IESE

Fraunhofer Einrichtung Experimentelles Software Engineering

Annual Report 1997

Imprint

Layout:
Dipl. Soz. Joachim Müller-Klink

Typesetting, lithography and graphics:
Fotosatz Burkhart GmbH,
Kaiserslautern

Printing:
Printec GmbH, Kaiserslautern

Photography:
Joachim Müller-Klink;
Thomas Brenner, Kaiserslautern;
Kuhn und Ziller Fotostudio,
Kaiserslautern;
Cover page: Image Bank, Pictor, Tony
Stone;

Annual Report of the Fraunhofer Institute for Experimental Software Engineering IESE 1997

Fraunhofer-Einrichtung für
Experimentelles Software
Engineering

Sauerwiesen 6
D-67663 Kaiserslautern

phone +49(0)6301/707-100
fax +49(0)6301/707-200

e-mail info@iese.fhg.de
internet http://www.iese.fhg.de

Foreword

In early 1996, the Fraunhofer Institute for Experimental Software Engineering (IESE) was founded in Kaiserslautern. Based on the vision that software competence will become increasingly crucial to the business success of companies in most branches of industry, IESE's mission is to establish itself as a leading organization in applied software engineering research and to become a preferred partner for the transfer of innovative software engineering technologies into industrial practice.

The institute grew out of the successful Software Transfer Initiative at the University of Kaiserslautern (STTI-KL) which was founded in 1993 under the sponsorship of the Ministry of Economics Affairs, Transportation, Agriculture, and Viniculture of the State of Rhineland-Palatinate. Within two years, IESE established itself as one of the leading international competence centers for applied research, and established strategic cooperations with major companies from the telecommunication, automotive as well as banking/ insurance industry. Special attention is being given to cooperation with small and midsize companies from the State of Rhineland-Palatinate.

Experimental Software Engineering employs experiments as an instrument for 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 optimized based on feedback gained from measurements.

The Fraunhofer IESE provides expertise not only in a wide range of innovative software engineering technologies, but also in approaches concerning the build-up of industrial improvement programs for continuous optimization (i.e., TQM, Kaizen) of software development processes. Areas of expertise most sought after in 1997 included process modeling and measurement for building up industrial improvement programs, experience factory mechanisms for establishing persistent learning organizations allowing for capitalization from improvements, quantitative and qualitative modeling techniques for supporting project management via predictive models for cost/time/quality, systematic inspection techniques for gaining early control over software development processes, product line approaches for creating software system families (variants) with high levels of reuse, and architecture and domain-driven software reengineering to leverage existing assets.

Major achievements in 1997 included the further build-up of a highly qualified work force of international standing, the establishment of IESE as an internationally leading competence center demonstrated by a high presence at international conferences and in international journals, an increasing number of (long-term) visits by internationally leading software engineering experts, the high rate of both repeat as well as new industrial contracts, and the increasing trend towards long-term strategic industry collaborations.

As a response to internationally operating companies' needs for global research and technology support, we launched the creation of a sister organization in the United States of America - the Fraunhofer Center Maryland (FC-MD) headed by Prof. Basili on 01.01.1998. FC-MD and IESE together will form an even stronger virtual research and technology transfer center in the area of Experimental Software Engineering.
Finally, I want to stress the high commitment and devotion of ALL employees to the mission of IESE. This commitment and devotion was and will be the basis for our success. We would like to sincerely acknowledge the active support and guidance we received from the Fraunhofer Gesellschaft e.V. in Munich, the University of Kaiserslautern, the State of Rhineland-Palatinate, and our Advisory Board (Kuratorium).

This report is intended to provide you with an overview of our research and transfer work in 1997. Together with the distinguished members of our Advisory Board we are optimistic to continue the successful path over the coming years.

Kaiserslautern, June 1998

Prof. Dr. Dieter Rombach

Contents

Foreword 7
Profile of the Fraunhofer IESE 10
- Vision and Mission 10
- Transfer Approach 11
- Customer Orientation 11
- History 12
- Perspective and Agenda 13
Competence in Research and Technology Transfer 14
- Competence Areas 14
- Collaborations 15
- Offerings 15
Structure 16
- A Matrix Organization 16
- Organigram 17
- Service Centers 18
- The Institute in Numbers 20
- Advisory Board 22
Technical Competence Areas 23
Research Mission 23
Quality and Process Engineering 25
Innovative Software Engineering 35
Transfer Projects 45
Industrially-funded Projects 45
Publicly-funded Projects 55
Appendix
Network in Science and Industry 62
Professional Contributions 65
- Lecturing Assignments 65
- Journal Editorships 65
- Committee Activities 66
- Presentations 67
Scientific Publications 68
- Articles in Journals and Books 68
- Conference Proceedings 69
- IESE Reports 71
- Other Reports 73
- Theses 75
Awards 77
Events, Facts, and Photos 78
The Fraunhofer Gesellschaft 88
Fraunhofer IESE Contact 90
Information Service 93

Competence Areas
Quality and Process Engineering

Process Modeling and Analysis 26
Quality Improvement and Experience Factory 28
Quantitative Methods 30
Software Engineering Environments 32

Innovative Software Engineering

Product Line Approaches 36
Reengineering and Maintenance 38
Requirements Engineering 40
Systematic Development Approaches 42

Projects

Industrially-funded Projects

Cost-Benefit Analysis of an Object-Oriented Framework 46
Development of a Generic Merchandising System Architecture 47
Development of Statistical Models for Benchmarking Software Productivity 48
Process Improvement through Systematic Measurement (PRISM) 49
RAMSIS Kernel Redesign 50
Software Variant Building 51
Domain Specific Software Architectures for GSM General Radio Packet Service 52
Understanding, Controlling, and Predicting Software Costs 53

Publicly-funded Projects

Midas - Measurable Improvement of Development, Deployment and Operation of Interbank Automation Software 56
MUVIE - Graphical Modeling of Business Workflows with Multi-View Editors 57
PERFECT - Process Enhancement for Reduction of Software Defects 58
PROFES - Product Focused Improvement of Embedded Software Processes 59
SoftQuali 60

...providing customer oriented solutions...

Vision and Mission

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

Our vision is that software competence will become the most valuable asset of all high-tech product and service branches. Such competence has to be built up, managed, and continuously developed according to well-defined strategic goals. More and more organizations will seek help regarding methods and techniques to identify, customize, continuously optimize, and strategically align their software engineering competence.

The mission of the IESE is to establish itself internationally as one of the top addresses both companies looking for help with their software engineering problems and for reasearches looking for collaboration in areas of applied software engineering research.

The Fraunhofer IESE is a competent partner in applied software engineering research and technology transfer. In order to live up to this expectation, the IESE has to continuously monitor customers' needs and strategic goals. It has to investigate the most promising innovative software engineering techniques and methods available, to develop their applicability for industrial-strength environments, and, finally, to transfer them into industrial practice, thus building up the software competence sought after by its customers.

Transfer Approach

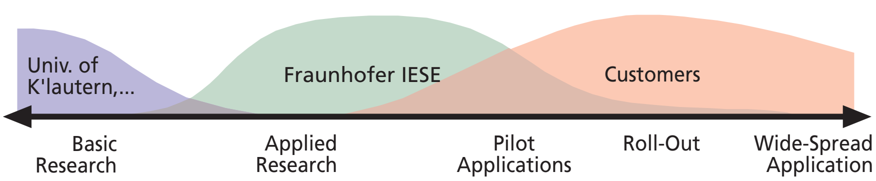
Since software development is mostly a non-repeatable human-based endeavor, a single standard software engineering technology cannot fit all situations. We strongly believe that high-quality software can only be developed economically by using software engineering technologies tailored to the specific goals and characteristics of the particular development project.

Consequently, software engineering research and transfer need to be performed in an experimental context. Our experimental approach makes it possible to experiment with the technologies in use and thus helps to thoroughly understand their weaknesses and strengths. Technologies can also be tailored to the goals and characteristics of particular projects and organizations and can be packaged together with empirically-gained experience in order to enhance their reuse potential in future projects.

Technology transfer according to the experimental approach follows a three-step process (graphic A).

- New promising technologies and methods are drawn from a rich body of basic research results from the highly-respected Computer Science Department at the University of Kaiserslautern, the Special Research Area (SFB 501), as well as from interactions with many other highly-renowned research institutes world-wide.
- Next, the new technologies and methods are experimentally evaluated in laboratory settings, introduced in carefully-selected pilot projects, evaluated in industrial-strength environments, and continuously improved.
- Such validated technologies are then disseminated as best practices to a wider range of customers.

Ⓐ Software Technology Transfer Life Cycle

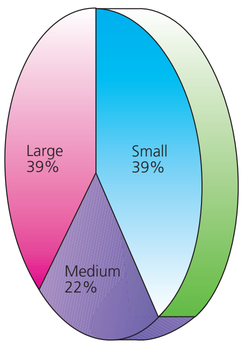


Customer Orientation

Our customers are companies from many different branches, of any size (grafic B), and from a large number of countries. In order to service such a large variety of customers, we have increased our efforts in building up domain knowledge in key application areas such as telecommunications, automotive systems, and banking/insurance/trade.

Number of Companies by Size

Ⓑ



Company size is defined by number of employees

Small < 50
Medium < 500
Large >= 500

In order to fulfil the special needs of small and medium-size companies, a separate service center has been established in 1997. This has already resulted in a considerable increase of small companies cooperating with us. Scientists from a large number of foreign countries have been hired to staff international customer projects.

...establishing a virtual institute...

History

The foundations of the experimental approach to software engineering were laid in the Eighties at the Software Engineering Laboratory (SEL), a U.S. organization co-sponsored by NASA's Goddard Space Flight Center, the Computer Sciences Corporation, and the University of Maryland. The achievements within the SEL were recognized with the 1st IEEE/SEI Process Achievement Award in 1994.

In 1992, Prof. Dr. Dieter Rombach, an active SEL member, moved from the University of Maryland to the University of Kaiserslautern to head the new chair for (Experimental) Software Engineering in the Computer Science Department.

In 1993, he launched the Software Technology Transfer Initiative Kaiserslautern (STTI-KL) which adapted the experimental approach to the needs of German companies and performed numerous successful transfer projects. The STTI-KL was funded by the State Ministry of Economic Affairs, Transportation, Agriculture and Viniculture of Rhineland-Palatinate.

In 1995, the Fraunhofer-Gesellschaft decided to incorporate the successful STTI-KL as a new Fraunhofer Institute. The Fraunhofer Institute for Experimental Software Engineering (IESE) was born.

The IESE is headed by Prof. Dr. Dieter Rombach. In January 1996, the institute started with 14 scientists. As of December 1997, the IESE employed 39 scientists, 3 guest scientists, 14 non-scientific staff and 25 students and other employees. In 1997, a sister organization of the IESE, the Fraunhofer Center - Maryland, in College Park, Maryland, USA was planned to start by January 1998. This Fraunhofer Center, headed by Prof. Dr. Basili aims at increasing the research competence of IESE and aid in the acquisition of international industrial projects.

Perspective and Agenda

The institute's strategy is to establish itself as a leading international competence center in software engineering. As of today

- we are coordinator and member of ISERN, the International Software Engineering Research Network, an international network with seventeen members,
- we maintain an international working environment: about one fourth of our staff comes from abroad,
- we are attracting many well-known guest scientists who contribute significantly to the excellence of our institute,
- we are about to open our sister institute in the USA,
- we have started an SME center and training center,
- we have started a number of research collaborations with leading institutional techtransfer and research institutes,
- we are active in many conference committees and editorial boards of international journals.

We will continue and extend these activities.

Concrete next steps in realizing the institute's strategy are:

- Further build-up and continuous improvement of highly demanded competences in
  - quality and process engineering (quality improvement, quantitative and qualitative methods) and in
  - innovative software product engineering approaches (inspections, product line development, requirements engineering, reengineering and maintenance).

Special emphasis will be on:

- leading organizations on product line approaches and on a broad variety of empirical cost, risk, and quality models.
- Concentration on key application domains (telecommunications, automotive systems, banking/insurance/trade).
- Extension of our independent service centers (SME center, training center).
- Foundation of Fraunhofer Centers in the USA and Asia.
- Intensification of research collaborations with international technology transfer and research & development institutes.

Competence in Research and Technology Transfer

Competence Areas

In order to satisfy the needs of our customers, we have to build up, maintain, and continuously develop a complementary set of competences, namely

- application domain competences
- software engineering competences
- software technology transfer competences.

Application Domain Competences

Our current application domain competence knowledge is concentrated on telecommunications, embedded systems, especially automotive systems, and banking/insurance/trade.

Software Engineering Competences

The following list provides brief definitions of our key technology competences in Software Quality and Process Engineering:

- Quality Improvement and Experience Factory
  "Facilitate continuous learning and persistent storage and reuse of development know-how."
- Quantitative and Qualitative Analysis, Prediction and Control
  "Capture relevant development data and analyze them, build prediction models and control project risks."
- Process Modeling
  "Represent and analyze key business and software development processes."
- Integrated Software Engineering Environments
  "Support all of the above through tool development."

Key technology competences in Innovative Product Engineering are briefly defined as follows:

- Requirements Engineering
  "Improve the early phases of software development."
- Product Line Approaches
  "Structure domain and design knowledge as well as software development know-how in such a way that it can be easily understood, changed, and reused across families of systems."
- Reengineering and Maintenance
  "Redocument and transition legacy systems and manage long-living software systems."
- Systematic Development Approaches
  "Develop certifiable and reliable software."

Technology Transfer Competences

The transfer of advanced industrial-strength software engineering technologies is the central task of the Fraunhofer IESE. We therefore maintain a transfer-oriented network of collaborations with technology providers, such as universities, with research and development departments of large organizations, with providers of tools that support our technologies, and with strategic partners that otherwise support our work.

The competence gained from collaboration with these providers enables the IESE to conduct technology transfer projects with customers, i.e., the users of our technology.

On the technology side, we have to monitor the latest developments, identify promising technologies, and experimentally evaluate and improve them to create industrial-strength technologies.

On the customer side, our responsibilities are to identify strengths and weaknesses of organizations, to define strategic improvement goals with our customers, to implement continuous improvement programs, to set up means to monitor progress of the changes introduced, and to capture and store experiences made.

Collaborations

The IESE conducts collaborations with technology providers, technology-transfer customers, and strategic partners. The overall goal is to identify, further develop, and put into industrial practice software engineering technology so as to increase the competence of our customers.

International Research

Among the international cooperation in applied software engineering research, the International Software Engineering Research Network (ISERN) with 17 sites in 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 Daimler-Benz.

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 17 industrial collaborations with 11 companies from our first year of existence were extended to 29 industrial collaborations with 20 companies in 1997, not including further industrial collaborations in the context of publicly-funded projects.

Appreciation of the overall IESE approach is high, as can be seen from the fact that 9 companies have renewed or even extended their collaboration with the IESE (see Grafic A on page 45.

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 which yield short-term return on investment.

In addition to bilateral cooperation, in 1997 the IESE has started a multinational consortium of international companies that team up in this joint endeavor to advance their software-engineering competence on a global scale, i.e., across different sites and business units, and in collaboration with other leading companies on the scene as well as other application domains.

Offerings

For 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,
- support towards development of certifiable software,
- preparation for certification.

For users of software, we offer:

- help in purchasing software,
- independent support for monitoring software development contracts.

For small and medium-size enterprises (SMEs) we offer individual assistance and "products" tailored specially to their needs on request.

Our services are offered by means of:

- goal-oriented transfer projects,
- long-term strategic research and development alliances,
- consulting,
- executive briefings,
- continuous training and education,
- studies and expert reports,
- state-of-the-art surveys,
- product evaluation,
- prototypical tools.

A Matrix Organization

The structure of Fraunhofer IESE is designed to optimally support applied research and technology transfer projects. In order to serve the differing needs of our customers, we have to put together project groups in a very flexible way. If necessary, we reorganize project groups to accommodate changing project needs over time.

Therefore, the basic institute structure is a matrix organization. Through the matrix we bring together our software engineering competences on the one side - provided by the Quality and Process Engineering (QPE) and Innovative Software Engineering Approaches (ISE) departments - and the change management and application domain know-how on the other side - provided by the Industrial Quality Improvement Projects (IQVP) and the Central Services and Public Projects (ZDÖP) departments.

Synergistic Research and Transfer Departments

Quality and Process Engineering (QPE) and Innovative Software Engineering Approaches (ISE) are maintaining and continuously improving the institute's technical competences. The department for Industrial Quality Improvement Projects IQVP (Industrielle Qualitäts-Verbesserungs-Projekte) and a fourth department, Central Services and Public Projects ZDÖP (Zentrale Dienste und öffentliche Projekte) are responsible for successfully planning, conducting, and managing industrially- and publicly-funded projects.

Project Management Groups

The European Public Projects and National Public Projects groups within ZDÖP are concerned with acquisition and management of public projects. Main sources for funding are the European Union (EU), the Federal Government of Germany (BMBF) and the State Government of Rhineland-Palatinate (MBWW, MWVLW).

The groups within IQVP address the special needs of companies from different industrial sectors. The Software Providers Group handles projects with companies that develop software as their primary product. All other groups deal with companies where software is an additional integrant contained in technical systems (e.g., automotive products, airplanes, printing machines), or services (e.g., telecommunications, banks, insurance, trade). An ever growing sector for us is telecommunication; it is, therefore, handled by a special group.

Organigram

Fraunhofer Institute for Experimental Software Engineering (IESE) Kaiserslautern	**Prof. Dr. Rombach**
External Relations Department (EB)	**Prof. Dr. Rombach**
Acquisition	Prof. Dr. Rombach
Contact Office FC-MD (USA)	Namingha
Consulting Center for SME's	Dr. Hörmann
Demonstration Center	Dr. Rösch
Education and Training Center	Eberle
Public Relations	Müller-Klink
Software Experience Center Projects	Dr. Bomarius
Central Services and Public Project Department (ZDÖP)	**Dr. Ruhe**
Administration	Halle
European Public Projects	Pfahl
Library and Publication Service	Göpfert
National Public Projects	Dr. Ruhe
Programming Services	Dr. Rösch
Technical Service	Huber
Quality- and Process Engineering Department (QPE)	**Dr. Briand**
Process Modeling and Analysis	Dr. Verlage
Quality Improvement and Experience Factory	Dr. Althoff
Quantitive Methods	Dr. El Emam
Software Engineering Environments	Dr. Rösch
Innovative Software Engineering Approaches Department (ISE)	**Dr. DeBaud**
Product Line Approaches	Dr. DeBaud
Reengineering and Maintenance	Girard
Requirements Engineering	Dr. Knauber
Systematic Development Approaches	Dr. Atkinson
Industrial Quality Improvement Projects Department (IQVP)	**Dr. Bomarius**
Software-Intensive Products	Dr. Bomarius
Software-Intensive Services	Dr. Bomarius
Software Products	Dr. Bomarius
Telecommunications Services	Dr. Schwarz

External

Offerings to industrial customers are supported and complemented by the following external service centers.

Consulting Center for Small and Medium-Size Enterprises

The general objective is to take care of the particular needs of small and medium-size companies. Industrial transfer projects for SMEs are conducted here (similar as in IQVP). Specific activities in 1997 included the formation of the association "Software Technologie Initiative e.V." (STI) together with several companies and the University of Kaiserslautern. In cooperation with STI, a workshop on "Qualitätsverbesserung in der Softwareentwicklung" was held in June 1997 with more than 80 participants. As a follow-up activity of this meeting, three evening workshops on "Inspections" and two on "Software Testing" have been performed, each of those with 20 participants on average. In addition, consulting activities started with several small projects.
Contact:
Dr. Klaus Hörmann
Tel. 06301/707-262
e-mail hoermann@iese.fhg.de

Contact Office to Fraunhofer Center-Maryland (FC-MD)

The general objective is to coordinate all IESE activities with researchers of the University of Maryland, and respectively the Fraunhofer Center Maryland (FC-MD), and to support joint industry projects. In addition, the Contact Office provides services such as German-English translations and linguistic review of English-language publications. The Contact Office also organizes monthly management meetings between the leadership of FC-MD and Fraunhofer IESE via video conference, organizes visits from U.S. colleagues, and supports foreign IESE employees in settling in Germany. Specific activities in 1997 included the preparation for the founding of the Fraunhofer Center Maryland (FC-MD) at the University of Maryland on January 1st, 1998.
Contact:
Sonnhild Namingha
Tel. 06301/707-239
e-mail namingha@iese.fhg.de

Contact Office to University of Kaiserslautern

The general objective is to provide visibility on campus, to manage the university affiliation, to provide on-campus laboratories for students employed by IESE, and to provide offices for IESE employes lecturing at the university and/or cooperating with on-campus research groups. Specific activities in 1997 included the processing of more than 20 diploma theses from IESE at the university, the organization of workshops for SMEs at the university, and the organization of guest lectures of IESE employees at the university.
Contact:
Kristina Jerkku
Tel. 0631/205-3329; -3341
e-mail jerkku@informatik.uni-kl.de

Demonstration Center

The general objective of the Demonstration Center is to provide a physical and virtual environment for the presentation of IESE competences and their potential to solve real-world customer problems. The presentation of IESE competences is achieved through interactive, multimedia showcases of technologies and supported by online access to real project data and software tools. Physically, the Demonstration Center is a special room in the main building of the Fraunhofer IESE, where showcases are demonstrated to customers. Virtually, the same presentations can be accessed via Web-interfaces from any Web-client within IESE. In 1997, the major showcase of the Demonstration Center, which is the so-called QIP Scenario, was presented at the CeBit fair.
Contact:
Dr. Peter Rösch
Tel. 06301/707-261
e-mail roesch@iese.fhg.de

Public Relations Center

The general objective is to inform media about Fraunhofer IESE activities with general concern, to provide the public with information material, to support marketing activities, to coordinate and execute presentations of the institute at exhibits and trade fairs, and to publish digital information (website, multimedia). Other tasks include: responding to general requests, checking media for relevant information, and maintaining the corporate design of the institute in general. Specific activities in 1997 included the publication of the first annual report of the Fraunhofer IESE and the build-up of a framework that supports the needs of effective public relations activities.
Contact:
Joachim Müller-Klink
Tel. 06301/707-122
e-mail mkl@iese.fhg.de

Internal

Research and technology transfer is supported by administrative and technical groups and centers.

Administration Center

The general objective is the smooth processing of routine administrative procedures in the areas of financial and personnel affairs. The administration provides the necessary planning and control data for managing the institute, and ensures the smooth exchange of information between the institute and Fraunhofer headquarters. Specific activities in 1997 included the registering and accounting of close to 1.200 transactions. An additional 475 business trips were submitted and processed.

Technical Service Center

The general objective is to provide a functioning computer network with 215 systems as well as numerous other equipment and components. The technical service provides systematic maintenance to hard- and software and pays attention to the requirements of data exchange, especially the high demands on the reliability and security of internal and external communication services. Additional tasks are the offering of internal hotline services, procuring hard- and software, as well as education and training in the technical-administrative area. Specific activities in 1997 included the beginning of the education of trainees with focus on system integration.

Library and Publication Center

The general objective is to provide suitable information resources to IESE scientists and to offer support in the field of publication of scientific contributions and project documents. In addition to supporting the staff in the area of Corporate Design, the services of the center are aimed at the introduction of document management. Specific activities in 1997 included the documentation of a total of 150 staff publications for the cooperation project 'Fraunhofer-Publica'.

Training and Education Center

The general objective is to improve the institute's abilities in training, education, and consultancy. The Education and Training Center is responsible for two main areas of strategic importance. First, in the field of external projects and cooperations, the center makes out syllabi and provides didactical support for training and education in software engineering. Second, the center focuses on the development of the institute's human resources by organizing well-tailored further training programs for all Fraunhofer IESE members. Specific activities in 1997 included the creation of professional teaching materials for our customers and internal trainings and seminars orientated towards improving the consultancy skills of our junior researchers.

...offering external and internal services...

The Institute in Numbers

Budget

Business

Income	**TDM**	**%**
Industrially-funded projects	2.909	40,9
Publicly-funded projects	860	12,1
Other Income	3	0,1
Public Grant (State of Rhineland-Palatinate)	3.332	46,9
	7.104	**100,0**

Expenses	TDM	%
Personnel	5.032	70,8
Miscellaneous	2.072	29,2
	7.104	**100,0**

Investments

Income	**TDM**	**%**
Industrially-funded projects	9	1,2
Public Grant (State of Rhineland-Palatinate)	771	98,8
	780	**100,0**

Expenses	**TDM**	**%**
	780	100,0

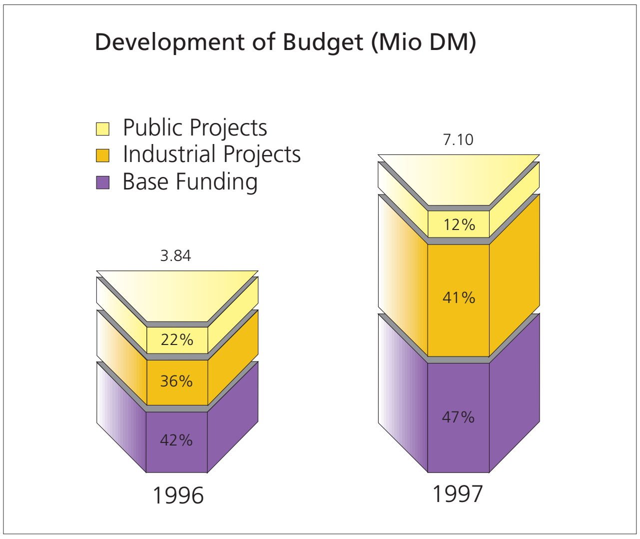
Personnel

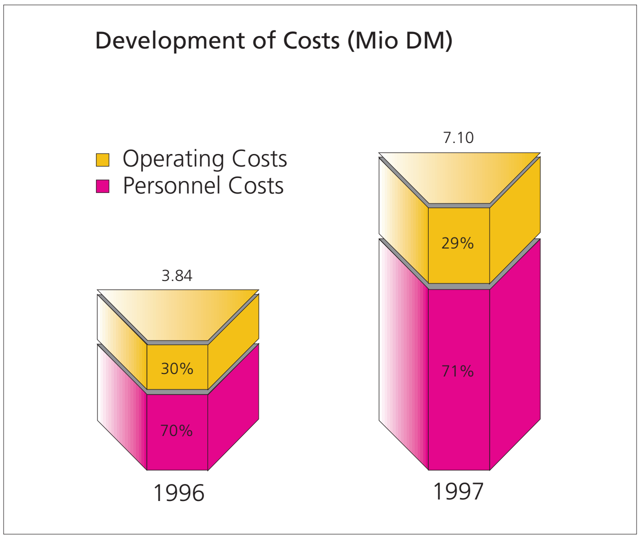
In its first year Fraunhofer IESE has almost doubled its staff. We were forced to hire leading experts from many different nationalities, thus creating an extraordinary multinational culture at the institute.

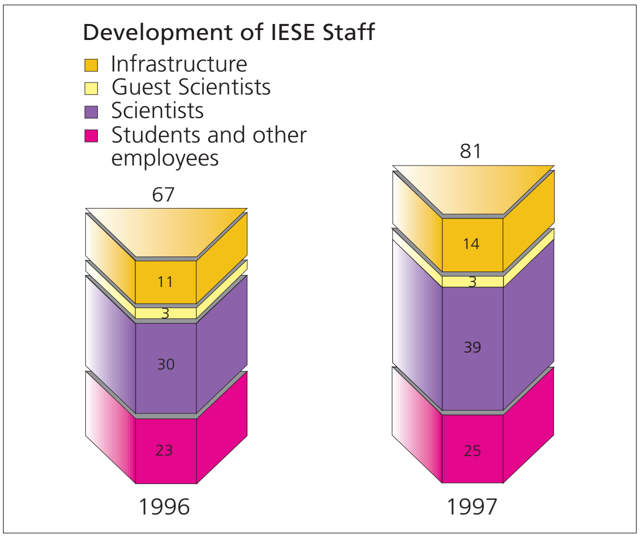
In 1997 growth in terms of staff was continued at a rate of about 20%.

Personnel	**as of 12/31/97**
	Number
Scientists	39
Infrastructure	14
Guest Scientists	3
Students & other employees	25
	81

Development







Advisory Board

Research

Prof. Dr. Gerhard Barth
Member of the Board of Directors
Alcatel/SEL

Prof. Dr. Victor R. 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
also: Vice-President of GI - German Computer Society

Dietmar Freigang
Director, Information Systems
Allianz-Lebensversicherung AG

Wolfgang Jung
Director
Deutsche Telekom AG
Development Center

Günther Plapp
Technical Director
Robert Bosch GmbH
K3/LE

Monika Gonauser
Department Head
Siemens AG
ZFE ST ACS

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

Government

Brigitte Klempt
Director, Department of Research and Technology Transfer
Ministry of Education, Science and Continous 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

Steffen Isensee
Director, Department of Computer Science Systems and GMD (Society for Mathematics and Data Processing)
Federal Ministry of Education, Research, Science and Technology (BMBF)

...transferring new technologies into practice...

Research Mission

Our customers face real, large-scale quality, productivity, and time-to-market problems within their software divisions. They expect us to perform quick root cause analyses, propose adequate techniques, methods, and tools to mitigate the identified problems, and help integrate them into their software and business processes as manageable competences.

This implies that such technologies should be rigorously evaluated within realistic conditions and properly packaged. In addition, once transferred, these technologies must be tightly controlled and managed for optimal use. That is, we must ensure that these technologies are properly used with respect to: conformance to intended use, resource expenditures, organization issues, and quality objectives.

The core technical contribution of the IESE is to empirically characterize, validate, and package innovative software technologies. To address this goal, the IESE core technical competences are structured around two highly synergistic departments: Quality and Process Engineering (QPE) and Innovative Software Engineering (ISE).

The primary mission of Quality and Process Engineering is to provide support for the transfer and subsequent optimization and control of software technologies through rigorous evaluation, quality control, and quantitative management.

The primary mission of Innovative Software Engineering is to maintain a portfolio of effective and innovative software engineering methods and techniques that leverage software development competences of our customers.

Without engineering-style processes, software development remains fraught with unpredictable risks. Quality and process engineering offers processes, methods, and techniques that lead to reliability and economic efficiency.

Quality and Process Engineering

Dr. Lionel Briand, Department Head

In order to monitor, evaluate, and control the transfer and tailoring of software technologies (e.g., tools, processes) into an organization, one needs to be able to measure the strengths and benefits of such a technology, but also its costs and inherent risks. In addition, in order to determine how to integrate a new technology into current practice, one needs to understand the software development processes and technologies in place, understand their weaknesses and strengths. Thus, the potential gains and dangers of a new technology can, in context, be precisely assessed and quantitatively investigated.

Once transferred, any technology needs to be monitored, controlled, and managed in order for it to be effective from a quality and productivity standpoint. In order to do so, the resource consumption and quality achievements of a technology need to be quantitatively modeled and linked to contextual and human factors.

To address the issues mentioned above, the QPE department is composed of four interacting and complementary groups:

- Quantitative Methods (QM)
  QM 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 modeling, and many other experimental techniques.

- Process Modeling (PM)
  PM aims at providing methods for process elicitation, modeling, and analysis so that specific process weaknesses and strengths may be identified. This is expected to naturally drive process improvement initiatives. We put particular emphasis on developing techniques to cope with realscale, high-complexity processes and organizations.

- Quality Improvement and Experience Factory (QE)
  QE aims at supporting the packaging of software knowledge (e.g., process models, productivity models) within an organization and facilitate its reuse. The dissemination and proper reuse of software knowledge requires the provision of facilities to store all forms of knowledge, retrieve and tailor it. In addition, QE provides strategies, infrastructures, and methods to support long-term cumulative, organizational learning.

- Software Engineering Environments (SEE)
  SEE aims at providing automated support for all the activities described above, ensuring that they can be implemented at minimal cost.

We place particular emphasis on developing solutions that are technically sound, optimal in their specific context of application, and tailored to our customers' expectations and needs.

...understanding, modelling, controlling...

Process Modeling & Analysis Group

Software development organizations operate according to a set of complex processes like specification, design, coding, testing, and configuration control. The introduction of new technologies or methods in this environment often causes severe problems. One of the major reasons is the lack of explicit information about the actual processes and their interrelationships.

Visualization of processes is needed first of all to understand and to better control the change of software development organizations and to predict the performance of projects. This visualization is achieved by modeling the processes descriptively. Simulation of those models allows the observation of their behavior in different contexts at low cost. Analysis of the models uncovers problems in software development.

Process modeling provides a necessary prerequisite to better understand, control, manage, and change software development processes. Overall, the explicit process models represent an important part of an organization's experience and demonstrate its ability to handle complex tasks. Process models are therefore a basic part of the documentation which is required for ISO 9000 certification. Availability of such documentation and fidelity to the processes executed are an important quality aspect in the assessment of an organization.

Goals

The general goal of the Process Modeling and Analysis Group is to provide accurate models of software development processes for use in process improvement. This consists of the following elements:

- Modeling
  Making software industry processes explicit, defining and validating conceptual frameworks for process modeling, providing a set of knowledge acquisition techniques for elicitation of process information, defining a process modeling methodology, and evaluating tools for process modeling.

- Analysis
  Analyze the process models both quantitatively and qualitatively in order to identify where process improvement is necessary; compare candidate process models for selection of best practice development.

- Process management
  Innovative technology to store, retrieve, and tailor process knowledge.

Description

The Process Modeling and Analysis Group is involved in the following technology transfer and research areas:

- Modeling industrial development processes, including the evaluation of applied process modeling technology.

- Development of a conceptual schema that helps capture all relevant aspects of processes within improvement programs. This includes the transformation between different process modeling languages.

- Specifying, testing, and evaluating process modeling tools for descriptive process modeling.

- Examination of mechanisms for coping with process variants and versions, which includes project-specific tailoring of process models.

- Definition of an operational process modeling method.

- Development of a Web-based process guide, which is a structure and navigation mechanism to represent an organization's process model. The aim of this process guide is to support developers in their daily work and help them achieve process conformance.

Scientific Issues

The Process Modeling and Analysis Group identified the following research fields as subjects of their future research activities.

- Conceptual Model and Views
  "Is there a canonical schema for describing development processes and what are useful variants in different contexts?"

- Modeling Method
  "What techniques are candidates for extending the portfolio of technologies for process elicitation and process documentation?"

- Analysis
  "What project parameters influence product quality and process attributes (e.g., timeliness, effort) and how can they be captured in process models?"

- Process Management
  "What are the requirements for defining an instance of an experience factory for process models?"

Practical Uses

Process modeling helps companies to understand the complex relationships in software development. Explicit process models support communication among different roles (e.g., managers and developers) and help reconcile differing views on the software process. Process models help project planning, identify causes for low product quality or budget overrun, capture the experience of an organization, fulfil requirements for quality management (e.g., ISO 9000-1), and support the implementation of process change within improvement programs.

Cooperation

Research Cooperation:
- Daimler-Benz Forschung und Technik, Ulm (D);
- Software Engineering Institute SEI, Carnegie Mellon University, Pittsburgh, Pennsylvania (USA);
- University of Kaiserslautern, Kaiserslautern (D);
- University of New South Wales / CAESAR, Sydney, (AU)

Industrial Cooperation:
- Bosch Telecom GmbH, Frankfurt/Main (D);
- Daimler-Benz Aerospace DASA, Bremen (D);
- KoDa GmbH, Würzburg (D)

Dr. Martin Verlage, Group Leader

Urike Becker-Kornstädt

Dirk Hamann

...defining strategies and structures...

Quality Improvement and Experience Factory Group

One of the fundamental principles of experimental software engineering is to understand and improve software quality and productivity. This must be based on empirical evidence and project experience. Even for small software organizations, all kinds of information about either are built up over the years. To such information, including also implicit knowledge like expertise and lessons learned, the overall term "experiences" will be applied. In order to effectively retrieve and reuse such experiences, they need to be captured, structured, and stored in a reusable form. A continuous build-up of them requires an appropriate organizational structure that must be integrated into the software organization. Such an organizational structure is referred to as an "experience factory" and within it the repository for the experiences is called "experience base".

Goal

Our goal is to help software organization improve by establishing custom-made experience bases/factories. Therefore, we enhance our methodology for building and running software engineering experience bases/factories as well as develop technologies needed to implement them. This is based on practical experiences from real-life experience bases.

Description

This group focuses on the following issues:

- developing a generic architecture of experience bases that can be easily tailored to specific customer needs,
- developing technologies to capture, structure, store, update, retrieve and reuse experiences, as well as to build up, use, and maintain experience bases based on SE experiences,
- developing a methodology for building up and maintaining the experience bases/factory,
- developing experience bases for specific application areas in SE (e.g., measurement programs, cost/benefit models, lessons learned about software tools, project management, etc.),
- developing an experience factory tool implementing the chosen architecture of an experience base, using the identified technologies, and supporting the developed methodology.

Scientific Issues

The scientific work of this group addresses the following topics and their related questions:

- Structure of an experience base
  What should be the structure of an experience base? What experiences should be stored, and to which degree should they be formalized? How to deal with the various semantic relationships within an experience base? What is the most appropriate structure of an experience base so that the software organization is optimally supported?
- Representation of experiences
  How can different kinds of experiences (e.g., if experiences are described on different levels of abstraction) be represented, made available, and combined in an effective way in consideration of the respective context of the user?

- Technologies for the implementation of an experience base
  Which technologies for the implementation of an experience base do exist? What are their respective costs and benefits? How do they correspond to the requirements in an industrial software organization?

- Methodology for building up and maintaining an experience base/factory
  How can the methodology for building up and maintaining an experience base/factory be enhanced?

- Automated support within the experience factory
  To which degree can the activities necessary to operationalize an experience factory be automated or supported by a tool? E.g., how can machine learning techniques be exploited for maintaining an experience base?

- Evaluation of an experience base/factory
  How can the success of an experience base/factory be evaluated?

- Operationalization of knowledge-based systems in industrial/business environments
  To which degree does the experience factory approach offer the necessary organizational and managerial means to operationalize knowledge-based systems in industrial/business environments?

Practical Use

Such experience stored in the experience base/factory can be used

- for decision support,
  e.g., the project management has to decide which technology to use on a project;

- for reuse,
  e.g., the capture of expertise and lessons learned minimizes the risk of committing the same mistake twice;

- for quality improvement,
  e.g., the continuous build-up supports the identification of high payoff areas for improvement;

- for productivity increase,
  e.g., the storage and thus the awareness of the software processes allows a rapid adaptation to the changing demands of the market.

Cooperation

Research Cooperation:
- Centre for Learning Systems and Applications (LSA), University of Kaiserslautern, Kaiserslautern (D);
- Consortium Esprit project “Information & Knowledge Reengineering for Reasoning from Cases” (Inreca-II; France, Ireland, Germany);
- Federal University of Santa Catarina, Florianópolis (Brazil);
- Humboldt University, Berlin (D);
- Special Research Area "Development of Large Systems with Generic Methods" (SFB 501), University of Kaiserslautern, Kaiserslautern (D);
- The Research Institute for Validation of AI Systems (VAIS) (Germany, Japan, USA);
- University of Maryland, College Park, Maryland (USA)

Industrial Cooperation:
- Allianz Life, Stuttgart (D);
- BSR Consulting, Munich (D);
- Daimler Benz Research and Technology, Ulm (D);
- Daimler Benz Aerospace DASA, Bremen (D);
- Dräger Medical Technology (The Netherlands);
- Ericsson LMF (Finland);
- Schlumberger RPS (France/The Netherlands);
- tecInno GmbH, Kaiserslautern (D)

Dr. Klaus-Dieter Althoff, Group Leader

Andreas Birk

Susanne Hartkopf

Dagmar Surmann

Carsten Tautz

...baseling processes and products...

Quantitative Methods Group

For software organizations to improve their efficiency and effectiveness, they have to be able to measure their processes and products. This measurement can be used to characterize and baseline their processes and products, to monitor and control projects, to evaluate new technologies, and to identify and track improvements. This approach is referred to as measurement-based improvement.

Goals

The general goal of the Quantitative Methods Group is to develop and apply technologies that facilitate measurement-based process and product improvement.

Description

This group is involved in the following technology transfer and research areas:

- setting up measurement programs in industry following the GQM paradigm and generalizing from these experiences to identify critical success factors for setting up a measurement program,
- empirical evaluation of software products through the analysis of field data and through experiments,
- developing techniques for the measurement, evaluation, and control of software inspections through the analysis of field data and through experiments,
- developing and evaluating new methods and modeling techniques for software cost estimation,
- evaluating, modeling, and improving the reliability, validity, and costs of software process assessments,
- further development of quantitative and qualitative modeling techniques for other areas of investigation.

Scientific Issues

The Quantitative Methods Group identified the following areas as subjects of on-going and future research activities:

- Definition and Validation of Product Measures
  "Which measures are most useful for understanding the structure of software and for managing its quality?"
- Inspections
  "What criteria should be used to decide whether to reinspect a software artifact?" and "How do we assess the effectiveness and efficiency of software inspections?"
- Cost Estimation Models
  "Which modeling techniques provide the greatest cost estimation accuracy?" and "How can we effectively incorporate local expert knowledge into cost estimation models?"
- Software Process Assessments
  "How can we improve assessment methods to increase their reliability?", "How does our process capability compare to that of other organizations in our industry?" and "How can we reduce the costs of assessments without compromising their quality?"
- Data Analysis
  "Which machine learning and statistical data analysis techniques

are most suitable for solving particular software engineering problems?" and "How can we improve upon existing data analysis techniques for use with software engineering data?"

Practical Use

- Product evaluation:
  We have built models to predict the error proneness of software components from measures of the system design, and we have compared object-oriented design documents built using different design guidelines to see which guidelines result in less maintenance effort. In addition, we have developed a comprehensive formalism for defining product measures of object-oriented systems. This formalism has been operationalized in a tool to measure C++ programs.

- Measurement, evaluation, and control of software inspections:
  We have built models to estimate how many defects remain in a document after an inspection to help decide whether it ought to be reinspected, and we have developed a benchmarking approach whereby the performance of inspections can be compared to that of companies that already have implemented inspections successfully. In addition, quantitative decision models that can be used to control and optimize inspection processes have been constructed.

- Cost estimation:
  We have developed a cost estimation modeling technique for use in organizations with small historical data sets. This technique augments the available historical data with the knowledge of experienced project managers. Uncertainty of expert knowledge is accounted for and explicitly modeled using Monte Carlo simulations. This also allows early assessment of project cost risks and benchmarking project productivity. Currently there is an on-going initiative to develop cost estimation models using functional size measures by combining machine learning and statistical techniques.

- Process assessments:
  We have undertaken an extensive program of evaluating the reliability of process assessments, identified ways of improving their reliability, and constructed cost models of process assessments. In addition, we have constructed international benchmarks of software process capability.

Cooperation

Research Cooperation:
- Centre de Recherche Informatique de Montreal, Montreal, Quebec (CAN);
- DATAMAX, Avon, France (F);
- European Software Institute, Bilbao (E);
- GrafP Technologies Inc., Montreal, Quebec (CAN);
- IVF, Centre for Software Engineering, Göteborg, (S);
- SANOFI Recherche, Montpellier, France (F);
- Software Engineering Institute (SEI), Carnegie Mellon University, Pittsburgh, Pennsylvania (USA);
- Software Engineering Laboratory (SEL), University of Maryland, College Park, Maryland (USA);
- Software Technology Transfer Finland, Espoo (SF);
- VTT Electronics, Oulu, Finland (SF)

Industrial Cooperation:
- Alcatel-Alsthom, Software Support Group, Paris (F);
- Daimler-Benz AG, Forschung und Technik, Ulm (D);
- Daimler-Benz Aerospace DASA, Bremen (D);
- Robert Bosch GmbH, Frankfurt/Main (D);
- sd&m GmbH & Co. KG, Munich (D)

Dr. Khaled El Emam, Group Leader

Dr. John Daly

Bernd Freimut

Isabella Wieczorek

Jürgen Wüst

...providing computer-based tools...

Software Engineering Environment Group

Software engineering involves many complex activities and artifacts concerning both product engineering (e.g., documents, code) and process engineering (e.g., design and inspection activities and their relationships). To keep the software engineering process under control and efficient, information about activities and products must be entered, stored and maintained in computer-based environments. Software engineering environments (SEEs) help engineers to deal with the inherent complexity of software engineering by providing computer-based tools for all areas of software engineering in an integrated way. This includes tools for all aspects of product and process engineering.

In the context of software quality improvement projects, specialized SEEs are needed which also address the requirements for data collection, analysis, and presentation visualization in an integrated environment. Therefore, an SEE can be viewed as the integrating framework for various tools which are required for process and quality control.

Goals

The SEE group aims at implementing the vision of a tailorable SEE for process control and process improvement. Therefore, topics related to SEEs in general, such as e.g. CASE tools or tool integration, etc. are put into the specific context of process control and improvement and are addressed according to specific requirements. In addition to topics which are related to SEEs, we also address various tool aspects in the context of specific activities that occur during the process of control and improvement. Thus, we address the integration framework (SEE for process control and improvement), as well as the components of this framework.

Description

The QPE/SEE group builds up competence in the area of software engineering environments and supports industrial and public process improvement projects with concrete tailored tool prototypes. One of the key issues for achieving our long-term vision of an SEE for process control and process improvement is to have an explicit representation of the process (the process model) on which various analyses can be performed. Therefore, the major topic is to provide tool support for process modeling (SPEARMINT). Other aspects of the process improvement lifecycle include tools for measurement support and the integration of corporate experience bases.

In the SPEARMINT project (Software Process Elicitation, Analysis, Reuse and Measurement in an Integrated Modeling Environment), a prototype for comprehensive software process support is being developed. The need for such a new product has arisen because of the lack of support given by existing tools for elicitation, and analysis of software processes. The focus of the SPEARMINT project is to support software process elicitation, measurement planning, process analysis, and reuse. The SPEARMINT prototype provides multiple configurable views on the software process in an integrated and comprehensive environment.

Scientific Issues

The scope of scientific issues addressed by the SEE group includes software engineering environments in general as well as aspects related to specific components in an software engineering environment:

- Integration in software engineering environments
- Integrated Software Process Management Support
- Computer Aided Software Process Measurement and Measurement Planning
- Evaluation of SEEs

Practical Use

Process improvement can only be efficiently achieved in practice if it is well supported by tools. Software engineering environments provide the basis for gaining intellectual control over processes and products.

The SEE group provides some of these tools through the SPEARMINT project. The SPEARMINT prototype is targeted to be a product which can be used by our scientists in actual industrial and public projects. The following major development phases have been identified:

- The current state of SPEARMINT supports elicitation of process models. In late summer of 98, we will have a robust prototype which can be used in projects for elicitation of process models.
- The next implementation phases will concentrate on the integration of measurement support. Features will then include the definition of GQM measurement plans and their integration in the SPEARMINT environment.
- Comprehensive software process management support is a long-term goal which will be addressed in approximately three years.

Besides the practical use in projects, the SPEARMINT project also provides a defined architecture and integrated framework for building the construction of software engineering environments. Therefore, SPEARMINT represents an integration framework for tools which are developed at the Fraunhofer IESE.

Cooperation

– Centre for Advanced Empirical Software Research (CAESAR, University of New South Wales, AU);
– University of Kaiserslautern (D)

Dr. Peter Rösch, Group Leader

Ralf Kempkens

Dr. Richard Webby

Jörg Zettel

Radical technological changes are an everyday occurrence in digital information processing. The introduction of innovative software technologies will only lead to success if carefully planned. Software engineering that pursues new development approaches must therefore have a solid basis in science and, at the same time, be practice-oriented.

Innovative Software Engineering

The very basis of any engineering activity is to provide carefully crafted and adapted technical solutions to problems encountered. Software development presents its own set of challenges, and by its very diversity requires a wide array of methods and techniques.

Yet, there are recurring themes, when observing software development from a life-cycle point of view. Most organizations fall in either one (or more) of the following three situations: They may be building one system at a time, they may be building a family of related systems (variants), and/or, they may need to leverage or reuse existing assets.

The primary mission of the IESE Department for Innovative Software Engineering (ISE) is to develop a portfolio of effective and innovative software engineering methods and techniques that address problems within the above depicted situations, for careful evaluation and transfer purposes.

To achieve this mission, the ISE uses its customers' existing or anticipated needs as the principal driver when monitoring the state-of-the-art, when selecting, adapting, and packaging promising approaches or, when required, developing new ones.

Our strategy has been to organize the department into four complementary competencies, each addressing, via its portfolio of sound methods and techniques, recurring problems within the software life-cycle:

- Requirements Engineering (RE)
  This group focuses on the optimal elicitation, modeling, and verification/validation of what exactly a software system should solve.

- Systematic Development Approaches (SDA)
  SDA addresses questions related to the repeatable, systematic, and traceable development of a system's requirements into an executable one, with certifiable attributes whenever possible. The group also tackles software inspections. Inspections are aimed at the elimination of defects at all level of development.

- Product Line Approaches (PLA)
  The focus of PLA is to help organizations efficiently produce families of systems that share core characteristics. These approaches encompass reuse approaches at the analysis, architectural, and source-code level as well as the organizational difficulties to transition towards a product line production structure.

- Software Maintenance and Reengineering (SMR)
  This group tackles the multiple types of problems that arise when a system has been fielded and needs to be maintained, redocumented, and/or restructured.

We emphasize the creation of tight relationships with our customers. We fully appreciate the difficulties but also the opportunities of such close collaborations. While technical excellence is a must, adaptability, practicality, and problem-orientation have been the keys to our success.

Dr. Jean-Marc DeBaud, Department Head

...reusing analysis and design results...

Product Line Approaches Group

There is tremendous customer pressure on the market for organizations to develop multiple variants of their core products, which should, of course, be ever faster, cheaper and of higher quality. Historically, organizations have responded to this challenge by organizing their products (and hence competencies) around product lines. There, variants are derived and manufactured from a core structure, or architecture.

The vision of product line approaches for software systems (PL) is to enable organizations to manage their software development efforts according to and benefiting from the PL principles. PL's principal goal is to manage product variability while minimizing effort duplication and maintaining an open and flexible central design.

Reuse is central to the idea of achieving control over a PL. Successful reuse takes many forms, but it has become apparent that analysis and design reuse, beyond the more traditional reuse of code, hold the key to achieving systematic and widespread software reuse.

In order to reuse analysis and design, it is necessary to take an application domain (the business or scientific application area of the product line) view of the world. A domain is an abstraction that denotes a set of similar problems that are together deemed to share a number of fundamental characteristics. Examples of such domains are Avionics, Accounting, Warehousing, and Guidance Systems.

Problems within a domain have often been solved over and over again. Hence, it may be possible, via a domain engineering process, to extract the specification and structure of one or more generic solution designs covering the problems in the domain. This almost always takes the form of a generic (reference) architecture specification. This reference architecture then serves as the PL core (reuse infrastructure) with which subsequent system variants can be efficiently derived. The field of PL approaches encompasses all the steps and processes necessary to construct and use such a domain-based reuse repository.

Goals

The main goals of this group are:

- Technical Issues
  Better understand the practical processes used and the problems encountered behind constructing, using, and evolving PL for software systems over time.

- Technology transfer issues
  Acquire, analyze, and reuse process information relating to the development of PL within a variety of organizations.

Both goals provide the conditions enabling the successful transition of this type of domain-based intensive reuse within organizations. To that effect, we have begun the development of a full-scale PL development methodology, PuLSE (ProdUct Line Software Engineering).

Description

In particular, this group focuses on:

- The development of a multistep process for introducing PL within organizations: PuLSE.

- Identifying the type of information that must be recorded when performing commonality analyses as well as the most suited representation notation.

- Which of the existing domain analysis methods appears to work best in practice, both from a scientific and a practical point of view? What types of information must be captured and how? Does this depend on the particular domain?

- How to transition results of a domain analysis to a fully-documented robust, flexible and highly customizable reference architecture.

- Understanding how variable designs can be expressed and understanding the usability aspect of the notation used. Is object-orientation suitable for this task?

- Maintaining traceability from the reference requirements down to the executable components of the reference architecture.

- Managing the versioning problem created by using a reuse infrastructure to develop a family of systems when the infrastructure itself evolves rapidly.

- How can product line designs be evaluated?

Scientific Issues

- How can we provide a scientific foundation for the notion of domain? This includes scoping, modeling, and representation issues that are difficult to fully resolve: There is some evidence to suggest that different types of domains call for different answers. What are the key issues characterizing domain types, and what consequences does these have?

- The level of complexity needed to drive the evolution of a PL is dependent on the maturity of the domain and the quality of the domain engineering leading to its definition. When domain maturity is low or modeling was less than optimal, perhaps for economic reasons, deep changes to the reference architecture are necessary. We need to find a way to tackle this systematically.

Practical Use

PL for software systems is an architecture-centric, reuse-based software development approach. The focus is on capturing and exploiting an organization's core business competence areas. To an organization subscribing to the approach, PL provides a method to analyze and record the organization's competence as well as a process for constructing a software reuse environment that will be key to the organization's software development capabilities in that domain and hence to its competitiveness.

Cooperation

Research Cooperation:
- European Software Institute, Bilbao (E);
- Software Engineering Institute (SEI), Pittsburgh, Pennsylvania (USA);
- Semantics Designs, Austin, Texas (USA);
- University of Kaiserslautern, Kaiserslautern (D)

Industrial Cooperation:
- Ericsson Eurolab Deutschland GmbH, Herzogenrath (D);
- Kretz Software GmbH (D);
- Markant Südwest Software- und Dienstleistungs GmbH, (D);
- Market Maker Software GmbH (D);
- softTECH Software Technologie GmbH (D);
- tecInno GmbH (D);
- Tecmath GmbH & Co. KG (D);
- Viva Software GmbH (D)

Dr. Jean-Marc DeBaud, Group Leader

Joachim Bayer

Oliver Flege

Klaus Schmid

Tanya Widen

...preserving the quality of legacy systems...

Reengineering and Maintenance Group

A large part of today's programmer time is spent on maintaining systems, legacy or not. It is estimated that 40 to 70% of the cost of a software system is accrued during maintenance.

Indeed, successful software systems have a long lifetime of modifications. However, unless special care is taken, the quality of a software system (modularity, cohesion of its components, understandability, etc.) can decrease rapidly and the cost of maintenance increases dramatically. In the worst cases, it becomes necessary to redocument and restructure a particular system if degradation was too sharp.

Two strategies can help correct this situation:

- Better design and maintenance practice
  Establishing guidelines and operations to reduce system degradation.

- Redocumentation
  A major portion of any large maintenance effort is spent on understanding the existing programs and manipulated data. Within this context, helping maintainers preserve the quality of legacy systems can be achieved by helping them to better understand the whole systems and thus enabling them to predict how proposed changes to services would impact the system and could lead to side effects.

Goals

The main goals of this group are:

- Study a number of specific approaches and techniques to preserve the quality of a software system during maintenance.

- Better understand what constitutes a good practical system overview for a maintainer who has to comprehend and modify a system under time pressure. In particular, should this overview contain the structure and dynamic behavior of the system, contracts between its components, data view, etc., and in what form?

- Understand what type of analysis can suggest transformations to be operated upon a system so as to improve its maintainability, and preserve other quality features.

Each goal has a particular industrial perspective. It focuses on acquiring, analyzing, and reusing process information on the introduction of these approaches and techniques in an industrial setting.

Description

In particular, this group focuses on:

- Extracting architectural views of a system
  - What are the components of this system?
  - How do they relate?
  - What are the contracts (protocols) which constrain the interaction among components?

- Integrating and maintaining user's input on a partially-recovered architecture. This user input is crucial, because semantic information can be gained which plays a role in the organization of architecture and which cannot effectively be recovered otherwise.

- Integration of domain information in architectural recovery tools.

- Study the following specific techniques to preserve the quality of a software system during maintenance:
  - impact analysis,
  - change tracking,
  - version and configuration management,
  - scenario-based system analysis.

- Supporting wrap/rewrite decision during migration. Proposing key component candidates which should be wrapped/rewritten. Providing information required to perform this decision.

- Creation of models to predict when it is cost-effective to reengineer, rewrite an application, or keep on maintaining it as before.

- Extraction of data dependencies.

- Identification of code which has been duplicated, then slightly modified. This code often leads to maintenance problems since corrective maintenance in one location is hard to effectively replicate elsewhere.

- Analysis of the structure of a system to suggest ways to perform information hiding and separation of concerns.

Scientific Issues

- Which of the existing architectural description languages best expresses the structure, behavior, and constraints of an architecture, so that it can be used and accepted in industry?

- How can a domain model guide architectural recovery and how can architectural recovery tools contribute to the creation of such a model?

- How to integrate complementary architectural views of a system?

Practical Use

- Provide an architectural description of a system to support:

  - validation of change (did we break or degrade the architecture?),
  - analysis of scenarios of possible future changes,
  - testing,
  - creation of a model for a family of systems in the same application domain,
  - identification of reusable components from existing system along with the constraints on their utilization.

- Identify cloned code in a system to reduce the system size a maintainer has to oversee and reduce the number of duplications where errors have to be corrected.

Cooperation

Research Cooperation:
- Instituto per la Ricerca Scientifica e Technologica IRST, Trento (I);
- Georgia Institute of Technology, Atlanta, Georgia, (USA);
- University of Stuttgart, Institute of Computer Science, Stuttgart (D);
- VTT Electronics, Oulu (SF);

Industrial Cooperation:
- Tecmath GmbH & CO. KG GmbH, Kaiserslautern (D)

Jean-François Girard, Group Leader

...capturing the customers needs...

Requirements Engineering Group

To optimally perform system development, what must be performed by that system must be fully, clearly, and unambiguously documented. This is the role of requirements engineering (RE). When requirements are not well documented, a series of negative consequences usually ensues. Systems are difficult to develop, cost and schedule overruns are very likely, and maintenance becomes a key ‘feature’ of the system life-cycle. Since requirements engineering interfaces customer and developer organizations, it plays a key role in the overall success of the software development project.

Requirements engineering has three major phases: elicitation, modeling, and validation/verification.

Requirements elicitation addresses the gathering of requirements from all implicated stakeholders. It is a multidisciplinary process involving managers, end-users, and maintenance personal. As a social process, it is burdened with all the delicacies of human interaction.

Requirements modeling deals with the production of the requirements documents and is hence different from eliciting them. As these documents form the basis for all further software development phases, any error introduced at this stage can have critical impact on software development and may be costly to repair. Requirements also influence project management, since they form the basis for cost and schedule estimates.

Validation ensures that the various stakeholders reach a consensus about the elicited set of requirements. Verification deals with proving that such a set of requirements meets certain properties such as consistency, completeness, and safety-relevant invariants.

Goals

The goal of this group is to define requirements engineering processes and product models which:

- initiate and support communication between end-users and software developers,
- define precisely the required semantics and properties of the system that is to be developed,
- lead to early detection of errors in the requirements, while trying to prevent them in the first place,
- create a basis for future maintenance and evolution of the resulting system.

Particular processes and products will usually depend on the characteristics of the development organization and the type of application to be constructed.

Description

The RE group concentrates on the following issues:

- For real-time, embedded systems, how can one construct requirements documents that satisfy the desired qualities? Especially, how can one formalize requirements to circumvent ambiguities and how can those be easily communicated to stakeholders?
- Evaluating a number of rigorous and formal requirements engineering techniques and exploring how

they can be applied practically.

- Since a large number of persons are involved in RE and because they present a high diversity in their goals, the negotiation of requirements is very important in order to achieve general acceptance of the final system. How can this process be adequately structured and enacted to achieve this goal?

- Requirements engineering for a family of systems, that is systems that deal with the same application domain, is usually studied independently of the analysis of single application systems. How are these activities different and what can they learn from each other? How does domain analysis impact the elicitation and modeling processes?

Scientific Issues

Various stakeholders will usually hold different views on the characteristics required from a system to adequately address their needs. These views need to be elicited and reconciled. This process needs to be supported by effective means, such as an adequately structured social process and possible automation.

A requirement document forms the basis for product development. Thus, its quality has a major impact on this activity. Consequently, maintaining its quality has to be an ongoing concern during its development and needs to be finally ascertained by such means as formal verification or inspection.

The reuse of artifacts during software development is a key in producing high quality products with little costs. The higher the abstraction level of the artifacts, the larger the potential gains. Thus it is an important issue to find ways for supporting the systematic reuse of requirements during the application development process. This is especially true when developing a family of systems.

Practical Use

Requirements engineering is a critical step that must precede any software development effort. It is the key to the commercial success of a project and to customer satisfaction, as it is necessary to ascertain that the system to be built will meet customer needs and that the customer understands the implications of fielding the system in its overall business environment.

To illustrate the importance of having a good requirements engineering process, it has been demonstrated that it costs 5 to 20 times more on average to remove a defect during implementation than during the requirements engineering phase.

Cooperation

Research Cooperation:
- McMaster University, Hamilton, Ontario (CAN);
- Naval Research Lab, Washington, D.C. (USA)
- RENOIR; Requirements Engineering Network of International cooperating Research groups - a network of excellence (ESPRIT, EU);
- University of Kaiserslautern, Kaiserslautern (D)

Industrial Cooperation:
- Bosch Telecom GmbH, Frankfurt/Main (D)

Dr. Peter Knauber, Group Leader

Erik Kamsties

...creating software quality systems...

Systematic Development Approaches Group

One of the main problems faced by software organizations today is keeping pace with the rapid rate of change in development technologies. New ways of developing and maintaining software systems are constantly emerging in the market place, but if not introduced and managed properly they can easily set back rather than improve an organization's software capability. Systematic development methods play a key role in helping organizations create quality software systems in a predictable and reliable way.

The SDA group focuses on the improvement, customization, and introduction of systematic development methods to help organizations manage their software projects. The key qualities that make a method "systematic" are the provision of a well-defined set of development artifacts (i.e. product model) together with a concrete process for developing and validating these artifacts. At all times it should be clear what activities have to be performed, when they should be performed and for how long. Also, wherever possible, development decisions should be based on concrete, quantitative measures rather than ad hoc judgements. The group also focuses on practical quality improvement techniques such as testing and software inspection methods.

One of the most systematic methods available today is the Cleanroom method. In addition to a well-defined product model, this approach provides a comprehensive set of quality improvement and assurance techniques, such as inspections, semiformal verification and statistical, model-based reliability testing. However, because it is fundamentally function-oriented, these techniques are not easily transferable to the object-oriented paradigm. Given the increasing importance of object technology, a major challenge for the group is therefore the adaptation of the Cleanroom techniques for use with this paradigm, particularly the new concepts of patterns, frameworks, and components.

Goals

The main goals of the group are:

- adapt the concepts of the Cleanroom approach for use with object technology,
- develop techniques for the systematic use of patterns, frameworks and components (e.g., CORBA, COM, Java Beans) in software development,
- fully integrate quality improvement technologies within a cohesive, systematic method, particularly inspection, testing, and reliability certification techniques.

Description

In particular, this group focuses on:

- developing a concrete, recursive product model based on the diagram types in the UML standard,
- defining a systematic set of techniques for creating, validating and verifying this product model,
- refining the techniques of statistical, model-based reliability testing and adapting them for use with object technology,

- perfecting the perspective inspection approach and adapting it for use with object technology.

Scientific Issues

The Unified Modeling Language defines the standard types of diagrams to be used in the creation of analysis and design models, but does not specify how many instances of each type are required, and how they should be related. Most methods have a fixed product model, with a static number of diagram instances. However, a recursive product model would be much more flexible, and lay the foundation for a method which is more readily scalable than those available today.

The key to traceability and verification of software artifacts is the elaboration of the refinement relationships which exist between them. Several forms of refinement seem to be fundamental, including decomposition and interaction refinement, but a full orthogonal set needs to be identified and integrated within the development process.

Although software inspection is a clearly powerful method for detecting and removing defects after each stage of development, its success is often diminished by the lac of adequate reading techniques. The perspective-base inspection approach tackles this issue in the form of so-called scenarios. However, a major challenge is defining a procedure for the development and tailoring of scenarios to particular environments.

The basis for statistical reliability testing is the creation of a detailed model of the systems' usage profile. Much of this information can be captured within UML analysis models, particularly use case diagrams, but not necessarily all relevant details. The utility of UML diagrams for statistical reliability testing needs to be investigated and clarified.

Practical Use

The vast array of software technologies on the market today can easily overwhelm organizations without a mature software process. The methods developed and customized by the SDA group can assist such organizations in leveraging the latest innovations for maximum benefit, and can help mitigate the risks involved in producing quality software products on time and within budget.

Cooperation

Research Cooperation:
- Dycon Systems, Bethseda, Maryland (USA);
- Q-Labs GmbH, Kaiserslautern (D);
- Software Engineering Technology Inc. (SET), Knoxville, Tennessee (USA);
- University of Kaiserslautern (D);
- University of Maryland (D);
- University of Tennessee, Knoxville, Tennessee (USA)

Industrial Cooperation:
- AEG Atlas GmbH, Frankfurt/Main (D);
- Allianz Lebensversicherungs-AG, Stuttgart (D);
- Daimler-Benz Aerospace DASA, Bremen (D);
- Daimler-Benz AG, Forschung und Technik, Ulm (D);
- Ericsson Eurolab Deutschland GmbH, Herzogenrath (D);
- Ernst Informatik GmbH, Kaiserslautern (D);
- Q-Labs GmbH, Kaiserslautern (D);
- Robert Bosch GmbH, Frankfurt/Main, Stuttgart (D);
- Siemens AG, ZFE, München (D)

Dr. Colin Atkinson, Group Leader

Christian Bunse

Stefan Jungmayr

Oliver Laitenberger

Fraunhofer IESE projects are based on give-and-take. Our customers expect the transfer of state-of-the-art know-how. We expect from our customers that they allow us to learn and improve so that we may provide better service next time.

Industrially-funded Projects

Industrially-funded projects are the core business of the IESE: Projects are designed to take care of the special needs of the customers. They depend upon the size of the customer and the type of department - r&d, software development, quality assurance - with which we collaborate. Industrial projects thus vary along different dimensions:

– They vary between pure technology transfer and pure r&d.

– They can be short-term or long-term.

– They can focus on directly increasing developers' know-how or on creating leveraging competence that enables the customer to self-improve.

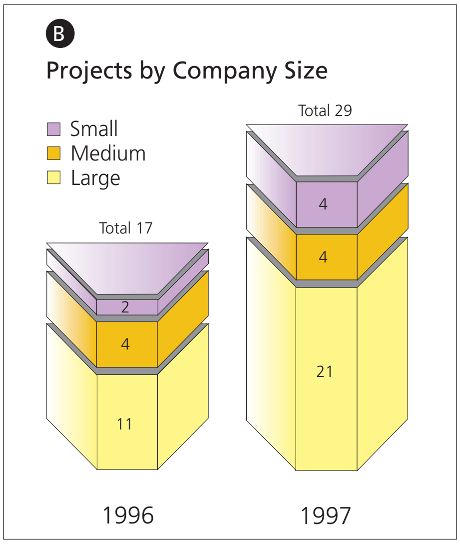
Especially when canvassing long-term collaborations, we design a series of projects rather than one monolithic project. We start with an expert study, a workshop and customer-specific training, and then move on to more long-term improvement programs.

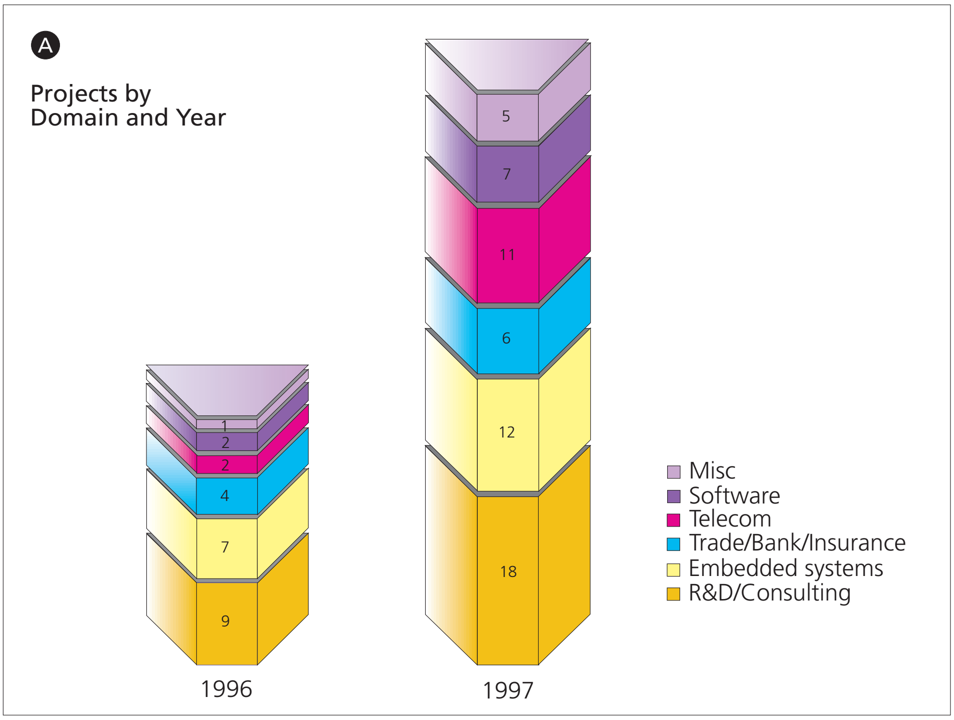
The increased renewal rate of projects with the same customer is a good indicator for customer satisfaction. The graphic C shows a clear increase in renewals.

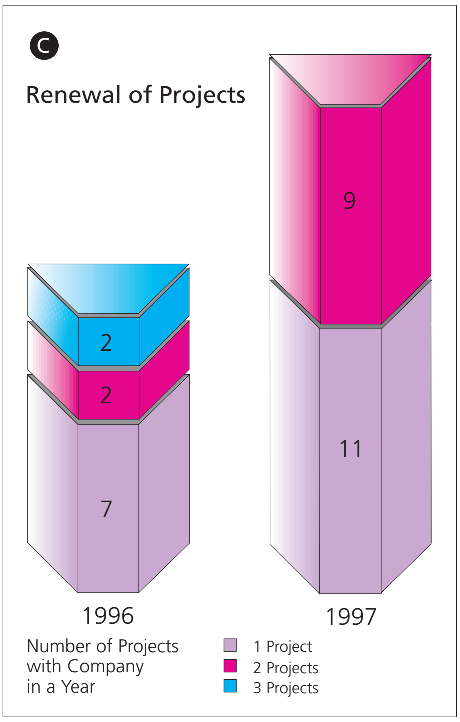
As compared to 1996, our set of market segments has not changed. Still, the primary software branch which we refer to as "Software", (graphic A) is of minor importance - wrt. revenue even more than indicated by this graphic.

The typical customers of IESE are still large companies. However, the foundation of an SME center has already led to an increase in small and medium-size company contacts, as can be seen in graphic B.

Dr. Frank Bomarius, Department Head







...assessing a development tool in industrial practice

Cost-Benefit Analysis of an Object-Oriented Framework

Alcatel had invested into buying a tool-supported object-oriented framework for promoting reuse and thus save effort and increase quality. The framework had been deployed to a number of sites and the question was to decide whether to deploy it further to more development sites.

The evaluation of new software development technology is a typical problem faced by the software industry. Fraunhofer IESE has developed a methodology to help companies perform such evaluations in an objective, reliable way and with limited cost overhead.

Approach

The technology evaluation methodology developed at the Fraunhofer IESE is based on the design of case studies and the use of well-designed questionnaires, structured interviews, and tailored data analysis. The goal is to collect objective, reliable, and analyzable data on the benefits and costs of introducing and using a given technology.

Using our methodology, we performed a survey analysis of carefully selected sites where the tool had been deployed in Alcatel. Reliable data were collected, checked for validity, and then analyzed over a period of one month.

Results

The results showed that the tool was cost- and quality- effective for the design and coding activities, but that there was no strong evidence of benefits for other types of development activities. One exception was an increased user satisfaction regarding the functionality of the systems (i.e., improved requirements engineering). The survey also showed that the extent of benefits strongly depended on a number of factors:

- frequent customer/user interaction with the development team,
- substantial training in object-oriented design principles,
- sufficient motivations provided to future framework users,
- easy access to expert support regarding the framework,

Based on the results of this study, Alcatel was able to decide on further deployment based on tangible evidence and, therefore, make a more informed, objective decision. Moreover, Alcatel is now in a position to leverage the benefits of the technology by controlling the influential factors identified.

Partner:
Alcatel Alsthom
Software Support Group
Route de Mozay
91460 Marcoussis
France

Contact:
Dr. Lionel Briand
email: briand@iese.fhg.de
Tel: +49 (0)6301/707-250
Fax: +49 (0)6301/707-200

Development of a Generic Merchandising System Architecture

WWS 2000 is a software development effort of Markant Südwest AG, a trading company. Markant used a commercial merchandising system in the past and, in 1995, decided to implement a new merchandising system on its own, which fits its needs better than currently available commercial products, does so at a lower cost, and can adapt to the very different types of markets and goods that need to be handled.

Objective

A generic, domain-specific architecture and its associated reusable component is to be specified and developed so as to enable the WWS2000 system to adapt to different lines of merchandising activities.

The principal role of the IESE within this project is the establishment of an efficient software development organization to enable Markant to take advantage of the product line approach. This consists of providing software engineering techniques and methods that enable this reuse-based engineering activity. Furthermore, the IESE supports Markant in the domain analysis, requirements engineering elicitation, architecture development and evaluation, methods and process conformance and tools, and in the management and optimization of the software development process.

Approach

The project started with a domain analysis and initial optimizations of organizational structures.

...capitalize on the PuLSE methodology...

The specific requirements for each of the merchandising variants are being gathered, beyond the original ones, and the product line domain analysis is under way. The PuLSE-CDA method is used for that purpose.

PuLSE-Eco is also currently used in order to get a handle on the scope of the product line. For the specification and development of the reference architecture, PuLSE-DSSA serves as the basis.

Continuous process optimization according to the improvement goals and preparation of ISO 9000 certification of Markant's matured software development process will be one of the IESE's future roles within this project.

Results

The second instance of the WWS2000 system is currently under development. A preliminary product line model has been developed and is under refinement.

Two more system instances that need to be developed will soon be analyzed, and their characteristics will come to augment the existing respective models. The architecture of the WWS2000 system has been set and a detailed design has been worked out.

The new merchandising system uses client-server technology. The client side is object-oriented, while the server side is a conventional high-performance relational database system.

Work started and is now continuing on the transition of the WWS2000 architecture to a generic merchandising system architecture. The result of this work is expected to begin system instances generation in mid-1998. The first system instance is to be fully operational during 1998 with two more in 1999.

Partners

Markant Südwest Handels AG
Winzler Straße 152-160
D-66955 Pirmasens
Markant Südwest Software- und Dienstleistungs GmbH
Sauerwiesen 6
D-67661 Kaiserslautern

Contact

Dr. Jean-Marc DeBaud
email: debaud@iese.fhg.de
Tel: +49(0)6301/707-251
Fax: +49(0)6301/707-202

...providing instruments for DASA...

Development of Statistical Models for Benchmarking Software Productivitity

The assessment of the cost for software development projects is one of the important tasks for project quality and upper management. After project completion, one might be interested in how costly a project was in comparison to other projects. This is a first step to identify potential problems in development practices. Such a comparison is referred to as benchmarking.

To benchmark a project, representative project data collected on completed projects can be used to build a comparison baseline. In those cases where locally collected data are used, this is referred to as internal benchmarking, since comparisons are based on "internal" data only and can be used to identify poor/good practices within the organization. Another possibility is to use data collected from a set of representative organizations operating in similar environments and application domains. A comparison with an external, representative baseline of projects allows the evaluation of the competitive advantage of a given organization and its projects. This is referred to as external benchmarking.

This project focused on external benchmarking and used the ESA (European Space Agency) multi-organization project database. It contains data from 100 projects from the space and military domain. Effort, size, and many other attributes that may influence the development effort have been collected. Using this database, Fraunhofer IESE provided instruments for Daimler Benz Aerospace AG (DASA) to assess their projects in comparison to a representative industry baseline.

Objective

The objective of this study was

- to develop statistical models for the purpose of benchmarking productivity at DASA RIO6,
- to provide guidelines on how to use these models for benchmarking purposes,
- to apply the models to an actual DASA project.

Approach

The analysis performed during the study was based on building alternative parametric and non-parametric benchmarking models using different statistical techniques, such as regression trees (non-parametric) and nonlinear least squares regression (parametric).

Results

The study produced "ready-to-use" benchmark models based on the ESA project database. Furthermore, procedures were developed of how to use these models, how to interpret the results of the benchmarks, and when to use each kind of model. These models and procedures were considered valuable additions to DASA's instruments to better control and improve their software productivity.

Partner

Daimler-Benz Aerospace AG
Space Infrastructure Division
PO-Box 105909
D-28059 Bremen

Contact

Dr. Lionel Briand
email: briand@iese.fhg.de
Tel: +49 (0)6301/707-250
Fax: +49 (0)6301/707-200

Process Improvement through Systematic Measurement (PRISM)

The increasing pace of the telecommunication business puts more and more requirements on development efficiency and product quality. At Bosch Telecom GmbH, the process of developing a large telecommunication system was targeted. The collaboration started in 1996 with a pre-study and characterization. After a pilot phase, the project is now in its roll-out phase.

Objective

The purpose of the project is two-fold. On the one hand, Bosch Telecom GmbH aimed at extending their strength in goal-oriented measurement, on the other hand the development process had to be improved.

An assessment of the project organization, performed some time before the collaboration, showed that although the development process was already under control, gains could be achieved by introducing methods for process and product measurement. The transfer project with IESE was set up as a direct consequence. The Goal/Question/Metric approach was chosen and Bosch Telecom GmbH method specialists joined the team to use it as an instance for future programs in other organizational units.

Approach

The transfer project aims at implementing the Experience Factory concept to support continuous improvement. To better understand the current software development, information was collected in a six-month characterization phase. A subsequent pilot phase allowed to tailor methods and techniques, to create a set of tools and procedures, and to lower barriers for introducing measurement-based management practices. Although the improvement program itself is promising, there are still the same risks as those associated with any cultural change. For example, skeptics must be convinced by means of positive results at any stage of the project.

...identifing potentials for improvement...

Right from the beginning, the participation of developers was considered indispensable for gathering knowledge about the software development process. Different types of feedback sessions were installed which are used to interpret complex process data and make suggestions for improvement. These sessions established close contact between the improvement team and developers, leaders, and managers.

When procedures, techniques, and tools were considered stable, the improvement program was rolled out, and now more than 60 people are involved in that program.

Results

The measurement helped right from the beginning, to identify potentials for improvement. Among other results there is now a description of the software development process, a comprehensive documentation of the measurement activities including a user's guide to instruct developers about their role in improvement tasks. A database tool using the company's Intranet has been developed to facilitate data collection, management, and evaluation. Here, IESE helped with prototypes to evaluate alternatives.

The measurement program produced a number of statements about the actual performance of the development process and the quality of the product. Management can now relate failures and faults to phases. Effort data gathered from the process are compared against schedules and capacity budgets to monitor the development activities and to detect deviations early.

Partner

Bosch Telecom GmbH
Kleyer Straße 96
60277 Frankfurt

Contact

Dr. Martin Verlage
Email: verlage@iese.fhg.de
Tel: +49(0)6301/707-157
Fax: +49(0)6301/707-200

RAMSIS Kernel Redesign - Designing the Architecture of a Product Family while Leveraging an Existing Application

A successful software system evolves over time. That very success often entails system extensions to adapt it to increasingly different contexts. Yet, frequently, these extensions take the form of independent evolutions leading to much duplicated efforts and increasingly difficult evolution activities.

RAMSIS is an example of such a successful application which was initially developed and used in one application area (domain), but now is the base of a number of different products.

RAMSIS is a tool for the anthropometric simulation of various aspects of the human body. It contains knowledge about the statistical distribution of body measures typical to different countries, methods to predict the posture of a human performing a given task as well as an indicator of human comfort feeling.

Objective

The goal of this project is to redesign the current kernel of the RAMSIS system in order to drastically enhance its maintainability and provide it with a new flexible architecture that will support foreseen applications. Yet, the substantial investments made to develop the existing systems cannot be discarded and hence must be leveraged to the maximum.

Approach

In the RAMSIS kernel redesign, the FUSE approach views the multiple foreseen and existing applications as a line of products sharing a set of core

> ...repackaging the RAMSIS kernel...

functionalities while varying in others. FUSE attempts to transition existing assets towards a product line architecture while integrating support of anticipated application in this architecture. It proceeds by iterations through the following phases:

- Product line modeling: It specifies what the product line should contain (content-wise) both from the existing systems as well as the anticipated ones' point of view. It collects the systems requirements from available sources, classifies and refines them until a line model emerges which embodies the specifications the architecture design phase should satisfy.

- Product line design: It generates a possible design, exploring what could be reused or learned from the existing assets and evaluating the design for conformance to the product line tasks with the help of future application scenarios.

- Existing assets recovery: It recovers elements like reusable candidates, system non-functional characteristics, example architectures, functionality partitioning, etc., so as to support the other phases.

Results

The results produced so far in this ongoing project include:

- a description of foreseen applications and required functionalities, both elicited from domain experts and designers of upcoming applications,

- a product map correlating needed functionalities with current and future applications,

- a preliminary reference architecture for the product line,

- a preliminary design of the key data representations,

- a set of usage and evolution scenarios which will be used to evaluate the reference architecture,

- a list of reusable component candidates from the existing applications. Multiple views of the architecture present in the current version of RAMSIS.

Work has now started on the evaluation and integration of these results and should lead to a complete product line description within the next year.

Partner
Tecmath GmbH & Co. KG
Sauerwiesen 2
D-67661 Kaiserslautern

Contact
Jean-François Girard
email: girard@iese.fhg.de
Tel: +49(0)6301/707-217
Fax: +49(0)6301/707-202

Software Variant Building - Developing Product Families within Small and Medium Enterprises

Small and Medium Enterprises (SME) develop a family of products in few key business areas. These products are typically created one at a time. This leads to long adaptation periods for new products as well as to much duplicated effort. Maintenance and evolution activities are then very difficult due to the lack of a common software architecture.

Characteristics of SMEs include limited resources, the need to react flexibly to changes in the requirements of their customers, and short-term planning of projects. Hence, a mechanism for rationalizing product line development is needed.

In the Software Variant Building Project, a model of each project partner's business domain is developed as a basis for a domain-specific software architecture (DSSA). A DSSA defines a generic software structure that flexibly supports current and potential future needs within the domain. Product variants within the line are then created by tailoring the generic components of a DSSA to specific problems, e.g., to serve the requirements of different customers or user groups.

Objective

The objective of the Software Variant Building Project is to help SMEs in the region reap the benefits of product line engineering. Such benefits, from a business point of view, include:

...verifying foundations for effective reuse...

- reduced costs for development and maintenance
- decreased time-to-market
- increased reliability
- faster introduction of new employees to the application area.

Approach

In the Software Variant Building Project, the PuLSE approach is adapted to the specific situation of SMEs. PuLSE (Product Line Software Engineering) defines a generic software lifecycle process for product lines development, fielding and evolution. One major advantage of the PuLSE approach is its modularity. That is, elements of the approach can be applied independently at different entry points within a company's software lifecycle: PuLSE can be applied at the economic analysis, product line modeling, and reference architecture development levels or at all of the above.

Results

The companies involved in the project benefit in various ways:

- They develop reliable, ready-to-use components that provide core functionality of the domain. These are integrated in a reference architecture that supports current and future applications in the domain.
- They can rapidly and efficiently derive custom applications from that common reference architecture.
- Each company's business is characterized by a domain model. This model facilitates understanding of the domain and communication with customers.
- Each company can benefit from the experiences of the other SMEs within the project. This experience base will have positive synergy effects on all project partners.

Within the project, presentation and training material has been developed to teach the PuLSE approach to the people involved in the process.

The project is funded in part by the Ministry of Economic Affairs, Transportation, Agriculture and Viniculture of the State of Rhineland-Palatinate.

Partners

Kretz Software GmbH;
Market Maker Software GmbH;
softTECH Software Technologie GmbH;
tecInno GmbH;
Tecmath GmbH & Co. KG;
Viva Software GmbH

Contact

Dr. Peter Knauber, Project Leader
email: knauber@iese.fhg.de
Tel: +49(0)6301/707-242
Fax: +49(0)6301/707-202

Study about Domain Specific Software Architectures for the GSM General Packet Radio Service (GPRS)

The GSM General Packet Radio Service is an upcoming addition to the GSM family of services. It complements the existing circuit-switched GSM capabilities by providing packet-switched services. As this standard is still in its formation stages, it provides a good opportunity to test the usefulness of domain analysis. That is, as a standard is supposed to support the creation of a whole family of new applications. Domain analysis could help in ensuring that this is the case by providing a study of the commonalities and variabilities relevant in the domain.

...introducing domainspecific software architectures

Objective

The study had the aim of investigating the applicability and usefulness of the domain analysis approach in the domain of GPRS (or sub-domains of GPRS). As part of this investigation, a model of the domain of GPRS was to be developed. Due to some unusual characteristics of the situation, there was a need to develop a specialized domain analysis process which was adapted to this particular situation. As the introduction of the 'family of system' point of view into software development can have a deep impact on a development organization, the possibility of integrating the product line approach with the existing software development approach used at Ericsson needed to be studied.

Approach

The study centered around the development of an appropriate model of the GPRS domain. However, due to particular challenges posed by the domain, e.g., since the standard was still in its development stages and hence there was a severe lack of domain experts, the need arose to develop a customized domain analysis approach. This approach was based on concepts already existing in state-of-the-practice methods like FODA and Synthesis, but combined them in a new, innovative manner. In defining this approach, the particular needs of the telecommunications area also played a key role. This approach was then applied to derive a precise definition of the scope of the domain and to develop a detailed model of the domain.

Result

The core result of the study is a detailed model of the GPRS domain. The development of this model led to the identification of various problems with the existing documents for the proposed GPRS standard. Variability and flexibility of adaptation to existing implementation was low.

The possibility of adapting the Ericsson software development approach to a product line approach was analyzed. Major modifications in the overall development process were identified and would need to be tackled in order to reap the benefit of the product line engineering approach.

Another major result of the study was the identification of several subdomains of GPRS which would be well-suited to the integration of a product line approach from an economic point of view.

Partner

Ericsson Eurolab Deutschland GmbH
Research Department
Ericsson Allee 1
D-52134 Herzogenrath

Contact

Dr. Jean-Marc DeBaud
email: debaud@iese.fhg.de
Tel: +49 (0)6301/707-251
Fax: +49 (0)6301/707-202

Understanding, Controlling, and Predicting Software Costs

This project was started in October 1997 for the Space Infrastructure Division at Daimler-Benz Aerospace (DASA). DASA is increasingly working on a fixed price contract basis and within tight schedule constraints. In this context, it becomes even more important to control project cost expenditures and schedule. Although uncertainty is inherent to software development and taking risks is inevitable, these risks should be carefully assessed and adequate contingency procedures should be planned. As part of an overall process improvement program, DASA has started an initiative to better understand, control, and predict the cost of their development processes.

Objective

In this context, the objective of the project was to get a better handle on development cost characterization, estimation, baselining, and monitoring. It was therefore decided to implement a tailored measurement program based on careful analysis of current software development practices.

Approach

Our approach to measurement was based on the Goal/Question/Metric paradigm. Interviews were performed with experienced DASA personnel in order to identify the most significant cost driving factors in the specific context of DASA RIO6, and to obtain a description of the actual development process and practices. This in turn served as a basis to devise a tailored, suitable measurement program to help control and predict development costs.

Results

A comprehensive measurement plan for effort characterization, monitoring, and estimation has been defined. This includes procedures to collect effort data and size measurement. Usage scenarios have also been documented to provide guidelines regarding the usage of the data to be collected. The measurement plan is tailored to the very specific needs of the DASA Space Infrastructure Division, taking into account the experience of DASA personnel and the very specific situation of European Space Industry. At DASA, a process improvement team has been established which is now taking up the task of setting up a measurement program based on the measurement plan and procedures developed by Fraunhofer IESE.

Partner

Daimler-Benz Aerospace AG
Space Infrastructure Division
PO-Box 105909
D-28059 Bremen

Contact

Dr. Lionel Briand
email: briand@iese.fhg.de
Tel: +49 (0)6301/707-250
Fax: +49 (0)6301/707-200

...identifying cost-driving factors...

Publicly-funded projects are the transmission belt between research and practice. Moreover, they allow cooperation across institutional boundaries, create synergistic effects, and permit the pursuit of long-term goals.

Publicly-funded Projects

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 both research and development and technology transfer. Additional bilateral industrial collaborations often result from performing these projects.

Publicly-funded projects play an essential role in the research and technology transfer strategy of the Fraunhofer IESE. They are used to

- collaborate with leading research institutes in projects of strategic relevance,
- cooperate with industrial partners to develop innovative solutions for their problems,
- transfer technologies into industry and establish related know-how.

There are different forms of publicly-funded projects corresponding to the funding organization and the scope of the funding program. Currently, five avenues of public research projects are maintained at the Institute:

- European ESPRIT projects
- European ESSI projects
- German BMBF projects
- German AiF projects
- Projects funded by the State of Rhineland-Palatinate

ESPRIT (European Strategic Programme for Research and Development in Information Technologies) is a European program designed to ensure that Europe’s industries gain competitive advantage from the efficient use of communication and information systems. Within the fourth framework of the ESPRIT program, the Fraunhofer IESE was involved in two international R&D projects in the area of ‘Software Intensive Systems Engineering’: PERFECT and PROFES. Both projects were used to collaborate with leading research and industrial organizations. The general objective was to develop competitive know-how for process and product improvement which can be used in subsequent industrial improvement programs.

The goal of the European Systems and Software Initiative (ESSI) is to promote improvements in the software development process in industry, by taking up well-founded and established - but insufficiently developed - methods and technologies, so as to achieve greater efficiency, higher quality, and greater economy. Fraunhofer IESE was involved in a Process Improvement Experiment aimed at demonstrating software process improvement in the configuration management domain. The MIDAS project will be described subsequently.

In 1994, the German Federal Ministry for Research and Technology (BMBF) initiated a special program to support software technology. The objective of the program was to increase the competence of German industry in software development. Among the few projects that were selected for funding was the SoftQuali project which is described in more detail in this chapter.

The Ministry of Economic Affairs, Transportation, Agriculture and Viniculture of the State of Rhineland-Palatinate supported the dissemination of process and software engineering technologies to small and medium-size companies in Rhineland-Palatinate.

Dr. Günther Ruhe,
Deputy Director, Department Head

The ‘Arbeitsgemeinschaft industrieller Forschungseinrichtungen e.V.’ (AiF) is a German organization for industrial collaboration. The special emphasis of this program is on small and medium-size enterprises. Together with the ‘Gesellschaft zur Förderung angewandter Informatik’ (GFaI), Fraunhofer IESE participated in a project called MUVIE.

MIDAS – Measurable Improvement of Development, Deployment and Operation of Interbank Automation Software

The Società Interbancaria per l'Automazione (SIA) is in charge of running, developing, and maintaining the national interbank network of Italy. Reliability and availability of interbank services offered by SIA are of essential importance to all the financial transactions performed within this network. The effectiveness of configuration management is, in general, expected to be of essential importance to the quality of the corresponding software development. However, no detailed qualitative and quantitative information was available about the main factors that influence the successful performance of configuration management, and about ways to exploit this information for optimal project performance.

Approach

Improvement was achieved by baselining the SIA software process and establishing an effective configuration management process. A suitable measurement program was defined and conducted in order to objectively assess the effectiveness of the new configuration management practice. The Configuration Management Definition of the configuration management process covers the description of the included policies, roles, and tools. The process modeling activity started from the problem reporting, tracking, and solving activities, and then was extended to the whole software lifecycle. Implementation of the process involved modification and optimization of the initial model and determination of critical success factors.

...measuring configuration management...

The effectiveness of the configuration management policies and tools was assessed by means of a measurement program which is based on the Goal/Questions/Metrics (GQM) paradigm. It contains the definition of GQM and measurement plans. The subsequent comparative analysis of measurement data reflected the situation before and after the introduction of configuration management in terms of cost and benefit.

Results

- Definition of the configuration management process covering the description of the included policies, roles, and tools. The process modeling activity started from the problem reporting, tracking, and solving activities, and was extended to the whole software lifecycle.
- Introduction of goal-oriented measurement within SIA.
- Stepwise definition of measurement goals by preference modeling.
- Definition of the GQM plans to evaluate benefits of configuration management.
- Modeling of configuration management processes.
- Execution of the measurement plan to assess the original situation (with respect to the baseline project). This involves the collection and analysis of data like the number of detected problems, the service availability time, the effort employed to correct errors, etc..
- Performance of common feedback sessions for analysis and interpretation of results.
- Experience packages on the above topics.

Partner

SIA - Società Interbancaria per l'Automazione
Viale Certosa, 218
20156 Milano, Italy

Contact

Dr. Günther Ruhe
email: ruhe@iese.fhg.de
Tel: +49(0)6301/707-121
Fax: +49(0)6301/707-203

MUVIE – Graphical Modeling of Business Workflows with Multi-View Editors

Graphical modeling of flows and structures helps managers and engineers understand and communicate systems in many disciplines. In practice, the applicability of visual representations is limited because the design of large systems results in huge and complicated graphics.

Approach

The objective of the MUVIE project is to conduct research on Multi-View Design Environments, dealing with the complexity of graphical representations maintaining user-defined views on the graphics.

Previous projects have shown that simple approaches like the Multi-View-Controller approach are not sufficient in this case.

In MUVIE, each view defines a focus on the underlying graph structure, visualizing only those parts of the system that pertain to the view. Incremental changes are managed by a formal approach called Graph Model. In this approach, all changes to the central graph structure (Central Abstract Graph) are mapped to graph replacements.

Because all views are mapped to subgraphs of the central graph structure, graph replacements can be used to update the views. Sophisticated user interaction techniques, including direct manipulation and hypertext navigation support, help manage relations among different views. Adaptable layout algorithms are integrated and relieve the user of complex manual placement tasks.

...maintaining user-defined views...

Architecture

The MUVIE architecture implies an independent module for management of all interrelationships among views and artifacts which is called Multi-View-Engine. The Multi-View-Engine is realized as a separate process and works completely independent of the visual representation of all artifacts.

Changes are processed incrementally based on a formal Graph Model, which ensures scalability and openness.

Results

The major results of the MUVIE-Project are:

- A set of documented techniques for building integrated multi-view environments based on graph structures. The techniques include interactive direct-manipulation techniques which help the user deal with multiple views, and a conceptual framework for incremental change and update handling at the technical layer. The documents are collected in a final report and will be released as an internal IESE report.
- A prototypic implementation of a framework. The prototypic implementation encompasses a client/server approach which can be reused for building visual language environments, such as, for example, CASE- and hypertext tools. Components of the framework encompass support for interaction, visualization, automatic layout, and management of views. The framework has been implemented in C++ both on Sun/Solaris and PC/WinNT platforms.
- A sample visual editor for FunSoft-Nets. As an evaluation of the prototypic framework, a concrete graphic editor for FunSoft-Nets has been implemented. This editor allows to define FunSoft-Nets from many different perspectives, to navigate between different representations.

Partner

Elpro Leit- und Energietechnik GmbH;
GFaI - Gesellschaft zur Förderung angewandter Informatik e.V.;
Fraunhofer ISST, Berlin/Dortmund;
IIEF - Institut für Informatik in Entwurf und Fertigung GmbH;
Ingenieurbüro Drews, Berlin;
REVIG - Rückstands- und Emissionsvermeidungs-Ingenieur-Gesellschaft mbH, Berlin

Contact

Dr. Peter Rösch
email: roesch@iese.fhg.de
Tel: +49(0)6301/707-121
Fax: +49(0)6301/707-203

PERFECT – Process Enhancement for Reduction of Software Defects

Systematic improvement in the software domain is based on basic concepts such as QIP (fundamental improvement paradigm for software development), experience factory (for organizational learning and reuse), and the GQM paradigm (for goal-oriented measurement). While these fundamental concepts are very convincing, their industrial application needs a more precise description that is supported by appropriate tools and augmented with industry-style introduction material.

Objective

The overall objective of PERFECT has been to assist European industry in the measurement-based improvement of software processes. A set of techniques, methods, and tools supporting the improvement activities has been developed.

Approach

The PERFECT Improvement Approach (PIA) guides the introduction and operation of company-specific process improvement programs. The PIA is defined through the following parts:

- principles of systematic improvement,
- generic models that make the improvement principles operational.
- A collection of refinements and instantiations of the generic models that provide operational support for systematic improvement.

The generic models are structured into three perspectives: a methodological perspective, an organizational perspective, and a functional perspective:

...assisting the European industry...

- The methodological perspective addresses the activities involved in systematic improvement.
- The organizational perspective addresses the roles and organizational entities involved in systematic improvement.
- The functional perspective addresses the organizational and human capabilities as well as the tool support required for systematic improvement.

Results

The major project results are the PERFECT Improvement Approach, a handbook and tutorials about it, as well as software tools and environments. PERFECT has been structured into three work packages: methodology, platform, and applications.

The methodological result is the PERFECT Improvement Approach (PIA). It guides the introduction and operation of company-specific improvement programs based on the Quality Improvement Paradigm (QIP), the Goal/Question/Metric approach (GQM), the Experience Factory concept (EF), and process modeling. PERFECT has made contributions and provided support tools for each of these areas.

The platform tasks have developed tools and environments for supporting improvement programs, such as APEL and GQMaspect. APEL is a software engineering environment, integrating product management, process modeling and enactment, and measurement. GQMaspect is a GQM editor, supporting the planning of measurement programs.

The applications have focused on and evaluated the methodology and platform developments in projects from the embedded systems and telecommunication domains. They have evaluated the PIA as being very helpful and are now disseminating and spreading it to other projects and departments within their organizations.

ESPRIT Project No 9090

Partners
The PERFECT project was carried out by a European consortium within the ESPRIT program by:
Cap Gemini Innovation (F);
Daimler-Benz AG (D);
LSR: Logiciels, Systèmes, Réseaux Grenoble (F);
Q-Labs (S);
Robert Bosch GmbH (D);
Siemens AG (N);
Sintef (N);
University of Kaiserslautern/Fraunhofer IESE (D)

Contact
Dr. Günther Ruhe
email: ruhe@iese.fhg.de
Tel: +49(0)6301/707-121
Fax: +49(0)6301/707-203

PROFES – Product Focused Improvement of Embedded Software Processes

The increasing amount and complexity of software in embedded systems (like, e.g., telecommunications systems, medical instruments, retailing systems, or avionics) sets new requirements for the quality of the products as well as for the management of the development process. The amount of software-related work is often more than 70% of the development effort for the whole system, and the software has to be developed in very short cycles, taking into account its close relationship with hardware and other product technologies.

For competitive companies, the customer-perceived product quality is a driving force for the improvement of embedded software development. Existing improvement approaches, however, are neither tailored to the specific needs of embedded software development nor focused on product quality requirements. Often, improvement goals are mainly based on software development process maturity profiles resulting from software process assessments. Software process assessments, however, do not establish detailed links from domain-specific product quality characteristics to individual development process aspects.

Objective

The objective of the PROFES project is to support the embedded systems industry with a tailored improvement methodology that:

- focuses improvement actions on those elements of the software development process that contribute most to the critical product quality factors;
- combines and enhances the strengths of goal-oriented measurement, process assessment, product/process modeling, and experience factory;
- is validated through case studies in three industrial organizations.

...supporting the embedded systems industry...

Approach

The PROFES product quality improvement methodology will be developed, validated, and exploited in three parallel industrial case studies representing three different application domains for embedded systems. The industrial application partners Dräger, Ericsson, and Schlumberger have been selected based on a shared set of customer-driven product improvement goals. By integrating goal-oriented measurement, product/process modeling, reuse of experience, and an enhanced embedded systems process assessment approach, the PROFES methodology will link software-related product quality factors directly to software development process characteristics and enable continuous product-driven improvement.

Results

- PROFES methodology handbook, containing:
  - guidelines to the identification and usage of product/process relationships,
  - support of an integrated use of goal-oriented measurement, software process assessment (enhanced for embedded systems), and reuse of experience,
  - guidelines to business impact modeling;

- tools to support the PROFES methodology;

- presentation and training material;

- packaged experience from the case studies, namely:
  - lessons learned from the application of the PROFES methodology,
  - cost/benefit models,
  - models describing specific relationships between software product quality factors and software development process characteristics.

ESPRIT Project No 23239

Partners
Dräger Medical Electronics (NL);
Ericsson Eurolab Deutschland GmbH (SF);
Etnoteam S.p.A. (I);
Fraunhofer IESE (D);
Schlumberger Retail Petroleum Systems (F);
University of Oulu (SF);
VTT Electronics (SF)

Contact
Dr. Günther Ruhe
email: ruhe@iese.fhg.de
Tel: +49(0)6301/707-121
Fax: +49(0)6301/707-203

SoftQuali

This project's main objective is to contribute to the theoretical and practical basis for systematic quality improvement in software industry. Quality improvement will be mainly based on

- goal-oriented measurement following the Goal/Question/Metrics paradigm,
- systematic review and inspection techniques,
- packaging and reuse of software best-practice know-how.

...establishing adequate software know-how...

Objective

The focused-quality goals in the selected application domains are flexibility of software processes and reliability of software products. Beside concrete results for the involved companies, one essential goal is to discover commonalities and differences between the application domains. All investigations within SoftQuali are accompanied by cost/benefit analyses. The whole project uses the experimental approach in conjunction with the Quality Improvement Paradigm as the underlying paradigm for systematic quality improvement.

Approach

Goal-oriented software measurement has proven to be a crucial device in defining the current state and in deriving subsequent improvement actions in software development. Within the Soft-Quali project, goal-oriented measurement is introduced for pilot projects at three sites (AEG Energietechnik GmbH, Allianz Lebensversicherungs-AG, Siemens AG).

Reviews and inspections belong to the most promising improvement techniques that can be applied to software development at all stages of the lifecycle for different artifacts such as requirements, design, or code documents. Applied from the very beginning, their application supports early identification of faults within the different phases of software development. Reviews and inspections will be introduced and investigated again in three parallel case studies.

Reuse of products, processes, and experience is a promising way of contributing to the development of high quality software. The concept of an Experience Factory institutionalizes the reuse of experience and supports:

- characterization and understanding (e.g., number of faults per component),
- evaluation and assessment (e.g., effectiveness of tool support),
- prediction and control (e.g., total project effort).

The project develops formalisms and methods to establish such experience packages.

Results

Technology transfer of goal-oriented measurement into pilot projects at the three experimental sites.

Performance of the measurement programs with investigation and comparative analysis of main factors influencing the quality aspects of reliability and flexibility.

Development and introduction of scenario-based reading techniques and validated results of their effectiveness and efficiency.

Guidelines and heuristics for the application of reviews and inspections in dependence of varying environments.

Evaluated prototypes for knowledge presentation, structuring, and reuse in the Experience Factory organization. Technology packages on goal-oriented measurement, reviews, and inspections, and related experience packages.

Partners

AEG Energietechnik GmbH (D);
Allianz Lebensversicherungs AG (D);
Daimler-Benz AG (D);
Siemens AG (D);
Fraunhofer IESE (D)

Contact

Dr. Günther Ruhe
e-mail: ruhe@iese.fhg.de
Tel: +49(0)6301/707-121
Fax: +49(0)6301/707-203

Appendix

Network in Science and Industry

Industrial Partners

- ABB
- Alcatel Alsthom (F)
- Alcatel-SEL
- Allianz Lebensversicherungs-AG
- AEG Energietechnik GmbH
- Bosch Telecom GmbH
- Daimler-Benz Aerospace AG
- Daimler-Benz AG
- Deutsche Bank AG
- Deutsche Telekom AG
- DLR
- Dräger Medical Electronics (NL)
- Ericsson Eurolab Deutschland GmbH
- Ericsson (S)
- Ericsson (USA)
- Etnoteam (I)
- ESA European Space Agency
- KoDa Kommunikations und Datentechnik
- Kretz Software GmbH
- Markant Südwest Handels AG
- Markant Südwest Software- und Dienstleistungs GmbH
- Motorola (USA)
- Q-Labs, Inc. (USA)
- Q-Labs Software Engineering GmbH
- Robert Bosch GmbH
- Schlumberger RPS (F)
- Siemens AG
- Siemens (A)
- Siemens (N)
- Societé Interbancaria per l'Automazione (I)
- softTECH - Software Technologie GmbH
- software, design & management GmbH & Co. KG
- tecinno GmbH
- Tecmath GmbH & Co. KG
- 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, Germany
- Institute of Computer Science, University of Stuttgart, Stuttgart, Germany

International Research Partners

- Center for Advanced Empirical Software Research (CAESAR), University of New South Wales, Sydney, Australia (formal affiliation agreement)
- Centre 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), College Park, USA (formal affiliation agreement)
- Federal University of Santa Catarina, Florianopolis, Brazil
- Georgia Institute of Technology, Atlanta, Georgia, USA
- GrafP Technologies Inc., Montreal, Quebec, Canada
- Instituto per la Ricerca Scientifica e Technologica (IRST), Trento, Italy
- SANOFI Recherche, Montpeiller, France
- 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

International Software Engineering Research Network (ISERN)

Coordinator of ISERN since 1996: Fraunhofer IESE

Members of ISERN:

- CSIRO; Australia
- Daimler-Benz Research Center; Germany
- Fraunhofer Institute for Experimental Software Engineering; Germany
- Lucent Technologies - Bell Laboratories; USA
- 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
- University of Bari; Italy
- University of Hawaii; USA
- University of Kaiserslautern; Germany
- University of Maryland at College Park; USA
- University of New South Wales; Australia
- University of Rome - Tor Vergata; Italy
- University of Strathclyde; Scotland; U.K.
- VTT Electronics; Finland

Visitors hosted

Michael Mehlich, Semantic Design, Austin, Texas, USA, January 9

Frank Sazama, Daimler-Benz AG, Foschungszentrum Ulm, Germany, January 20

François Coallier, Bell, Montreal, Canada, February 4

Bruce Lewis, US Army, Huntsville, Alabama, USA, March 27

Mike Dyer, Guest Scientist at the Fraunhofer IESE, May 5

Dr. Scott P. Overmyer, University of Maine, Portsmouth, Maine, USA, June 24

William E. Riddle, SEI, Pittsburgh, Pennsylvania, USA, July 7

Dr. Marc Kellner, SEI, Pittsburgh, Pennsylvania, USA, July 9

Dr. Katrina Maxwell, INSEAD, France, August 14

Jason Selvidge, Software Engineering Technology, Inc., Knoxville, Tennessee, USA, August 18

Prof. Jim Hook, Pacific Software Research Center, Portland, Oregon, USA, September 1

Dr. Spencer Rugaber, College of Computing, Georgia Institute of Technology, Georgia, USA, October 9

Letters from Guest Scientists

Mike Dyer

I was fortunate to be asked by Dieter Rombach to spend the first half of 1997 at the Fraunhofer IESE with the goal of transferring knowledge on the Cleanroom method to the staff. Cleanroom is a software development methodology that was developed at IBM during the early 1980's under the leadership of the late Dr. Harlan Mills. My first goal was to transfer knowledge on the different aspects of the method which covers the entire software development life-cycle from requirements analysis through test. This was accomplished through a series of seminars at the institute and also at the University of Kaiserslautern.

My second goal was to work with a group of IESE researchers in using the Cleanroom ideas for the development of a product that could be used for future IESE business. To that end, a project was performed which incorporated the Cleanroom formalisms into the Perspective Based Inspection methodology which was an ongoing technology area within the institute. Cleanroom has rigorous methods for analyzing requirements, a formal process for translating those requirements into a provably correct software design, and a statistically based approach for rigorous software testing. A project was organized that defined the use of these formalisms within an inspection process and, then, used the defined inspection process for checking the usability of the ideas in a project setting. The results were documented in a technical report which defines a formal approach to Perspective Based Inspections, which addresses the total software development life-cycle and which organizes a set of templates which can be used for the different roles in the inspection process. It would be hoped that this technical report would be the foundation for future research into inspection technology and also for use in improving the software development processes of the IESE industrial and government clients.

In addition to this technically stimulating assignment, my association with the IESE staff was professionally beneficial and rewarding. I learned many new ideas on experimental design, object orientation, requirements analysis, and numerous other technical areas. The institute has a diversified staff with a broad base of technical expertise which should provide for its future success. I was fortunate to make many personal and professional acquaintences that I am sure will survive for many years into the future.

A final point on my assignment at the institute was the wonderful setting in the town of Kaiserslautern. My wife and I thoroughly enjoyed our stay in this delightful German city and were never at a loss for things to do and places to go. We took the opportunity to see most of Germany and areas of the surrounding countries. Overall I would give our IESE tenure an A+ rating from both a professional and personal perspective.

Jason Selvidge

I spent six weeks at the Fraunhofer Institute for Experimental Software Engineering (IESE) and specifically with the group researching Cleanroom Software Engineering. During this time, I was able to familiarize myself with the competent members of the team while we performed a technology transfer in the testing phase of Cleanroom - statistical testing of software.

We shared the latest methods of how to test different classes of software (applications, embedded, real-time, etc.) using Markov chain models and random number generators, and we discussed ways to improve the current methods. In this way we were able to put together the most complete usage specification that I have witnessed, for a GUI-based application.

On a more personal note, I had a great time in Kaiserslautern. The people were kind, the food was tasty, and the town is surrounded by great hiking!

Professional Contributions

Lecturing Assignments at Universities

C. Atkinson:
Lecture
Object-Oriented Software Development,
Department of Computer Science,
University of Kaiserslautern,
Winter Semester 1997/1998

K.-D. Althoff:
Lecture
Problemlösemethoden in Expertensystemen:
Entscheidungsunterstützung und Diagnose,
Department of Computer Science,
University of Kaiserslautern,
Summer Semester 1997

L. Briand:
Lecture
Experimentation in Software Engineering,
Department of Computer Science,
University of Kaiserslautern,
Winter Semester 1997/1998

J.-M. DeBaud:
Lecture
Domain-oriented Software Engineering,
Department of Computer Science,
University of Kaiserslautern,
Summer Semester 1997

D. Rombach:
Lecture
Software Engineering I,
Department of Computer Science,
University of Kaiserslautern,
Winter Semester 1996/1997 and
Winter Semester 1997/1998

D. Rombach:
Project Course
Software Engineering I,
Department of Computer Science,
University of Kaiserslautern,
Summer Semester 1997

D. Rombach, Günther Ruhe:
Lecture
Software Engineering II,
Department of Computer Science,
University of Kaiserslautern,
Summer Semester 1997

D. Rombach:
Project Course
Software Engineering II,
Department of Computer Science,
University of Kaiserslautern,
Winter Semester 1996/1997 and
Winter Semester 1997/1998

Günther Ruhe:
Lecture
Experimental Software Engineering,
Friedrich-Schiller-Universität, Jena
Winter Semester 1997/1998

Reinhard Schwarz:
Lecture
Verteilte Systeme
Fachbereich Informatik,
TH Darmstadt,
Summer Semester 1997

Journal Editorships

L. Briand:
Empirical Software Engineering: An International Journal

K. El-Emam:
Software Process Newsletter

D. Rombach:
IEEE Software Magazine

D. Rombach:
The Journal of Systems and Software

D. Rombach:
Informatik: Forschung und Entwicklung

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

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

Committee Activities

Althoff, K.-D.:
PC-Member, International Conference on Case Based Reasoning ICCBR ’97

Althoff, K.-D.:
Co-Chair, ICCBR ’97 focus area on Case Based Reasoning and Software Engineering

Althoff, K.-D.:
Co-Speaker, German Special Interest Group on Machine Learning within the German Computer Science Society (GI)

Briand, L.:
General Chair, IEEE Workshop on Empirical Studies of Software Maintenance WESS ’97

Briand, L.:
Tutorial Chair, IEEE International Conference on Software Maintenance ICSM ’97

Briand, L.:
Member, Steering Committee International Conference on Software Maintenance ICSM ’97

Briand, L.:
PC Member, Empirical Assessment of Software Environment Technologies EASE ’97

Briand, L.:
PC Member, IEEE International Conference on Software Engineering ICSE ’97; Workshop on Process Modelling and Empirical Studies of Software Evolution

Daly, J.:
Member, Organising and Program Committee International Conference on Software Engineering ICSE ’97; Workshop on Process Modelling and Empirical Studies of Software Evolution

DeBaud, J.-M.:
PC Member, European Reuse Workshop ERW ´97; member of the steering committee; member of the steering committee Product Line Issue Action Team (PLIAT)

DeBaud, J.-M.:
PC Member, Working Conference on Reverse Engineering WCRE ´97

El Emam, K.:
PC Member, 3rd IEEE International Symposium on Software Engineering Standards

El Emam, K.:
PC Member, International Conference on Software Engineering ICSM ’97

El Emam, K.:
PC Member, Workshop on Empirical Studies of Software Maintenance WESS ’97

El Emam, K.:
International Trials Coordinator for the Software Process Improvement and Capability dEtermination Trials

D. Rombach:
General Chair, ICSE-18

D. Rombach:
Chairman, Steering Committee ICSE (International Conference on Software Engineering), from 1996 to 1998

D. Rombach:
Member, Technologiebeirat, Rheinland-Pfalz, since 1994

D. Rombach:
Member, Supervisory Board of the German National Research Center for Information Technology (GMD), since 1996

D. Rombach:
Member, Advisory Board of Q-Labs, since 1996

D. Rombach:
Senior Member, Institute of Electrical and Electronics Engineers (IEEE), since 1996

Key Note Presentations

Rombach, D.:
Ingenieurmäßige Softwareentwicklung: Anforderungen an Forschung, Leben und industrielle Praxis, 3. CI-Fachtagung STJA '97, Erfurt, September 10.-11., 1997

Rombach, D.:
Inspections and Testing: Core Competencies for Reliability Engineering, ISSRE '97, Albuquerque, NM, USA, November 3, 1997

Rombach, D.:
Softwareentwicklungskompetenz: Voraussetzung für zukünftige Wettbewerbsfähigkeit, 1st Conference on Quality Engineering in Software Technology, November 26, 1997

Rombach, D.:
The business benefits of software process improvement, ESI's Members Forum, Bilbao, Spain, February 12, 1997

Presentations

Birk, A.:
IESE - Tutorial "Process Improvement", Daimler-Benz Forschung und Technik, Ulm, Germany, June 1997

Birk, A.; Pfahl, D.:
Tutorial on Goal Oriented Measurement (GQM), Consultants, SEPG members and QA staff of Dräger Medical Electronics, Ericsson, Etnoteam, VTT Electronics,
Saariselkä, Finland, March 26-27, 1997

Bomarius, F.; Birk, A.:
Workshop Experience Factory, Workshop Deutsche Telekom,
Saarbrücken, Germany, November 1997

Laitenberger, O.:
Perspective-Based Reading of Code Documents, Robert-Bosch GmbH, Kaiserslautern, Germany, March 1997

DeBaud, J.-M.:
Transferring Domain-specific Software Engineering: Industrial Experiences, Lucent technologies Bell Laboratories, Chicago, USA, June 1997

DeBaud, J.-M.:
The Product Line Approach to Software Engineering, Georgia Institute of Technology, Atlanta, Georgia, USA, October 1997

Hartkopf, S.:
Goal-oriented Learning in Experimentel Software Engineering using Rough Sets Presentation, Fachgruppentreffen für Maschinelles Lernen 1997, University of Kaiserslautern, Kaiserslautern, Germany, July 1997

Pfahl, D.:
Goal Oriented Measurement (GQM), Dräger Medical Technologies,
Best, Netherlands, June 1997

Rombach, D.:
Software Entwicklungskompetenz: Voraussetzung für Wettbewerbsfähigkeit, 3. Mannheimer Unternehmerforum, Mannheim, Germany, October 7, 1997

Rombach, D.:
Kontinuierliche Qualitätsverbesserung, Professorenkonferenz, Bosch-Telecom, Backnang, Germany, October 14, 1997

Rombach, D.:
Experience Factory, Industrieseminar, Deutsche Telekom AG, Saarbrücken, Germany, November 20, 1997

Rombach, D.:
Auswirkungen neuer Informations- und Kommunikations-Technologien, Panel, SPD-Zukunftswerkstatt, SPD Rheinland-Pfalz, Universität Kaiserslautern, Kaiserslautern, Germany, November 22, 1997

Rombach, D.:
Experience Factory, Industrieseminar, Robert-Bosch GmbH, Stuttgart, Germany, November 28, 1997

Rombach, D.:
Software-Entwicklungskompetenz: Voraussetzung für zukünftige Wettbewerbsfähigkeit, Management-Briefing, Mercedes-Benz, Stuttgart, Germany, November 27, 1997

Tautz, C.:
Requirements for the Knowledge-Based Support of Software Engineering Measurement Plans, SEKE'97, Madrid, Spain, June 1997

Articles in Journals and Books

Names of Fraunhofer IESE members appear in bold.

Althoff, K.-D.:
Evaluating Case-Based Reasoning Systems: The Inreca Case Study
Postdoctoral thesis at the Computer Science Department of the University of Kaiserslautern, July 1997

Althoff, K.-D.; **Birk, A.**; Gresse von Wangenheim, C.; **Tautz, C.**:
Case-Based Reasoning for Experimental Software Engineering
in: M. Lenz, B. Bartsch-Spörl, H. D. Burkhard, S. Wess., editors, Case-Based Reasoning Technology - From Foundations to Applications
State-of-the-Art Series, 1997

Basili, V.R.; **Rombach, D.**:
The TAME Project: Towards Improvement-Oriented Software Environments
P. Oman (ed.), Pfleeger, S.L. (ed.): Applying Software Metrics, Los Alamitos
IEEE Computer Society Press, 1997

Briand, L.C.; **Bunse, C.**; **Daly, J.**; Differding, C.:
An Experimental Comparison of the Maintainability of Object-Oriented and Structered Design Documents
Empirical Software Engineering 2 (1997), No. 3, pp. 291 - 312

Briand, L.; Differding, C.; **Rombach, D.**:
Practical Guidelines for Measurement-Based Process Improvement
The Journal of Software Process Improvement and Practice, Vol. 2, No. 4, 1997

Briand, L.C.; Morasca, S.; Basili, V.R.:
Response to: Comments on Property-Based Software Engineering Measurement: Refining the Additivity Properties
IEEE Transactions on Software Engineering 23 (1997), No. 3, pp. 196 - 197

Briand, L.C.; William, T.M.:
Response to "Handling Regression Subsets in Software Modeling" by R. Gulezian
The Journal of Systems and Software 36 (1997), No. 3, S. 313 - 314

Cindric, D.; Kramer, K.; **Rombach, H.D.**; Gresse von Wangenheim, C.; **Birk, A.**:
Plattformunabhängige Werkzeugunterstützung der Entwicklungsphase des Messplans und der Erstellungsphase der Fragebögen des GQM-Prozesses (GQMmeaplan), Kaiserslautern, 1997

Dellen, B.; Maurer, F.; Münch, J.; **Verlage, M.**:
Enriching Software Process Support by Knowledge-based Techniques
International Journal of Software Engineering and Knowledge Engineering, Vol. 7, No. 2, pp. 185 - 215, 1997

El Emam, K.; Höltje, D.:
Qualitative Analysis of a Requirements Change Process
Empirical Software Engineering 2 (1997), No. 2, pp. 143 - 152

El Emam, K.; **Fusaro, P.**:
Fraunhofer Institute for Experimental Software Engineering
Software Process - Improvement and Practice 3 (1997), No. 1, pp. 59 - 61

El Emam, K.; **Briand, L.**; Smith, R.:
Assessor agreement in rating SPICE processes
Software Process Improvement and Practice Journal, 2(4): pp. 291 - 306, John Wiley, 1997.

Fusaro, P.; Lanubile, F.; Visaggio, G.:
A Replicated Experiment to Assess Requirements Inspection Techniques
Empirical Software Engineering 2 (1997), No. 1, pp. 39 - 57

Goldenson, D.R.; **El Emam, K.**; Herbsleb, J.; Deephouse, C.:
Empirical studies of software process assessment methods, Software Process Assessment and Improvement
In: T. P. Rout (ed.), Computational Mechanics

Gresse, G.; Hoisl B.; **Rombach H.D.**; **Ruhe G.**:
Kosten-Nutzen-Analyse von GQM-basiertem Messen und Bewerten: Eine replizierte Fallstudie.
Wirtschaftsinformatik: Ergebnisse empirischer Forschung
In: O. Grün/L.J. Heinrich (Hrsg.). Unter Mitarb. Von I. Wiesinger, 1997, pp 119-135.

Laitenberger, O.; **DeBaud, J.-M.**:
Perspective-based Reading of Code Documents at Robert Bosch GmbH
Information and Software Technology 39 (1997), pp. 781 - 791

Morasca, S.; **Briand, L.C.**; Basili, V.R.; Weyuker, E.J.; Zelkowitz, M.V.:
Comments on: "Towards a Framework for Software Measurement Validation"
IEEE Transactions on Software Engineering 23 (1997), No. 3, pp. 187 - 188

Conference Proceedings

Althoff, K.-D.:
Validating Case-Based Reasoning Systems;
in: Proceedings Leipziger Informatik-Tage, 1997

Althoff, K.-D.; Birk, A.; Tautz, C.:
Experience Factory: Learning from Software Engineering Experiences;
in: W. Krause, U. Kotkamp, R. Goertz (eds): Proceedings of the 3rd Conference of the German Society for Cognitive Science (KogWis '97), University of Jena, 1997

Althoff, K.-D.; Birk, A.; Tautz, C.:
The Experience Factory Approach: Realizing Learning from Experience in Software Development Organisations;
in: Proceedings of the 10th German Workshop on Machine Learning, University of Karlsruhe, 1997

Althoff, K.-D.; Wilke, W.:
Potential Uses of Case-Based Reasoning in Experience Based Construction of Software Systems and Business Process Support;
in: R. Bergmann and W. Wilke (eds.), Proceedings of the Fifth German Workshop on Case-Based Reasoning, (1997)

Atkinson, C.:
Meta-Modeling for Distributed Object Environments;
in: IEEE Computer Society: 1st International Enterprise Distributed Object Computing Workshop, EDOC '97 - Proceedings, Los Alamitos, IEEE Computer Society Press, 1997

Bartsch-Spörl, B.; Althoff, K.-D.; Meissonnier, A.:
Learning from and reasoning about case-based reasoning systems;
in: Proceedings of the 4th German Conference on Knowledge-Based Systems (XPS97), March 1997

Basili, V.R.; Condon, S.; El Emam, K.; Hendrick, R.B.; Melo, W.L.:
Characterizing and Modeling the Cost of Rework in a Library of Reusable Software Components;
in: Association for Computer Machinery (ACM), IEEE Computer Society: 19th International Conference on Software Engineering, ICSE '97, Los Alamitos, IEEE Computer Society Press, 1997

Becker, U.; Hamann, D.; Verlage, M.:
Descriptive Modeling of Software Processes;
in: Proceedings of Software Process Improvement Conference (SPI '97), Barcelona, Spain, 1-4 December 1997

Becker, U.; Verlage, M.:
Das Werkzeug MoST zur Entwicklung von Prozeßmodellen;
in: Tagungsband des dritten Workshops der GI-FG 5.1.1 - Vorgehensmodelle - Einführung, betrieblicher Einsatz, Werkzeug-Unterstützung und Migration, Berlin, March 1997

Becker, U.; Webby, R.:
Towards a Logical Schema Integrating Software Process Modeling and Software Measurement;
in: ICSE1997, Workshop: Process Modelling and Empirical Studies of Software Evaluation, Fraunhofer Institute for Experimental Software Engineering, May 1997

Bergmann, R.; Wilke, W.; Althoff, K.-D.; Breen, S.; Johnston, R.:
Ingredients for Developing a Case-Based Reasoning Methodology;
in: R. Bergmann and W. Wilke (eds.), Proceedings of the Fifth German Workshop on Case-Based Reasoning, (1997)

Birk, A.:
Modeling the application domains of software engineering technologies;
in: Proceedings of Automated Software Engineering '97, IEEE Computer Society Press, 1997

Briand, L.C.; Bunse, C.; Daly, J.:
An Experimental Evaluation of Quality Guidelines on the Maintainability of Object-Oriented Design Documents: (Workshop on Empirical Studies of Programmers, 1997, Alexandria),
in: Wiedenbeck, S.; Scholtz, J.: Empirical Studies of Programmers. Seventh Workshop
New York, 1997

Briand, L.; Bunse, C.; Daly, J.; Differding, C.:
An Experimental Comparison of the Maintainability of Object-Oriented and Structured Design Documents;
in: M. J. Harrold (ed.), Visaggio, G. (ed.), IEEE Computer Society, ACM Universita di Bari, International Conference on Software Maintenance 1997, ICSM '97, Los Alamitos, IEEE Computer Society Press 1997

Briand, L.; Daly, J.; Wüst, J.:
A Unified Framework for Cohesion Measurement in Object-oriented Systems;
in: IEEE International Symposium on Software Metrics (Metrics '97), Proceedings of the 4th international Software Metric Symposium, p. 43-53, Albuquerque, USA, November 1997

Briand, L.; Devanbu, P.; Melo, W.L.:
An Investigation into Coupling Measures for C++;
in: Association for Computer Machinery (ACM), IEEE Computer Society: Proceedings of the 19th International Conference on Software Engineering, ICSE '97, Los Alamitos, IEEE Computer Society Press, 1997

Briand, L.; El Emam, K.; Freimut, B.; Laitenberger, O.:
Quantitative Evaluation of Capture-Recapture Models to Control Software Inspections;
in: Proceedings of the 1997 International IEEE Symposium on Software Reliability Engineering (ISSRE'97), Albuquerque, USA, November 1997

Briand, L.C.; **Laitenberger, O.**; **Wieczorek, I.**:
Building Resource and Quality Models for Software Inspections;
in: Proceedings of the International Software Consulting Network Conference (ESI/ISCN'97), Budapest, Hungary, November 1997

Briand, L.C.; Lanubile, F.:
2[nd] International Workshop on Empirical Studies of Software Maintenance, WESS ´97, 1997, Bari, Italy

Briand, L.C.; Morasca, S.:
Software Measurement and Formal Methods: A Case Study centered on TRIO+ specifications;
in: IEEE International Conference on Formal Engineering Methods (ICFEM '97), Hiroshima, Japan, December 1997

Bunse, C.:
An Effective Inspection Technique for Object-Oriented Code;
in: Jan Bosch, Stuart Mitchell (eds.), ECOOP'97 Workshop Reader, pp 417-418, LNCS,1997

Cugola, G.; Fuggetta, A.; **Fusaro, P.**; Gresse von Wangenheim, C.; Lavazza, L.; Manca, S.; Rosaria Pagone, M.; **Ruhe, G.;** Soro, R.:
A Case Study of Evaluating Configuration Management Practices with Goal-Oriented Measurement;
in: Proceedings of the Fourth International Software Metrics Symposium, November 5-7, 1997, Albuquerque, New Mexico, USA, pp. 144-151

Daly, J.; **El Emam, K.**; Miller, J.:
Multi-Method Research in Software Engineering;
in: Briand, L.C. (ed.), Lanubile, F. (ed.), 2nd International Workshop on Empirical Studies of Software Maintenance WESS '97, 1997, Bari, Italy

DeBaud, J.-M.:
DARE: Domain-Augmented ReEngineering;
in: I. Baxter (ed.), A.Quilici (ed.), C. Verhöf (ed.), 4th Working Conference on Reverse Engineering, WCRE '97, Amsterdam, Los Alamitos, IEEE Computer Society Press, 1997

DeBaud, J.-M.:
A Domain-Augmented Reengineering Approach;
in: Proceedings of the Legacy System Reengineering Workshop, ICSE'97, Los Alamitos, IEEE Computer Society Press, Boston, May 1997

DeBaud, J.-M.:
Towards a Customizable Domain Analysis Framework: Initial Lessons from the Field;
in: Proceedings of the European Reuse Workshop '97, ERW'97, Brussels, Belgium, November 1997

El Emam, K.; **Fusaro, P.**; Smith, B.:
Modelling the Reliability of SPICE Based Assessments;
in: Third International Symposium and Forum on Software Engineering Standard (ISESS'97), Walnut Creek, California, June 1997

El Emam, K.; Höltje, D.; Madhavj, N.H.:
Causal Analysis of the Requirements Change Process for a large System;
in: M. J. Harrold (ed.), Visaggio, G. (ed.), IEEE Computer Society, ACM Universita di Bari: International Conference on Software Maintenance 1997, ICSM '97, Los Alamitos: IEEE Computer Society Press 1997

El Emam, K.; Smith, B.; **Fusaro, P.**:
Modeling the Reliability of SPICE Based Assessments;
in: IEEE Computer Society, 3rd International Software Engineering Standards Symposium and Forum, ISESS '97, Emerging International Standards, Los Alamitos, IEEE Computer Society Press, 1997

Fusaro, P.; **El Emam, K.**; Smith, B.:
Evaluating the Interrater Agreement of Process Capability Ratings;
in: Proceedings of the 4th International IEEE Symposium on Software Metrics, Metrics'97, Albuquerque, USA, November 1997

Girard, J.-F.; Koschke, R.:
Finding Components in a Hierarchy of Modules: A Step towards Architectural Understanding;
in: M. J. Harrold (ed.), G.Visaggio (ed.), IEEE Computer Society, ACM Universita di Bari, International Conference on Software Maintenance 1997, ICSM '97, Los Alamitos, IEEE Computer Society Press 1997

Girard, J.-F.; Koschke, R.; Schied, G.:
A Metric-based Approach to Detect Abstract Data Types and State Encapsulations;
in: IEEE Computer Society: Automated Software Engineering Conference (ASEC'97) - Proceedings, Los Alamitos, IEEE Computer Science Press, 1997

Girard, J.-F.; Koschke, R.; Schied, G.:
Comparison of Abstract Data Type and Abstract State Encapsulation Detection Techniques for Architectural Understanding;
in: I. Baxter (ed.), A. Quilici (ed.), C. Verhöf (ed.), 4th Working Conference on Reverse Engineering, WCRE '97, Los Alamitos, IEEE Computer Science Press, 1997

Gresse, C.**; Briand, L.C.**:
Requirements for the Knowledge-Based Support of Software Engineering Measurement Plans;
in: 9th International Conference on Software Engineering and Knowledge Engineering, SEKE '97, Madrid, Spain, 1997

Hartkopf, S.; **Ruhe, G.**:
Goal-oriented Learning in Experimental Software Engineering by using Rough Sets;
in: Proceedings 10th German Workshop on Machine Learning, University of Karlsruhe, 1997

Knauber, P.:
Reusable components of Java programs;
in: Proceedings of STJA (SmalltalkJava) '97, Erfurt, September 1997

Morasca, S.; **Briand, L.**:
Towards a Theoretical Framework for Measuring Software Attributes;
in: Proceedings of the 4th International IEEE Symposium on Software Metrics, Metrics'97, Albuquerque, USA, November 1997

Morasca, S.; **Ruhe, G.**:
Knowledge Discovery from Software Engineering Measurement Data: A Comparative Study of two Analysis Techniques;
in: 9th International Conference on Software Engineering and Knowledge Engineering, SEKE '97, Madrid, Spain, pp. 450-458, June 1997

Münch, J.; Schmitz, M.; **Verlage, M.**:
Tailoring großer Prozeßmodelle auf der Basis von MVP-L;
in: Tagungsband des 3. Workshops der GI-FG 5.1.1 - Vorgehensmodelle - Einführung, betrieblicher Einsatz, Werkzeug-Unterstützung und Migration, Berlin, March 1997

Rombach, D.:
SFB501: Entwicklung großer Systeme mit generischen Methoden;
in: CI-Jahrestagung, Aachen, September 25, 1997

Ruhe, G.:
Knowledge Discovery from Software Engineering Data: Rough Set Analysis and its Interaction with Goal-Oriented Measurement;
in: First European Symposium on Principles of Data Mining and Knowledge Discovery (PKDD '97), Trondheim Norway. Lecture Notes in Computer Science, Vol. 1263: Lecture Notes in Artificial Intelligence, pp. 167-177, June 1997

Simon, J.-M.; **El Emam, K.**; Rousseau, S.; Jacquet, E.; Babey, F.:
The Reliability of ISO/IEC POTR 15504 Assessments;
in: ESI/FSCN Conference, November 1997

Tautz, C.; **Althoff, K.-D.**:
Using Case Based Reasoning Research Software Knowledge;
in: D. B. Leake (ed.), E. Plaza (ed.): Case-Based Reasoning Research and Development, Second International Conference on Case-Based Reasoning, ICCBR '97 - Proceedings, 1997
Verlage, M.; Münch, J.:
Formalizing Software Engineering Standards;
in: IEEE Computer Society, 3rd International Software Engineering Standards Symposium and Forum, ISESS '97, Emerging International Standards, Los Alamitos, IEEE Computer Society Press, 1997

Wilke, W.; Vollrath, I.; **Althoff, K.-D.**; Bergmann, R.:
A Framework for Learning Adaptation Knowledge Based on Knowledge Light Approaches;
in: R. Bergmann & W. Wilke (eds.), Proc. of the Fifth German Workshop on Case-Based Reasoning, (1997)

IESE Reports

Althoff, K.-D.; **Birk, A.**; **Gresse, C.**; **Tautz, C.**:
Case-Based Reasoning for Experimental Software Engineering
IESE - Report 063.97, December 1997

Althoff, K.-D.; **Birk, A.**; **Tautz, C.**:
The Experience Factory Approach: Realizing Learning from Experience in Software Development Organizations
IESE - Report 013.97/E, September 1997

Althoff, K.-D.; **Tautz, C.**:
Operationalizing the Reuse or Software Knowledge Using Case-Based Reasoning
IESE - Report 017.97/E, September 1997

Althoff, K.-D.; **Tautz, C.**:
Using Case-Based Reasoning for Reusing Software Knowledge
IESE - Report 004.97/E, September 1997

Basili, V.R.; Condon, S.; **El Emam, K.**; Hendrick, R.B.; Melo, W.L.:
Characterizing and Modeling the Cost of Rework in a Library of Reusable Software Components
IESE - Report 042.97/E, December 1997

Becker, U.; **Verlage, M.**:
MVP-L's Modeling Support Tool MoST
IESE - Report 002.97/E, September 1997

Becker, U.; **Webby, R.**:
Towards a Comprehensive Schema Integrating Software Process Modeling and Software Measurement
IESE - Report 021.97/E, September 1997

Becker-Kornstädt, U.; Hamann, D.; Verlage, M.:
Descriptive Modeling of Software Processes
IESE - Report 045.97/E, December 1997

Becker-Kornstädt, U.; Webby, R.:
A conceptual schema integrating software process modeling and measurement
IESE - Report 021.97/E, July 1997

Birk, A.:
A Knowledge Acquisition Method for Domain Analysis of Software Engineering Technologies IESE - Report 019.97/E

Birk, A.:
Modeling the Application Domains of Software Engineering Technologies
IESE - Report 014.97/E, September 1997

Birk, A.; C. Hoffmann:
A Tool for Supporting automated Collection of subjective Measures: An Implementation Case Study
IESE - Report 067.97, December 1997

Birk, A.; Kempkens, R.; Rombach, D.; Ruhe, G. (eds):
The PERFECT Handbook - Vol. 1: Improvement Methodology
IESE - Report 059.97, December 1997

Birk, A.; Kempkens, R.; Rombach, D.; Ruhe, G. (eds):
The PERFECT Handbook - Vol. 2: Infrastructure Technologies
IESE - Report 060.97, December 1997

Birk, A.; Kempkens, R.; Rombach, D.; Ruhe, G. (eds):
The PERFECT Handbook – Vol. 3: Process Enactment
IESE - Report 061.97, December 1997

Birk, A.; Kempkens, R.; Rombach, D.; Ruhe, G. (eds):
The PERFECT Handbook - Vol. 4: Application of PERFECT
IESE - Report 062.97, December 1997

Briand, L.C.; El Emam, K.; Bomarius, F.:
A Hybrid Method for Software Cost Risk Analysis
IESE Report 055.97/E, December 1997

Briand, L.C.; Bunse, C.; Daly, J.:
An Experimental Evaluation of the Quality Guidelines on the Maintainability of Object-Oriented Design Documents
IESE - Report 038.97/E, December 1997

Briand, L.C.; Daly, J.; Wüst, J.:
A Unified Framework for Cohesion Measurement in Object-Oriented Systems
IESE - Report 040.97/E, December 1997

Briand, L.C.; El Emam, K.; Bomarius, F.:
A Hybrid Method for Cost Estimation and Risk Assessment
IESE - Report 055.97, December 1997

Briand, L.C.; El Emam, K.; Freimut, B.; Laitenberger, O.:
Quantitative Evaluation of Capture Recapture Models to Control Software Inspections
IESE - Report 053.97/E, December 1997

Briand, L.C.; El Emam, K.; Laitenberger, O.; Fussbroich, T.:
Using Simulation to Build Inspection Efficiency Benchmarks for Development Projects
IESE - Report 052.97/E, December 1997

Briand, L.C.; Laitenberger, O.; Wieczorek, I.:
Building Resource and Quality Management Models for Software Inspections
IESE - Report 041.97/E, December 1997

Briand, L.C.; Morasca, S.:
Software Measurement and Formal Methods: A Case Study centered on TRIO+ Specifications
IESE - Report 050.97/E, December 1997

Ciolkowski, M.; Differding, C.; Laitenberger, O.; Münch, J.:
Empirical Investigation of Perspective-Based Reading: A Replicated Experiment
IESE - Report 048.97/E, December 1997

Cugola, G.; Fusaro, P.; Gresse, C.; Lavazza, L.; Manca, S.; Pagone, M.R.; Ruhe, G.; Soro, R.:
MIDAS Process Improvement Experiment Final Report
IESE - Report 066.97/E, December 1997

Daly, J.; El Emam, K.; Miller, J.:
An empirical research methodology for software process improvement
IESE - Report 039.97/E, December 1997

El Emam, K.; Briand, L.C.:
Cost and Benefits of Software Process Improvement
IESE - Report 047.97/E, December 1997

El Emam, K.; Goldenson, D.R.; Briand, L.C.; Marshall, P.:
Interrater Agreement in SPICE-Based Assessments: Some Preliminary Results
IESE - Report 043.97/E, December 1997

El Emam, K.; Höltje, D.; Madhavji, N.H.:
Casual Analysis of the Requirements Change Process for a Large System
IESE - Report 054.97/E, December 1997

El Emam, K.; Smith, R.; **Fusaro, P.**:
Modeling the Reliability of SPICE-Based Assessments
IESE - Report 046.97/E, December 1997

Fusaro, P.; **El Emam, K.**; Smith, B.:
Evaluating the Interrater Agreement of Process Capability Rating
IESE - Report 051.97/E, December 1997

Fusaro, P.; **El Emam, K.**; Smith, R.:
The Internal Consistencies of the 1987 SEI Maturity Questionnaire and the SPICE Capability Dimension
IESE - Report 037.97/E, December 1997

Goldenson, D.R.; **El Emam, K.**; Herbsleb, J.; Deephouse, C.:
Empirical Studies of Software Process Assessment Methods
IESE - Report 044.97/E, December 1997

Hoffmann, M.; **Birk, A.**; Von Els, F.; **Kempkens, R.**:
GQM Aspect V1.0: User Manual
IESE - Report 020.97, 1997

Kamsties, E.; Plessow, M.; Pocher, M.; **Rösch, P.**; Schmid, M.; Vigerske, W.:
Graphische Unterstützung komplexer Geschäftsabläufe durch Integration unterschiedlicher Sichten in Multi-View Editoren für Workflows, Projekt MUVIE - Abschlußbericht
IESE - Report 024.97/D, November 1997

Laitenberger, O.; **DeBaud, J.-M.**:
Perspective-Based Reading of Code Documents at Robert Bosch GmbH
IESE - Report 049.97/E, December 1997

Morasca, S.; **Ruhe, G.**:
Knowledge Discovery from Software Engineering Measurement Data: A Comparative Study of two Analysis Techniques
IESE - Report 008.97/E, September 1997

Ruhe, G.:
Knowledge Discovery from Software Engineering Measurement Data: Rough Set Analysis and its Interaction with Goal-oriented Measurement
IESE - Report 009.97, September 1997

Simon, J.-M.; **El Emam, K.**; Rousseau, S.; Jacquet, E.; Babey, F.:
Reliability of ISO/IEC PDTR 15504 Assessments
IESE - Report 056.97/E, December 1997

Von Latum, F.; Oivo, M.; Von Solingen, R.; Hoisl, B.; **Rombach, D.**; **Ruhe, G.**:
Shifting to Goal-Oriented Measurement in Industrial Environments, Experiences of Schlumberger
IESE - Report 035.97, November 1997

Webby, R.; **Rösch, P.**; **Verlage, M.**:
SPEARMINT - A Prototype Tool for Visualising Complex Software Processes
IESE - Report 058.97/E, December 1997

Other Reports

Althoff, K.-D.; Richter, M.; Wilke, W.:
Case-Based Reasoning - A New Technology for Experience Based Construction of Knowledge Systems
Technical Report, University of Berkeley/Centre of Learning Systems & Applications, University of Kaiserslautern, 1997

Basili, V.R.; Condon, S.; **El Emam, K.**; Hendrick, R.B.; Melo, W.L.:
Characterizing and Modeling the Cost of Rework in a Library of Reusable Software Components
ISERN Technical Report; 97-07

Baum, L.; Dellen, B.; **Kamsties, E.**; Von Kneten, A.; Vorwieger, S.:
Modeling Real-Time Systems with SCR - Lessons learned in a Building Automation System Project
Special Research Area 501, Department of Computer Science
SFB Report 07/97, University of Kaiserslautern 1997

Becker-Kornstädt, U.; **Webby, R.**:
A conceptual schema integrating software process modeling and measurement
CAESAR-Report 97/6
The University of New South Wales, Centre for Advanced Empirical Software Research, School of Information Systems, Sydney, NSW 2052, Australia.

Becker, U.; **Hamann, D.**; **Verlage, M.**:
Descriptive Modeling of Software Processes
ISERN Technical Report; 97-10

Becker, U.; **Hamann, D.**; Münch, J.; **Verlage, M.**:
MVP-E: A Process Modeling Environment
IEEE TCSE Software Process Newsletter, No. 10, 1997

Briand, L.; **Bunse, C.**; **Daly, J.**:
An Experimental Evaluation of Quality Guidelines on the Maintainability of Object-Oriented Design Documents
ISERN Technical Report; 97-02

Briand, L.; **Daly, J.**; **Wüst, J.**:
A Unified Framework for Cohesion Measurement in Object-Oriented Systems
ISERN Technical Report; 97-05

Briand, L.; **Laitenberger, O.**; **Wieczorek, I.**:
Building Resource and Quality Models for Software Inspections
ISERN Technical Report; 97-06

Briand, L.C.; **El Emam, K.**; **Bomarius, F.**:
A Hybrid Method for Software Cost Risk Analysis
ISERN Technical Report; 97-24

Briand, L.C.; **El Emam, K.**; **Freimut, B.**; **Laitenberger, O.**:
Quantitative Evaluation of Capture Recapture Models to Control Software Inspections
ISERN Technical Report; 97-22

Briand, L.C.; **El Emam, K.**; **Laitenberger, O.**; Fussbroich, T.:
Using Simulation to Build Inspection Efficiency Benchmarks for Development Projects
ISERN Technical Report; 97-21

Briand, L.C.; Morasca, S.:
Software Measurement and Formal Methods: A Case Study centered on TRIO+ Specifications
ISERN Technical Report; 97-19

Ciolkowski, M.; Differding, C.; **Laitenberger, O.**; Münch, J.:
Empirical Investigation of Perspective-based Reading. A Replicated Experiment, Special Research Area 501 (Development of Large Systems with Generic Methods), SFB Report 11/97, University of Kaiserslautern, 1997

Ciolkowski, M.; Differding, C.; **Laitenberger, O.**; Münch, J.:
Empirical Investigation of Perspective-Based Reading: A Replicated Experiment
ISERN Technical Report; 97-13

Daly, J.; **El Emam, K.**; Miller, J.:
An empirical research methodology for software process improvement, Fraunhofer Institute for Experimental Software Engineering, Germany, 1997
ISERN Technical Report; 97-04

El Emam, K.; **Briand, L.**:
Costs and Benefits of Software Process Improvement
ISERN Technical Report; 97-12

El Emam, K.; Smith, B.; **Fusaro, P.**:
Modelling the Reliability of SPICE Based Assessments
ISERN Technical Report; 97-11

El Emam, K.; Höltje, D.; Madhavji, N.H.:
Causal Analysis of the Requirements Change Process for a Large System
ISERN Technical Report; 97-23

El Emam, K.; Goldenson, D.R.; **Briand, L.C.**; Marshall, P.:
Interrater Agreement in SPICE-Based Assessments: Some Preliminary Results
ISERN Technical Report; 97-08

Fusaro, P.; **El Emam, K.**; Smith, S.:
The Internal Consistency of the 1987 SEI Maturity Questionnaire and the SPICE Capability Dimension
ISERN Technical Report; 97-01

Fusaro, P.; **El Emam, K.**; Smith, B.:
Evaluating the Interrater Agreement of Process Capability Rating
ISERN Technical Report; 97-20

Goldenson, D.R.; .; **El Emam, K.**; Herbsleb, J.; Deephouse, C.:
Empirical Studies of Software Process Assessment Methods
ISERN Technical Report; 97-09

Laitenberger, O.; **DeBaud, J.-M.**:
Perspective-based Reading of Code Documents at Robert Bosch GmbH
ISERN Technical Report; 97-14

Simon, J.-M.; **El Emam, K.**; Rousseau, S.; Jacquet, E.; Babey, F.:
Reliability of ISO/IEC PDTR 15504 Assessments
ISERN Technical Report; 97-28

Verlage, M.:
Experience with Software Process Modeling
Software Process. Improvement and Practice 3 (1997), No. 2, pp.133-136

Post-doctoral Thesis

Althoff, K.-D.:
Evaluating Case-Based Reasoning Systems: The Inreca Case Study; Department of Computer Science, University of Kaiserslautern.
Title of scientific presentation: Wissensbasierte Systeme zur technischen Diagnose;
Title of inaugural lecture: Fallbasiertes Schließen in der Praxis - Aktueller Stand und Zukunftsperspektiven;
Kaiserslautern, July 1997

Doctoral Theses

Bröckers, A.:
Modellbasierte Analyse von Software-Projektrisiken;
Department of Computer Science, University of Kaiserslautern, Dissertation 1996, (Shaker: Berichte aus der Informatik, Aachen 1997), Advisor: Prof. Dr. Dieter Rombach, Kaiserslautern, September 1997

Knauber, P.:
Ein System für die Konstruktion objektorientierter Übersetzer;
Department of Computer Science, University of Kaiserslautern, Advisor: Prof. Dr. H.-W. Wippermann, Prof. Dr. H.-J. Hoffmann, Kaiserslautern, October 1997

Verlage, M.:
Ein Ansatz zur Modellierung großer Software-Entwicklungsprozesse durch Integration unabhängig erfaßter rollenspezifischer Sichten;
Department of Computer Science, University of Kaiserslautern, (Shaker: Berichte aus der Informatik, Aachen 1998), Advisor: Prof. Dr. Dieter Rombach, Kaiserslautern, July 1997

Diploma Theses

Bayer, J.:
Requirements and Design for a Domain-Specific Software Architecture Software Design Environment;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Dr. Jean-Marc DeBaud,
February 1997

Bernhard, R.:
Interaktion zwischen dem GQM-Prozeß und der Experience Factory;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Christiane Gresse, Christiane Differding,
April 1997

Denn, M.
An investigation of the usability of graphical software process support technology;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, R. Webby,
June 1997

Els, F.v.:
A Tool for Knowledge Acquisition and Modeling of Application Domains of Software Engineering Technologies;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Andreas Birk, Dr. Klaus-Dieter Althoff,
December 1997

Freimut, B.:
Capture-Recapture Models to Estimate Software Fault Content;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Dr. Lionel Briand, Khaled El Emam, Oliver Laitenberger,
June 1997

Fußbroich, T.:
Measuring Software Inspection Process;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Dr. Lionel Briand, Khaled El Emam, Oliver Laitenberger,
May 1997

Hartkopf, S.:
Analysis in GQM-Based Measurement: Feedback Sessions with Rough Sets;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Dr. Günther Ruhe,
April 1997

Hoffmann, M.:
A Decision System for Selection of Software Engineering Technologies Based on Models of their Application Domains;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Andreas Birk, Klaus-Dieter Althoff,
December 1997

Klüter, A.:
A Tool for Code Reading by Stepwise Abstraction;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Christian Bunse,
March 1997

Kreuels, C.:
Einsatz präziser Dokumentation in der Softwareentwicklung - Eine Fallstudie mit den Methoden nach Parnas;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, E.ric Kamsties,
March 1997

Muthig, D.:
Supporting the Specification of System Families;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Dr. Jean-Marc DeBaud, Joachim Bayer,
December 1997

Steigner, A.:
Identifikation von Modellen in GQM-basierten Meßprogrammen und Repräsentation in einer Erfahrungsdatenbank;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Christiane Gresse, April 1997

Wüst, J.:
Quality Metrics for Object-Oriented Systems;
Department of Computer Science, University of Kaiserslautern,
Supervisor: Prof. Dr. Dieter Rombach, Dr. Lionel Briand,
January 1997

Master Theses

Porter, V.:
Empirical Validation of Object-Oriented Measures;
University of Stirling, Stirlingshire, UK
Supervisor: Dr. John Daly, Dr. Lionel Briand, October 1997

Project Theses

Van Els, F.:
Plattformunabhängige Werkzeugunterstützung der Planungsphase des GQM-Prozesses;
Department of Computer Science, University of Kaiserslautern, Supervisor: Prof. Dr. Dieter Rombach, Andreas Birk, January 1997

Kuhröber, C.:
Literature Survey on Defect Classification;
Department of Computer Science, University of Kaiserslautern, Supervisor: Prof. Dr. Dieter Rombach, Isabella Wieczorek
July 1997

External

Bernd Freimut:
Software Engineering Award (Diploma Thesis)
Awarded by the "Ernst-Denert-Stiftung" at the GI-Conference, Aachen, September, 1997

Lionel Briand, Khaled ElEmam, Bernd Freimut and Oliver Laitenberger:
Best Paper Award at the ISSRE '97, Albuquerque, USA

Jean-François Girard, Rainer Koschke and G. Shied (University of Stuttgart):
Oustanding Contribution Award at the 4th Working conference on reverse engineering
October, 1997

Internal

Oliver Flege:
The Fraunhofer IESE 1997 Award for Project Excellence

Dr. Reinhard Schwarz:
The Fraunhofer IESE 1997 Award for Project Excellence

Brigitte Göpfert:
The Fraunhofer IESE 1997 Award for Infrastructure Excellence

Dorothea Kilgore:
The Fraunhofer IESE 1997 Award for Infrastructure Excellence

Jean-François Girard:
The Fraunhofer IESE 1997 Award for Research Excellence

Jürgen Wüst:
The Fraunhofer IESE 1997 Award for Research Excellence

Bernd Freimut:
The Fraunhofer IESE 1997 Award for Thesis Excellence

Chronical (highlights)

January
Talk by Michael Mehlich, Semantic Design, Austin, Texas, USA
“A software engineering environment that supports the incremental construction and maintenance of large application systems driven by semantics and captured designs”
January 9

Presentation by M. Mehlich, Semantic Design, Austin, Texas, USA
“Automatic program generation, software maintenance,software architecture and domain engineering”
January 9

Presentation by F. Sazama, Daimler Benz Forschungszentrum, Ulm, Germany
“Results in the area of capturing and reusing experiences -Overview on the qualtity pattern approach”
January 20

March
Presentation by Bruce Lewis, US Army, Huntsville, Alabama, USA
"Reengineering Real-time Embedded Systems for Evolvability"
March 27

May
Foundation of STI Software Technology Initiative at Kaiserslautern, Germany
May 6

June
Talk by Mike Dyer, Guest Scientist at the Fraunhofer IESE, Germany
“Cleanroom Overview and Experience Report”
June 18

Talk by Mike Dyer, Guest Scientist at the Fraunhofer IESE, Germany
“Box Structured Analysis unique approach to requirements and design analysis stematic approach to requirements decomposition”
June 20

Talk by Mike Dyer, Guest Scientist at the Fraunhofer IESE, Germany
“Structured Programming and Functional Verification building blocks for program development correctness proving at each step of code elaboration”
June 23

Talk by Dr. Scott P. Overmyer, University of Maine, Portsmouth; Maine USA
"A Methodology for Constructing User Oriented Requirements Specifications for Large Scale Systems Using Electronic Hypermedia"
June 24

Talk by Mike Dyer, Guest Scientist at the Fraunhofer IESE, Germany
“Statistical Testing Theory and Practice user representative test samples prediction of software reliability”
June 25

July
Talk by William E. Riddle, SEI, Pittsburgh, Pennsylvania, USA
“Supporting Collaborative Processes”
July 7

Talk by Marc I. Kellner, SEI, Pittsburgh, Pennsylvania, USA
“Quantitative Process Model Simulation: Support for Process Management and Improvement”
July 9

Dr. James Hook

September
Talk by Dr. James Hook, Pacific Software Research Center, Portland, Oregon, USA
“Software Design Automation”
September 1

Visit of Dr. Hansjörg Schäfer, Member of the Parliament of the Federal Republic of Germany,
September 2

Second meeting of the Fraunhofer IESE Advisory Board, Kaiserslautern, Germany
September 19

Talk by Heinrich Berlejung, University of Karlsruhe, Karlsruhe, Germany
“Software Quality Improvement for Numerical Applications”
September 24

Dr. Marc I. Kellner

October
Talk by Dr. Spencer Rugaber, College of Computing, Georgia Institute of Technology, Georgia, USA
"Mission Oriented Architectural Legacy Evolution"
October 9

Talk by Dr. Spencer Rugaber, College of Computing, Georgia Institute of Technology, Georgia, USA
"Using Visualization for Architectural Localization and Extraction"
October 9

Dr. Spencer Rugaber

Talk by Prof. Dr. Egon Börger, Università di Pisa, Pisa, Italy
"On the Use of ASMs for Software Engineering"
October 27

November
Talk by Wolfram Bartussek, Prosys Gesellschaft für Programmsysteme, Darmstadt
"Terminological Modelling as a Basis for Rigorous Software Development"
November 27

December
Talk by Prof. Dr. Walter F. Tichy, University of Karlsruhe, Karlsruhe, Germany
"Two Controlled Experiments Assessing the Usefulness of Design Pattern Information During Program Maintenance"
December 11

Foundation of STI

On May 6th, 1997 the "Software Technologie Initiative Kaiserslautern e.V." was founded (see photo right). This was the consequence of an continuous co-operation with quite a number of small and medium enterprises (SMEs) in the field of Software Engineering.

The idea was to intensify this co-operation and to found a non-profit society which is able to offer consulting, training, workshops and technology transfer in this area with all these offerings being especially customized to SMEs. Additional tasks are to support research and education in this field, to support contacts between science and practice and to support practical studies of students at german or international companies and research organizations.

The founding members were the following companies:

– Q-Labs GmbH,
– MARKANT SÜDWEST Software- und Dienstleistungs GmbH,
– SYSTEM NET,
– Tecmath GmbH & Co. KG,
– Schönfisch&Faust Computer Integration,
– tecInno GmbH,
– ICON Intelligent Control Gebäudetechnik GmbH, as well as the University of Kaiserslautern, and Fraunhofer IESE.

Foundation of the STI Software Technology Initiative. From left to right: Markus Kennerknecht, Christian Wild, Dr. Klaus Hörmann, Ingrid Gehrlein, Wolfgang Jacob, Prof. Dr.Dieter Rombach, Karlheinz Schönfisch, Horst Degen-Hientz, Ralph Traphöner

One month later the first public event took place on June 11th. More than 80 representatives from companies all over Germany came together for the workshop "Qualitätsverbesserung in der Softwareentwicklung" (see photos on the bottom of this page and on the following page).

Emphasis of the workshop were methods to make software development more reliable and cost-effective and to facilitate the planning of projects. The consulting services of STI were presented, as well as means to support and finance SMEs. Examples of co-operation projects with Fraunhofer IESE were reported by managers of customer companies.

The workshop ended with a discussion on the demand for services, consulting and exchange of experiences which would be desirable from the industrial point of view.

Talking to a large audience: Dr. Günther Ruhe

Panel discussion. From left to right: Dr. Ulrich Müller, Horst Degen-Hientz, Dr. Wilhelm Krüger, Florian Bernauer, Prof. Dr. Dieter Rombach

Presenting concepts of software quality improvement: Dr. Frank Bomarius

Adressing economic perspectives: Dr. Ulrich Müller, Representative of the Ministry of Economic Affairs, Transportation, Agriculture and Viniculture of the State of Rhineland-Palatinate

Offering services for small and medium-size enterpises: Dr. Klaus Hörmann

Meetings

Geir Fagerhus, Manager at Q-Labs (l.) and Prof. Dieter Rombach, April 29, 1997

Farewell Party: Prof. Rombach says “Good bye” to Richard Webby, Mike Dyer and Minna Mäkäräinen, June 26, 1997

Visit of Dr. Hansjörg Schäfer (Member of the Parliament of the Federal Republic of Germany) at Fraunhofer IESE. Prof. Rombach (right) outlining strategic tasks, September 2, 1997

Prof. Basili (left) and Prof. Rombach on the eve of a planned cooperation, Septemer 19, 1997

Collegial Cooperation: Members of the Software Engineering Research Group, University of Kaiserslautern and IESE Experience Factory Group, 1st EFT workshop, September 22, 1997

Prof. Jürgen Zöllner (right), Minister of Education, Science and Continuous Education, State of Rhineland-Palatinate, and Prof. Dieter Rombach, at the SPD Zukunftswerkstatt ´97, November 22, 1997

Participations at Exhibitions

Talking to a visitor at the Innova ´97: Isabella Wieczorek and Joachim Müller-Klink, June 19, 1997

Visit of Kurt Beck (left), governor of the state of Rhineland-Palatinate, at the CeBIT stand of Fraunhofer IESE, March 15, 1997

Information about Fraunhofer IESE services - RegioTec ´97, December 4, 1997

Public presence: Fraunhofer IESE at the Rhineland-Palatinate 50th Anniversary Celebration, November 22, 1997

Dr. Martin Verlage informing visitors at "Open House 1997, University of Kaiserslautern", April 27, 1997

Fraunhofer IESE at the Mannheimer Unternehmer Forum, October 7, 1997

Media Coverage of the Fraunhofer IESE

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

- Computerwoche, 12-12-1997
- IHK Journal, No. 5, 1997
- Industrie Anzeiger, 06-02-1997
- Die Rheinpfalz,
  - 02-08-1997
  - 06-06-1997
  - 06-12-1997
  - 06-30-1997
  - 09-03-1997
  - 09-05-1997
  - 09-23-1997
- Uni-Spectrum Kaiserslautern, No. 4, 1997
- Wirtschaftsinfo Kaiserslautern, April 1997
- Wirtschaftsmagazin Pfalz, No. 9, 1997

The Fraunhofer-Gesellschaft

The Research Organization

The Fraunhofer Gesellschaft is the leading organization of applied research in Germany. It operates 47 research institutes in Germany with about 9,000 employees, about the half of them scientists and engineers. The Fraunhofer Gesellschaft expands to a worldwide Organization, especially in USA and Asia. Home of the Fraunhofer-Gesellschaft is Munich.

One of the goals of the Fraunhofer company policy is a rapid transfer of innovations.

The total expenditure for 1996 reached the level of about 1.3 billion DM; more than two-thirds of this amount is earned through contracts from industry and the public sector (>50% of the industrial earnings come from small- and medium- sized enterprises). International activities are increasingly important. Apart from the collaboration with numerous companies and research establishments within Europe the Fraunhofer Gesellschaft operates resource centers and research units in the United States. The Fraunhofer-Management-Gesellschaft mbH (FhM) was founded as a subsidiary company in 1990.

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

The Research Fields of the Fraunhofer Gesellschaft

Eight fields form the core of Fraunhofer research:

- Materials and Components
- Production Technology
- Information and Communication
- Microelectronics and Microsystems
- Sensor Systems, Testing Technologies
- Process Engineering
- Energy, Environment, Health
- Technical and Economic Studies

Apart from research services, certified test beds and other facilities can also be provided.

Advantages of Contract Research with the Fraunhofer Gesellschaft

- More than 2,600 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 service 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 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 make the technical innovations necessary to stay competitive. We would be glad to provide further information on subsidy programs for small businesses.

Executive Board
(December 31, 1997)

Prof. Dr.-Ing. Dr. hc. mult. Hans-Jürgen Warnecke (President)
Dr. jur. Dirk-Meints Polter (Personnel and Legal)
Dr. rer. pol. Hans-Ulrich Wiese (Finance)

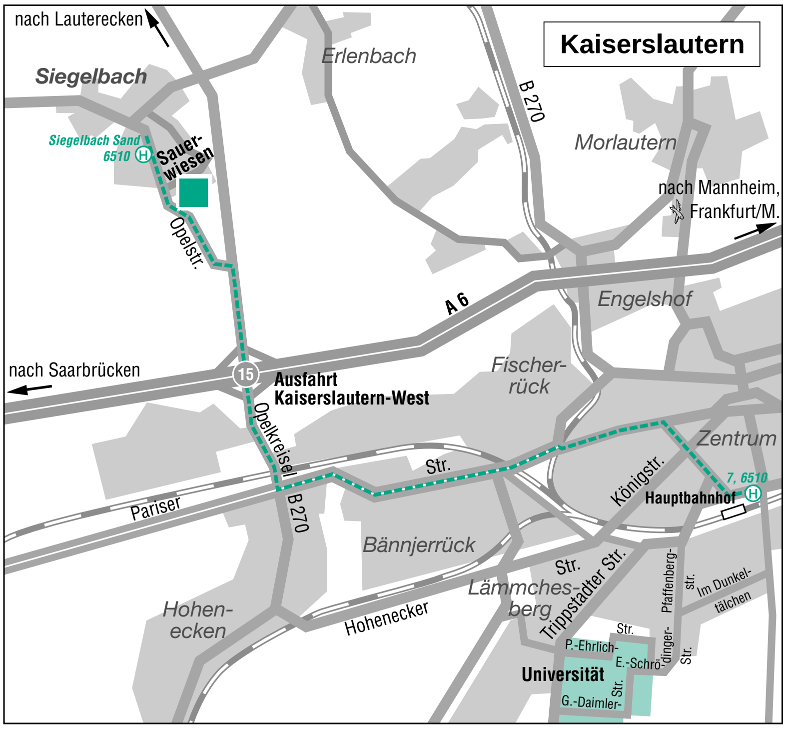
Address

Fraunhofer-Gesellschaft
Postbox 19 03 39
D-80603 Munich
Leonrodstraße 54
D-80636 Munich, Germany
Tel +49(0)89/1205-01
Fax +49(0)89/1205-317
email: info@zv.fhg.de
www: http://www.fhg.de

Fraunhofer locations

Fraunhofer Institute for
Experimental Software Engineering
Sauerwiesen 6
D-67661 Kaiserslautern
Tel: +49(0)6301/707-100
Fax: +49(0)6301/707-200
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 (Saarbrück-en) or the east (Mannheim) on highway (Autobahn) A6. Take the exit"Kaiserslautern-West" and follow the signs that read "Lautereck-en". About 500 m after exiting the highway, turn left to "Siegelbach". Follow the road leading through a forest. Right after entering "Siegel-bach" 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 Siegel-bach; 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)

Fraunhofer IESE Contact

Dial Phone No. +49(0)6301/707- ...	
100	Prof. Dr. Dieter Rombach Director rombach@iese.fhg.de
121	Dr. Günther Ruhe Deputy Director Department Head ZDÖP (Central Services and Publicly-funded Projects) ruhe@iese.fhg.de
121	Dr. Frank Bomarius Department Head IQVP (Industrial Quality Improvement Projects) bomarius@iese.fhg.de
251	Dr. Lionel Briand Department Head QPE (Quality and Process Engineering) briand@iese.fhg.de
251	Dr. Jean-Marc DeBaud Department Head ISE (Innovative Software Engineering) debaud@iese.fhg.de
262	Dr. Klaus Hörmann Center for Small and Medium Enterprises (SME) hoerman@iese.fhg.de
122	Joachim Müller-Klink Public Relations mkl@iese.fhg.de

Information Service

If you want to receive information material by mail, send or fax us a copy of this page.

Fraunhofer-Einrichtung für
Experimentelles Software Engineering
Sauerwiesen 6

D-67661 Kaiserslautern

Periodica and Brochures

- ❐ Annual Report 1997 of the Fraunhofer IESE
- ❐ Annual Report 1998 of the Fraunhofer IESE (starting in April 1999)
- ❐ Please add my address to your Annual Report mailing list.
- ❐ Overview of the Fraunhofer IESE
- ❐ The Fraunhofer-Gesellschaft from A-Z
- ❐ The Research Institutes of the Fraunhofer-Gesellschaft
- ❐ Annual Report of the Fraunhofer-Gesellschaft

Information on Services and Developments

- ❐ Seminars, Workshops
- ❐ Publication List
- ❐ STI Software Technology Initiative

Return Address

____
Last Name, First Name

____
Company

____
Position

____
Department

____
Address

____
Zip Code / City

____
Telephon

____
Fax

____
Date and Signature

Your data will be stored in an address database for internal processing only.

Point of Contact:
Joachim Müller-Klink
Press and Public Relations
Telephon +49 (0) 6301 / 707-122
Fax +49 (0) 6301 / 707-200
E-mail info@iese.fhg.de