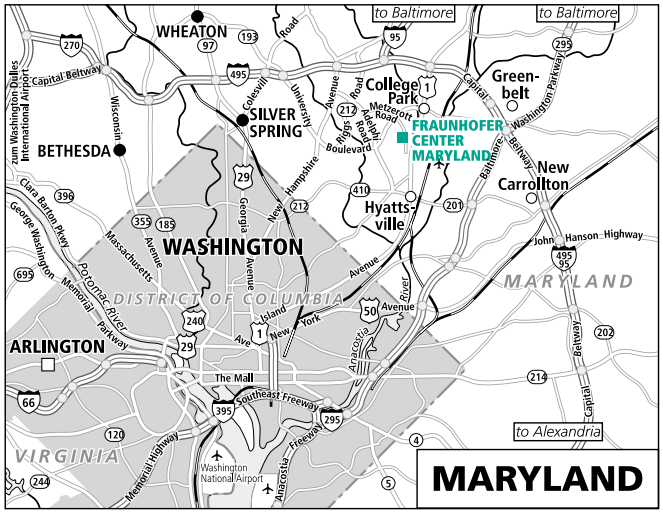
Fax: +1 301 405 6638
Email: info@fc-md.umd.edu
Website: http://fc-md.umd.edu



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 Richmond (I-95/495 South). Take Baltimore Avenue (Route 1) exit 25 towards College Park.
Make a right onto 193 West.
For directions from this point on, see bottom of 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 towards College Park
Make a right onto 193 West.
For directions from this point on, see bottom of page!

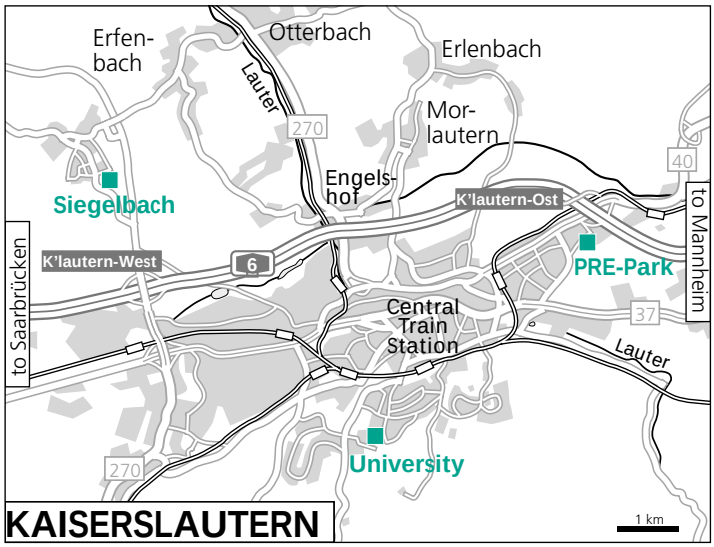
by train
From Metro station (College Park- Univ. of Maryland) 15 minute walk or taxi or by bus 83

by plane
B.W.I. Airport (about >45 minutes by car)
Exit the Airport to Route 295 South, take exit for Greenbelt Road, Maryland Route 193. At the stop sign, make a left onto South Way. Take Greenbelt Road Route 193 East. Continue onto University Blvd.
For directions from this point on, see bottom of page!

National Airport
(about 90 minutes by car)
Exit the airport towards I-395 North headed for 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 6 miles. Stay on BWI Parkway to the exit for Maryland Route 193. This is Greenbelt Road, take Route 193 East. Continue onto University Blvd.
For directions from this point on, see bottom of page!

further directions:
Make a left at the first light onto Azalea Lane. (Metzerott Rd. is to the right) (Azalea Lane turns into Paint Branch Drive)
Bear to your left around the circle past the baseball field, the dumpster, and the parking lots on the left and right hand sides.
You will then see a red brick building.
Make a right into that parking lot K4.
The name of the building is Agriculture / Life Sciences Surge Building.
We are located on the third floor.

Global View of Kaiserslautern



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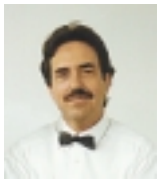

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- ❒ Seminars, Workshops
- ❒ STI Software Technology Initiative

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