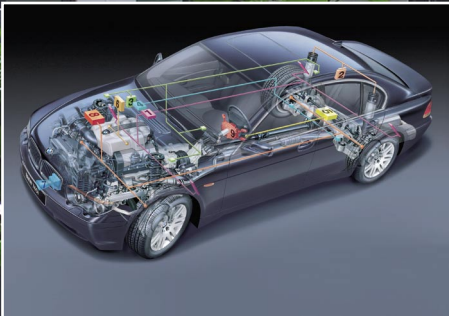
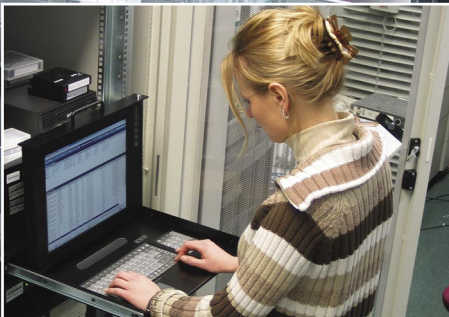




Fraunhofer Institut
Experimentelles
Software Engineering

Annual Report 2005



The Fraunhofer Institute for Experimental Software Engineering

Fraunhofer Institute for Experimental Software Engineering IESE

Fraunhofer-Platz 1
67663 Kaiserslautern
Germany

Phone: +49 (0) 631 / 68 00-60 00

Fax: +49 (0) 631 / 68 00-10 99

E-mail: info@iese.fraunhofer.de

Internet: www.iese.fraunhofer.de

Executive Director

Prof. Dr. Dieter Rombach

Director

Prof. Dr. Peter Liggesmeyer

The Fraunhofer Institute for Experimental Software Engineering IESE is one of 58 institutes of the Fraunhofer-Gesellschaft. Under the leadership of Prof. Rombach and Prof. Liggesmeyer, it performs applied research in various areas of Software Engineering.

In cooperation with international project partners from industry, academia, and public sector, the institute, which is the leader in its field in Europe, is developing new technologies, methods, processes, and tools that form an engineering-style basis for software development. In the service area of applied research, Fraunhofer IESE offers much more than classical consulting services, namely, innovative solutions for problems in the area of Software Engineering with measurable added value for an organization's daily operation.

Companies and organizations of any size, including especially small and medium-sized enterprises, receive support in improving their software and system development through contract research, consulting, and technology transfer. More than 100 scientists are using innovative technologies and experience to develop practice-oriented solutions for all areas of everyday life dominated by software.

Fraunhofer IESE's scientific backbone consists of three main divisions with different scientific foci. They are dedicated to developing innovative software engineering methods, technologies, and tools, to empirically proving their benefit, and to packaging the research results.

Annual Report 2005

Fraunhofer Institute for
Experimental Software
Engineering IESE



© 2005 Fraunhofer IESE



Editorial Notes

Editorial Board:

Doris Langthaler

Dipl.-Chem. Patrick Leibbrand
(in charge)

Dipl.-Dolm. Sonnhild Namingha

Translation:

Dipl.-Dolm. Sonnhild Namingha

Layout und Setting:

Stephan Thiel

CD-ROM Production:

CS Film und Multimedia

Photographs:

Fraunhofer IESE

Fraunhofer PR-Netzwerk

BMW AG (Titelbild)

JAXA (S. 13)

Bosch (S. 64, 65, 80)

FAME®, PuLSE®, SPEARMINT®, NiXE®, and CROCODILE® are registered trademarks of Fraunhofer-Gesellschaft.

All other products and tradenames may be registered by their respective owners. A lack of such indication does not imply that a particular name is free of third-party rights.

**Fraunhofer Institute for
Experimental Software
Engineering**

Fraunhofer-Platz 1
67663 Kaiserslautern
Germany

Phone: +49 (0) 631/68 00-60 00
Fax: +49 (0) 631/68 00-10 99

info@iese.fraunhofer.de
www.iese.fraunhofer.de



Editorial



Prof. Dr. Dieter Rombach



Prof. Dr. Peter Liggesmeyer

The year 2005 was special in every respect. One dominating topic for us was the move to the new Fraunhofer Center located on Trippstadter Straße. Thanks to the enormous efforts of everyone involved, the building could be completed as scheduled and was turned over to its intended use when Fraunhofer IESE moved in in August 2005, with Fraunhofer ITWM following in December. We are grateful to everyone involved in the construction as well as to all of our employees, who contributed their part to ensuring that the move went smoothly and that research continued without major interruptions. The official inauguration ceremony of the institute center took place on 21 February 2006.

The institute's commitment in the areas of Embedded Systems and Ambient Intelligence has grown more intense. Software plays a crucial role in these application domains, which demand powerful processes, methods, and techniques in software engineering. The topic of "Embedded Systems" runs through our projects like the proverbial red thread – ranging from object-oriented development of embedded systems via security-, safety-, and reliability analyses to component-based testing processes (see page 63 ff.).

You will find an up-to-date research report on our European cooperation project BelAml starting on page 14; a functioning prototype on the aspect of "Assisted Living" will soon demonstrate the state of implementation of the idea of Ambient Intelligence.

Fraunhofer IESE is part of a constantly growing network of scientific and industrial collaborations. The Fraunhofer Center Maryland FC-MD, for instance, with which we have been collaborating since its foundation in 1998, is one of the most successful subsidiaries of Fraunhofer-Gesellschaft in the United States. Both customer-oriented research and international software engineering cooperation will be further expanded with FC-MD's new director, Dr. Rance Cleaveland. As a representative of our numerous other research and industrial collaborations all over the world, we would just like to mention our increased cooperation with the Japan Aerospace Exploration Agency JAXA. Starting on page 13, you will find the most recent software engineering developments in the aerospace industry. The scientific ranking of the "Journal for Systems and Software" once again lists Fraunhofer IESE in the top position in Europe. This scientific continuity is complemented by an increasing num-

ber of extensive collaboration projects with industrial companies. As a result of this, the institute has achieved a budget mix of 40% industrial projects and 40% preliminary projects from the public sector with 20% base funding, which is an ideal mix according to the criteria of Fraunhofer-Gesellschaft. We expect to be able to extend the ongoing collaborations with companies such as Robert Bosch GmbH, Siemens AG, or Ricoh Co., Ltd. by strategic alliances with other companies, and we plan on having onsite collaborations with industrial companies in our new Research Labs.

We want to thank our partners and customers for their trust and cooperation. Fraunhofer IESE remains committed to you, and what we have achieved together motivates us to meet new challenges.

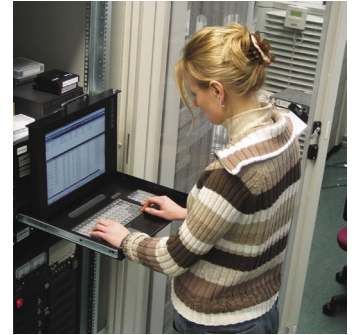
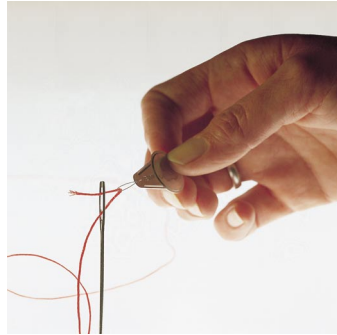
A handwritten signature in black ink, appearing to read "Dieter Rombach".

Dieter Rombach,
Executive Director
Fraunhofer IESE

A handwritten signature in black ink, appearing to read "Peter Liggesmeyer".

Peter Liggesmeyer,
Director Fraunhofer IESE

Table of Contents



Profile of Fraunhofer IESE

Highlights in 2005	10
Fraunhofer IESE and its Network Partners	22
The Fraunhofer-Gesellschaft	26
Fraunhofer IESE Alliances	28
Organizational Structure	30
The Fraunhofer IESE Advisory Board	32
Development of Personnel and Budget	33

Departments

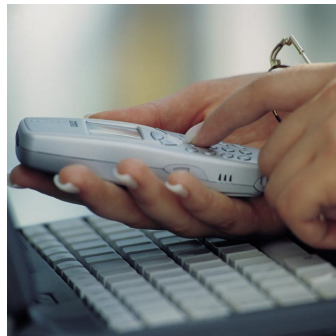
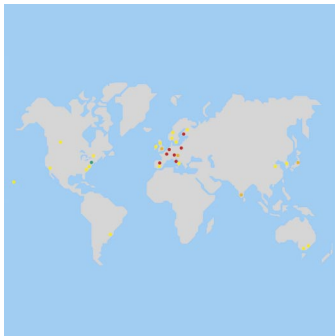
Requirements and Usability Engineering (RUE)	36
Product Line Architectures (PLA)	38
Component Engineering (CE)	40
Processes and Measurement (PAM)	42
Testing and Inspections (TAI)	44
Security and Safety (SAS)	46
Experience Management (EM)	48
Education and Training (EAT)	50

Business Areas

Automotive and Transportation Systems	54
Telekommunication, Telematics and Service Providers	56
Medical Systems	58
Information Systems and Public Sector	60

Projects

Infotainment Systems in Automobiles – Product Line Technology at Blaupunkt GmbH	64
Blended Learning for the Introduction of Object-oriented Development Methods at Robert Bosch GmbH	66
ESSaRel – Embedded Systems Safety and Reliability Analyser	69
Software-based Products and Services for the Virtual Office of the Future	71
Function Point-based Effort Estimation for Software Development in the Public Sector	74
CBTesten – Component-based Testing	77
Customized Software Quality – Definition of Efficient Quality Strategies	80



International Collaborations and Projects

Research and Globalization	84
Institutional Collaboration with the Fraunhofer Maryland Center (FC-MD)	85
Multinational European Union Collaborations	91
Fraunhofer IESE in Worldwide Projects	94
Fraunhofer IESE in International Networks	100

Contact

How to find us	104
Fraunhofer IESE Contact Persons	106
Information Service	109

Appendix

Network in Science and Industry	112
Professional Contributions	117
Scientific Publications	125
Awards	139
Events	139



Highlights in 2005	10
Fraunhofer IESE and its Network Partners	22
The Fraunhofer-Gesellschaft	26
Fraunhofer IESE Alliances	28
Organizational Structure	30
The Fraunhofer IESE Advisory Board	32
Development of Personnel and Budget	33

Highlights in 2005



Simulation and reality:
Images that were only known from computer simulations become reality.

Smooth Move of Fraunhofer IESE

After almost two years of construction, the first phase of the new Fraunhofer Center near the University has been completed. Right on time, on 01 August 2005, the scientists of the Fraunhofer Institute for Experimental Software Engineering IESE moved into their new domicile. The new building with its state-of-the-art technical equipment was received with unanimous enthusiasm and offers new opportunities.

Since the end of last July, the staff of Fraunhofer IESE was practically sitting on packed bags in Siegelbach; the move into the new building on Fraunhofer-Platz was imminent. An institute-wide vacation was scheduled for the last week of July in order to allow technicians, transportation workers, and helpers to perform a huge logisti-

cal effort without any distractions: The complete move of a high-tech scientific research institute within just a few days.

At the same time, the final work at the new institute building located on the newly created Fraunhofer-Platz was going on at full speed. The sophisticated technical infrastructure of the software engineering institute, in particular, created numerous challenges for those in charge. Bertram Recktenwald, the main person responsible at Fraunhofer IESE for the installation and operation of the extensive computer and network systems, and his team had to overcome various obstacles: "Computer system and network wiring in this building are highly complex; any mistake can lead to serious delays. However, through far-sighted advance planning, we have managed to launch all relevant systems on time."



Green space right in the middle of the institute:

Generously sized inside courtyards between the office wings improve the indoor climate and offer an invitation to meet.



Almost finished:

The plants are still missing, but the entrance area already has a generous and inviting appearance.

Thus, the institute was able to present itself in all its splendor when the move took place on 01 August. The staff was enthusiastic about the rooms, the equipment and furnishings, and the materials used. 5000 square meters of office space can now be used by up to 250 persons belonging to the institute; but this is not all yet. The building offers a range of new possibilities: Huge atriums, flooded by light and filled with plants, extend over more than 4 floors. They offer a place for people to meet as well as for events accessible to the public, such as technical expositions with over-sized items. Meeting rooms with complete media equipment

are an appropriate environment for scientific conferences and international congresses. Last but not least, specially equipped Research Labs offer employees of industrial companies the opportunity to cooperate with Fraunhofer IESE scientists right here on site. The institute center's own cafeteria does not only provide meals for the staff, but will also provide the appropriate catering for any event. "Our intention with the new building was to create optimal conditions for excellent scientific work", stated Holger Westing, managing director of Fraunhofer IESE. "Therefore, the equipment and infrastructure used are state of the art and offer comfortable

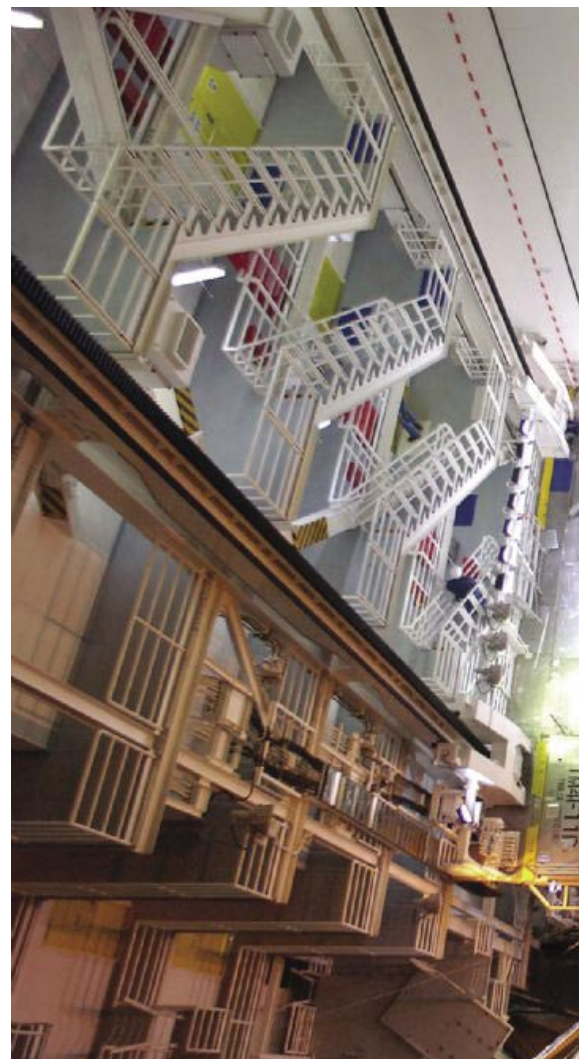


Heavy-weight precision work:
A crane lifts the symbol of the Fraunhofer Center, a hyperboloid weighing several tons, and maneuvers it perfectly to its final location.

working conditions to our staff. From the Fraunhofer point of view, this also includes being able to reconcile career and family; a day care center with 20 spaces will be completed by the end of the year.”

The planning of the new building for the two institutes Fraunhofer IESE and ITWM, with all its technical gadgets, was done under the leadership of Prof. Horst Ermel from the AS Plan office of architects in Kaiserslautern and is a model project of the Fraunhofer-Gesellschaft, with a total volume of 47.5 million euro. In a construction project of this dimension, various “childhood diseases” can never be fully avoided. Yet, Reinhard Hens, the AS Plan architect in charge of construction, is more than satisfied with the progress and the completion: “The execution of this major project went exceedingly smooth. The problems we observed were relatively harmless; corrective actions were minor.”

Those portions of the building that were not yet in use when IESE moved in, i.e., the future home of the sister institute Fraunhofer ITWM and the day care center, were completed in giant leaps. Interior construction of ITWM was concluded rapidly, and this institute has by now also moved in on time at the end of 2005. A joint inauguration celebration took place in February of this year with participating VIPs from politics, science, and industry.



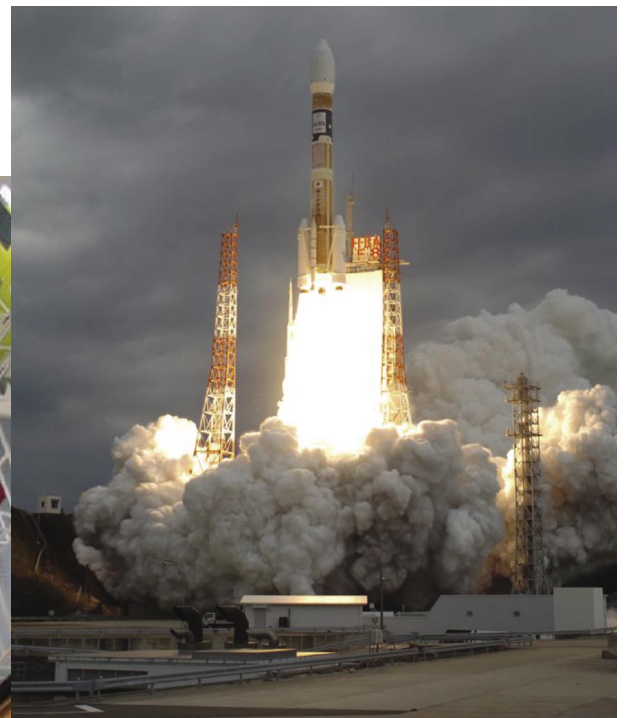
Cooperation with JAXA

Since the beginning of 2005, Fraunhofer IESE has been collaborating with the Japan Aerospace Exploration Agency JAXA in Tokyo. The topic of this cooperation is the establishment and optimization of highly efficient development processes for software intensive systems in the aerospace domain. In this context, measurements are considered an important instrument for efficiently designing and optimizing software development processes and products. They support the precise planning of software and system development projects and serve as indicators for early warning against risks. Together with the Japanese project partners, software development

procedures and processes at JAXA are being analyzed and their improvement potential is determined. In light of the increasing maturity of software developing organizations, it is becoming increasingly important to use measurements in a goal-oriented way, to draw the correct conclusions from measurement results, and to use the knowledge gained for the quantitative planning and control of projects. In the context of the project with JAXA, a measurement system for monitoring and controlling highly complex system development projects for safety-critical aerospace applications is being designed and introduced in a step-wise manner by the IESE department Processes and Measurement under the leadership of Dr. Jürgen Münch.



“Advanced Land Observation Satellite” (ALOS): This satellite, which is also called “Daichi” by the Japan Aerospace Exploration Agency JAXA, is used for precise land coverage observation. It was successfully launched in January 2006 and is an example of the perfect interaction of hardware and software in a critical application area. Photo ©JAXA



Textbook launch: One of JAXA's modern H-IIA launch vehicles transports the “Advanced Land Observation Satellite” (ALOS) into orbit. The mission is a complete success - ALOS was able to start its observation of the earth as planned. Photo ©JAXA

JAXA's H-IIA Launch Vehicle in the hangar. The successor to H-II was optimized technically and is comparable to ESA's Ariane 5 with regard to payload capacity and launch costs. Photo ©JAXA

**BelAml –
European Collaboration in the Area
of Ambient Intelligence**

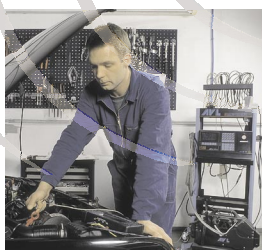
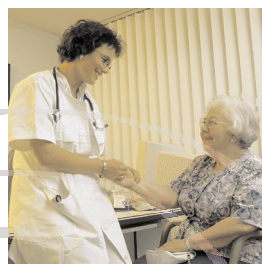
There is a new buzzword going around in the IT domain: Ambient Intelligence. This term describes the vision of an intelligent environment that reacts to the presence of humans and objects in it in a sensitive and adaptive manner while providing a variety of services. These intelligent environments will consist of a multitude of nearly invisible, interconnected computing nodes. They will process information received via sensors and communicate spontaneously and non-systematically in order to finally influence their environment via new types of user interfaces in a context-sensitive way.

Looking at the far reaching effects of the underlying technological approach, the Ambient Intelligence paradigm will fundamentally change our everyday lives in all areas of application: Vehicle assistance systems could independently

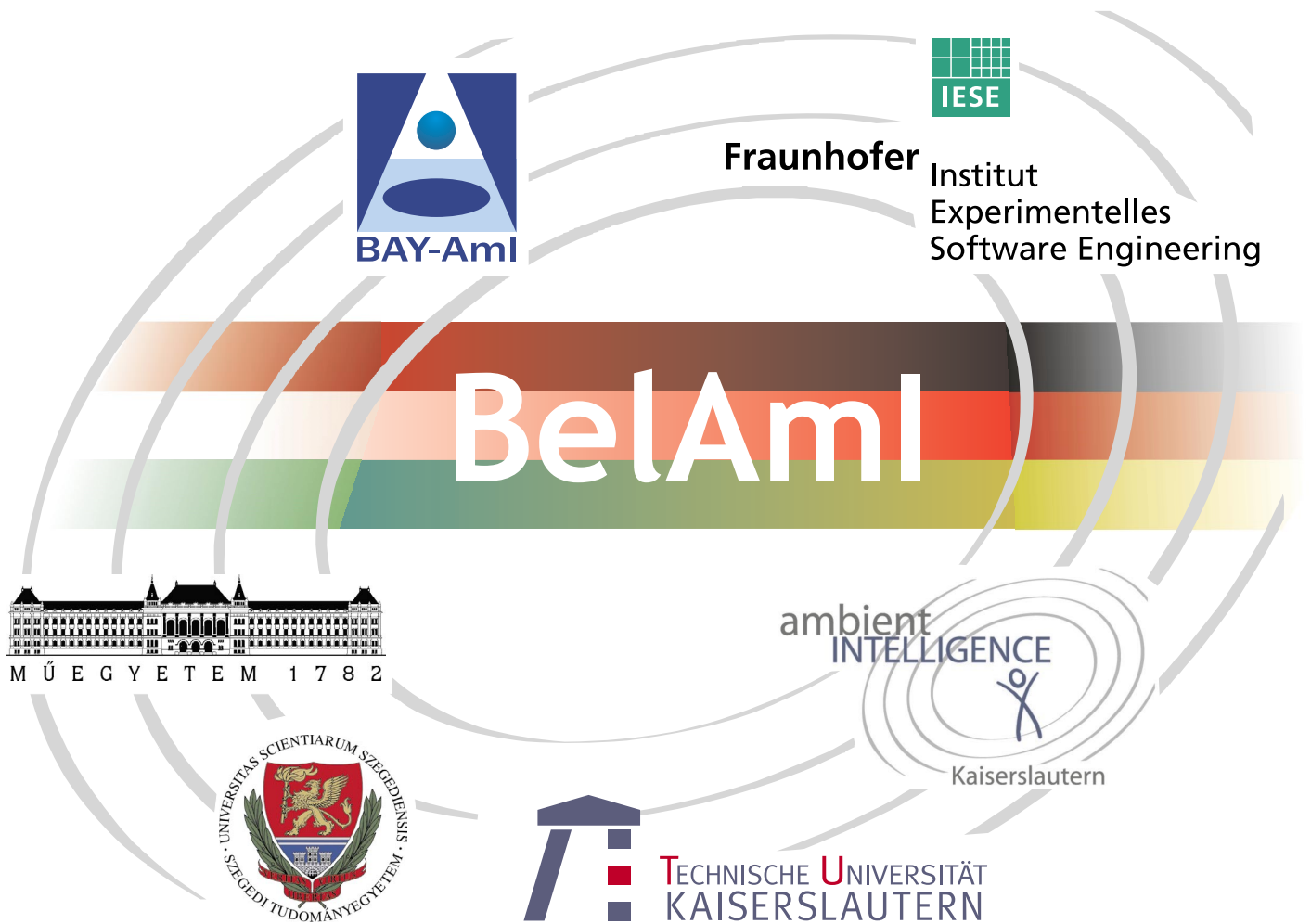
take over safety functions for the driver; in the health sector, such assistance systems could, on their own, inform a physician in case of an unusual medical condition, or they might look up suitable instructions for the maintenance of a technical appliance from a large maintenance handbook. Although our daily environment is being constantly enriched by IT technology, the use of Ambient Intelligence will once again make humans the center of interest.

Extreme miniaturization, cheap mass production, as well as progress made in microelectronics, communication technology, software development, and human-machine interaction let the vision of computer technology that is unobtrusively integrated into our lives appear to be at close hand. However, in order to actually make this a reality, the innovations achieved in the various competence areas must be brought together and must be combined into systematic solutions. This has so far proven to be quite difficult due to the wide range of the required competencies. Excellent prerequisites in this respect are being offered by the project BelAml (see article on page 94), in which Fraunhofer IESE has closely cooperated with the Inter-University Centre for Telecommunications and Informatics (ETIK) and the Bay Zoltan Foundation for Applied Research in Hungary as well as with the University of Kaiserslautern since October 2004. More than 40 scientists from different competence areas are working on facing the challenges offered by Ambient Intelligence and on finding innovative solutions, which they implement in joint demonstrators and scenarios. In addition to proving that the solutions developed are suitable in practice, this demonstrator-driven

Ambient Intelligence:
Support in all areas of life.



¹ Bilateral German-Hungarian Research Collaboration on Ambient Intelligence Systems
<http://www.iese.fraunhofer.de/BelAml>



research approach also allows the early involvement of industry in the research and development activities.

One of the application areas that the BelAml project focuses on is "Assisted Living". This area of providing IT support to people with special requirements – for example, elderly people, people with disabilities – is of particular social and economic significance in aging industrial societies. Its benefit for the persons affected and for the social systems as a whole would be

immense if Ambient Intelligence solutions were able to allow persons with special requirements to remain longer in their own homes, leading longer lives without requiring external assistance. This problem has been selected by the team of BelAml researchers, who is currently developing a suitable assistance system that would enable the target group to have an ordered and comfortable daily routine. A first version of this system will be completed in the spring of 2006, and will be continually evolved after that.

A concentration of competence:
The collaboration partners of the BelAml project.

Girls do it themselves:

5th to 10th grade female students assemble operational personal computers from individual components in the context of Girls' Day 2005 at Fraunhofer IESE.



Explanations by an expert:
Natascha Hooks, system integrator and administrator at Fraunhofer IESE, explains the different components of a modern personal computer to the participants.

Girls' Day 2005 – Girls can do it!

The objective of Girls' Day as a Germany-wide campaign is to generate interest in girls for fields of study outside the "typically female" professions by offering them practical experiences and personal talks. The Fraunhofer Institute for Experimental Software Engineering IESE in Kaiserslautern also opened its doors to girls in grades 5 – 10 on 28 April 2005, and offered a diverse and interesting program.

The information event offered by the well-known IT research institute, which presented "typically male jobs" to the female students, was all about taking part. In the hardware workshop, operational personal computers were assembled from numerous electronic components under the professional guidance of Fraunhofer IESE technicians. The participants got to know the interaction of the various parts of a computer; they assembled parts, tested

them, and located sources of failures. At the end, a comprehensive functional test was performed and the computer was operational – talk about only boys being able to do that!

Once again, another workshop offered by the institute at this year's Girls' Day was all about the Internet. After a brief film to introduce the topic, it was again "do-it-yourself": How to take the right "exit" off of the data highway and find the desired information? Which forms of communication does the Internet offer besides telephone or email? What can be done to protect oneself from the dangers in the Internet, and how not to put one's foot into one's mouth? Answers to such interesting questions regarding the "network of networks" were found by working in teams; in a cyber scavenger hunt, the participants were able to prove their freshly sharpened sense of detection and orientation.

MetriKon 2005

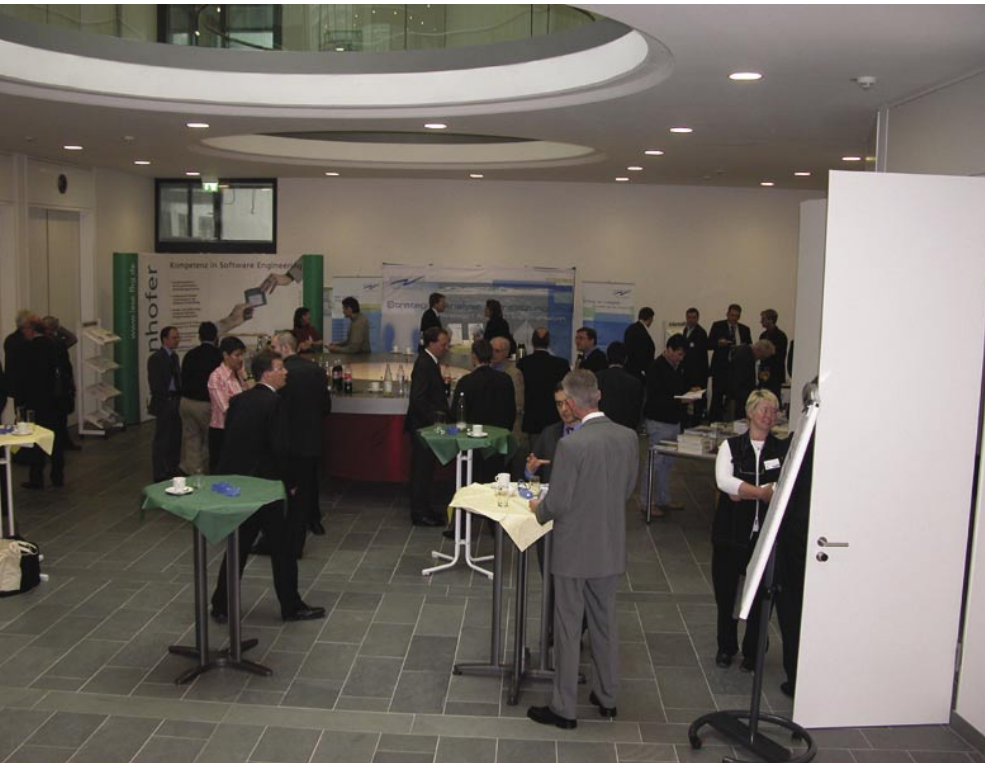
In 2005, Fraunhofer IESE hosted the annual DASMA conference MetriKon, which has traditionally focused on the issues of "Software Metrics" and "Effort Estimation of IT Projects". In addition, the agenda included related software development issues. Renowned experts and practitioners from science, industry, and administration gave talks on the most recent developments and experiences regarding software metrics. Particular emphasis was placed on providing enough time for discussions and exchange of experience. More than 80 participants came to the new institute center in Kaiserslautern to listen to interesting talks and take part in discussions.

In his keynote speech, Prof. Peter Liggesmeyer stressed the importance of measurements aimed at obtaining quantitative, reproducible statements on software quality. According to Prof. Liggesmeyer, this is necessary in very different contexts, such as when determining defect rates or minimum availability of a system in the context of drawing up a contract. Today, software is often used in application areas where quantitative statements on quality are common or necessary, which suggests software measurement. Prof. Liggesmeyer gave a comprehensive overview of statistical methods for software reliability, concluding with useful hints on how to introduce those and apply them in the industrial practice.



Great interest:

Practice-relevant technical presentations and well renowned speakers found a large audience.



Exchanging ideas:

The simultaneous company exhibition enabled talks between experts and users.

Dr. Christoph Ebert focused on the importance of productivity as measurement data for business in his keynote speech and explained how to measure it quantitatively in the context of software and system development. His main topics included improvement of project estimations, supplier assessment, and productivity improvement.

There was a variety of other interesting professional talks, including those by Dr. Horst Zuse on the topic of "Halstead Measures" and by Harry Sneed on the topic of "Measuring the Effectiveness of Software Tests". Fraunhofer IESE was represented by members of the department "Processes and Measurements", who presented the

tool M-System for measurement-based assessment of software quality. "Our competencies and services in the areas of software metrics, quantitative project management, and cost estimation met with great interest by participants from industry and research", summed up department head Dr. Münch. Project partners of Fraunhofer IESE also used the opportunity to present the results of their work and participate in the exchange of experience.

The DASMA award for diploma theses, which is endowed with 1000 Euro, was presented to Evgenia Wollenhaupt. The objective of her thesis was the development of a GQM-based measurement system at Siemens AG. Other highlights of MetriKon included an all-day tutorial held by Fraunhofer IESE on the topic of "Goal-Oriented Software Measurement" as well as an exhibition by participating companies held during the conference. In parallel to MetriKon, membership meetings of the GI Special Interest Group 2.1.10 ("Software Measurement and Evaluation") and of DASMA were held, as was a workshop on the topic of "Software Productivity".



Dr. Rance Cleaveland
Executive Director
Fraunhofer Center Maryland (FC-MD)

Dr. Rance Cleaveland, Fraunhofer Center Maryland (FC-MD) Executive Director, Appointed

College Park, Maryland, May 13, 2005
Dr. Rance Cleaveland, Professor of Computer Science at the University of Maryland, has been appointed Executive Director of the Fraunhofer Center Maryland (FC-MD) in College Park, Maryland.

Prof. Cleaveland was formerly Professor of Computer Science at the State University of New York (SUNY) at Stony Brook. He is author of over 100 scientific publications and has served on numerous program and advisory committees for national and international research organizations and technical symposia. He received his PhD in Computer Science from Cornell University in Ithaca, New York, in 1987.

Prof. Cleaveland’s research has focused on tools and techniques for ensuring the correctness of software systems. With two colleagues, he founded Reactive Systems, Inc. (RSI), to commercialize research in this area. RSI now has over 30 customers, including leading automotive and aerospace manufacturers and their suppliers

“I am very pleased to be joining FC-MD,” said Prof. Cleaveland.

“The people are top-notch, and I look forward to continuing to advance an agenda of cutting-edge, customer-driven research on software engineering.”



eGovernment in practice:
In a first step, the business processes of selected companies from the chemical, automotive, and agricultural sectors are analyzed with regard to their eGovernment potential.

Value-driven eGovernment: Moving away from Individual Solutions toward a more Wide-Angled Approach through Systematic Identification of Potential in Business and Public Administration

In the summer of 2005, the Rhineland-Palatinate Ministry of Economy, Transportation, Agriculture, and Viniculture commissioned Fraunhofer IESE with a research project aimed at systematically preparing and advancing the further expansion of a benefit- and value-oriented eGovernment in Rhineland-Palatinate.

eGovernment solutions that are accepted by business, government, and citizens alike and that represent a recognizable added value for all stakeholders involved already exist for individual procedures on all administrative levels. The current challenge consists of achieving a tighter, widely comprehensive integration of interconnected business and administrative procedures on a wide scale by employing electronic solutions through benefit-driven eGovernment. Already successful approaches are to be expanded, and through the use of new approaches, yet untapped economic potentials should be developed.

Rhineland-Palatinate articulates this challenge in its "eGovernment Action Plan". One of the projects intended to implement this action plan is the research project "Bestimmung von eGovernment-Potenzialen in Wirtschaft und

Verwaltung" (Identification of eGovernment Potentials in Business and Public Administration), which was initiated by Fraunhofer IESE in the summer of 2005 on behalf of the Rhineland-Palatinate Ministry of Economy, Transportation, Agriculture, and Viniculture.

During the first step in this project, selected companies from the chemical, automotive, and agricultural sectors of Rhineland-Palatinate industry are surveyed in order to first, identify business processes that tie in with government procedures, and second, to determine the business value that companies ascribe to those processes. Subsequently, based upon the results of this survey, and in cooperation with the University of Applied Sciences for Public Administration in Mayen, which is performing a survey among the state government agencies with the same objective, comprehensive process chains regarding their eGovernment potentials are analyzed. Finally, in dialog with all stakeholders - from the business, research, administration, and political sector - a well balanced prioritization of the identified process chains should be reached.

Through this project, the state of Rhineland-Palatinate intends to ensure that the further implementation of a sector-driven eGovernment will not be based on incidental conditions, but will rather be developed through systematic analysis of administrative procedures and business processes.

Fraunhofer IESE and its Network Partners

International Research Networks

Fraunhofer IESE fulfills its mission of applied research and technology transfer through close collaboration with users of software engineering technology, providers of new technologies, and strategic partners in national and international collaborations. Thus, IESE actively promotes further development of software engineering technology and its transfer into industrial practice.

Fraunhofer IESE is a member in several international research associations. The **International Software Engineering Research Network (ISERN)** with approx. 35 members from science and industry plays an important role in Fraunhofer IESE's international research collaborations. ISERN is a forum for applied software engineering researchers for exchanging the latest research results and experiences.

In addition, Fraunhofer IESE is affiliated with the Center for Empirically Based Software Engineering (CeBASE), a project of the National Science Foundation (NSF) in the United States. Other CeBASE members include FC-MD, the University of Maryland, the University of Southern California, Mississippi State University, and the University of Nebraska-Lincoln.

ISERN

International Software Engineering Research Network



Quality Improvement

Bilateral research and exchange programs for students and scientists exist with renowned institutions such as the Experimental Software Engineering Group at the University of Maryland, the Center for Software Engineering at the University of Southern California, the Software Engineering Institute (SEI) of Carnegie Mellon University, Pittsburgh, Carleton University in Toronto, the University of Calgary, Canada, the National ICT Australia Ltd (NICTA), Sydney, and the Software Quality Institute at Griffith University in Australia.



International competence networks promote global scientific exchange - not only virtually.

Publicly-funded Collaborations

Fraunhofer IESE is the coordinator of the national network software-kompetenz.de, a project funded by the German Federal Ministry of Education and Research.

The partners are

- Brandenburgische Technische Universität ("Brandenburg University of Technology"), Cottbus
- Fraunhofer-Institut für Rechnerarchitektur und Softwaretechnik FIRST ("Fraunhofer Institute for Computer Architecture and Software Technology"), Berlin
- Fraunhofer-Institut für angewandte Informationstechnik FIT ("Fraunhofer Institute for Applied Information Technology"), St. Augustin
- Fraunhofer-Institut für Experimentale Software Engineering IESE, Kaiserslautern
- Fraunhofer-Institut für Informations- und Datenverarbeitung IITB ("Fraunhofer Institute for Information and Data Processing"), Karlsruhe
- Fraunhofer-Institut für Software und Systemtechnik ISST ("Fraunhofer Institute for Software and Systems Engineering"), Berlin

- Oldenburger Forschungs- und Entwicklungsinstitut für Informatik-Werkzeuge und -Systeme OFFIS ("Oldenburg Research and Development Institute for Computer Science Tools and Systems"), Oldenburg
- Institute for Computer Science IV, Technical University of Munich, Munich

The mission of ViSEK is to provide German software developing organizations with fast and simple access to the latest and most appropriate methods for developing software according to engineering principles. Its primary goals are the establishment of a community of software engineering experts and professional users as well as the creation of an Internet portal that makes the ViSEK partners' expert knowledge accessible to the more than 20,000 software developing companies in Germany. The portal or virtual competence center thus provides the basis for successful knowledge transfer between research and industry.



ESERNET is being funded by the Information Societies Technology Programme of the European Union under grant IST-2000-26754. The complete list of partners and members can be found at www.esernet.org.



On the European level, Fraunhofer IESE is the coordinator of the [Experimental Software Engineering Research Network \(ESERNET\)](#). The main objective of ESERNET is to establish and maintain Europe's leadership position in experimental software engineering as an essential catalyst for the rapid and sustained improvement of European software competencies. It is funded by the European Commission in the context of the 5th Framework's IST program.

Furthermore, there are collaborations with several other publicly-funded consortia. These either deal with further development of software engineering technology or with the dissemination of best practices and technology transfer. Often, these projects result in bilateral, industrially-funded collaborations. Public project sponsors include the state government of Rhineland-Palatinate, the German federal government, and the European Commission.

Further information:

www.software-kompetenz.de

www.esernet.org

Industrially-funded Collaborations

Fraunhofer IESE's industrial cooperation partners range from global players to small regional companies. They can be grouped into four categories:

- Large national and international organizations looking for support in their mid- to long-term strive for quality improvement in software development.
- Large national and international organizations with their own R&D department, who are looking for competent research partners.
- Medium-sized enterprises, who want to establish improvement programs or who must implement technology changes under very tight budget and schedule constraints.
- Small companies, who want to use proven technology that yields short-term return-on-investment.

Specialized Services for SMEs

In addition to the bilateral collaborations, Fraunhofer IESE and FC-MD are the organizers of a worldwide consortium consisting of globally operating organizations – the Software Experience Center (SEC). SEC is an association of organizations who want to expand their software engineering competencies on a global scale. In SEC, companies exchange experience across various locations and business areas, and in cooperation with other leading organizations from their own application domain as well as from other domains.

The Competence Center for Software Technology and Training (KSTW) offers services that are custom-tailored to small and medium-sized enterprises. Services focus on fundamental software engineering practices such as requirements engineering, systematic testing, inspections, etc. KSTW's software competence kit ("Baukasten Software Kompetenz") allows for individual consultation, including self-assessment workshops, systematic business process modeling, problem analyses based on ISO 15504/SPICE, and customized continuing education measures for employees.

The Research Lab for SMEs (which was established with funds from the state of Rhineland-Palatinate and the European Commission/EFRE) offers clusters of SMEs an opportunity to jointly work on one software engineering research topic. The focus is on establishing an infrastructure for adapting software engineering topics to the special needs of SMEs, and also includes preparations for transferring such topics to SMEs.



The Fraunhofer-Gesellschaft

Address

Fraunhofer-Gesellschaft e. V.
 P.O. Box 12 04 20
 HansasträÙe 27c
 80636 München, Germany
 Phone: +49 (0) 89/1205-01
 Fax: +49 (0) 89/1205-317
 E-mail: info@zv.fraunhofer.de
 Internet: www.fraunhofer.de

Fraunhofer Locations in the USA

Boston, Massachusetts
 College Park, Maryland
 Newark, Delaware
 Pittsburgh, Pennsylvania
 Plymouth, Michigan
 Providence, Rhode Island

Fraunhofer Locations in Asia

Beijing, China
 Jakarta, Indonesia
 Seoul, Korea
 Singapore
 Tokyo, Japan

Fraunhofer Locations in Europe

Brussels, Belgium

The Fraunhofer-Gesellschaft undertakes applied research of direct utility to private and public enterprise and of wide benefit to society. Its services are solicited by customers and contractual partners in industry, the service sector and public administration. The organization also accepts commissions and funding from German federal and Länder ministries and government departments to participate in future-oriented research projects with the aim of finding innovative solutions to issues concerning the industrial economy and society in general.

By developing technological innovations and novel systems solutions for their customers, the Fraunhofer Institutes help to reinforce the competitive strength of the economy in their local region, and throughout Germany and Europe. Through their work, they aim to promote the successful economic development of our industrial society, with particular regard for social welfare and environmental compatibility.

As an employer, the Fraunhofer-Gesellschaft offers its staff the opportunity to develop the professional and personal skills that will allow them to take up positions of responsibility

within their institute, in other scientific domains, in industry and in society.

At present, the Fraunhofer-Gesellschaft maintains some 80 research units, including 58 Fraunhofer Institutes, at over 40 different locations in Germany. The majority of the roughly 12,500 staff are qualified scientists and engineers, who work with an annual research budget of over 1 billion euros. Of this sum, more than €900 million is generated through contract research. Roughly two thirds of the Fraunhofer-Gesellschaft's contract research revenue is derived from contracts with industry and from publicly financed research projects. The remaining one third is contributed by the German federal and Länder governments, partly as a means of enabling the institutes to pursue more fundamental research in areas that are likely to become relevant to industry and society in five or ten years' time.

Affiliated research centers and representative offices in Europe, the USA and Asia provide contact with the regions of greatest importance to present and future scientific progress and economic development.

The Fraunhofer-Gesellschaft was founded in 1949 and is a recognized non-profit organization. Its members include well-known companies and private patrons who help to shape the Fraunhofer-Gesellschaft's research policy and strategic development.

Executive Board

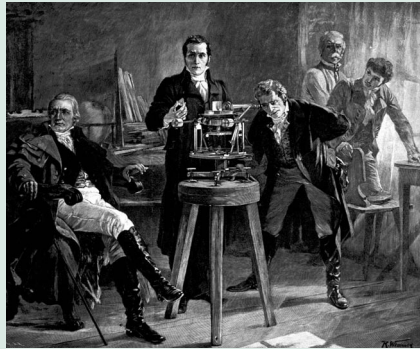
(as of 31 December 2005)

Prof. Dr. Hans-Jörg Bullinger
President, Corporate Policy and Research

Dr. Alfred Gossner
Finances and Controlling (incl. Business Management, Purchasing, Real Estate)

Dr. Dirk-Meints Polter
Human Resources and Legal Affairs

Prof. Dr. Dennis Tschritzis
Chief Information Officer (CIO),
International Business Development



The man behind the name:

Joseph von Fraunhofer

The Fraunhofer-Gesellschaft owes its name to Joseph von Fraunhofer (1787-1826), the successful Munich researcher, inventor and entrepreneur.

Born of a family of modest means, the glass-grinding apprentice Joseph von Fraunhofer joined the institute for optics headed by privy councillor Joseph von Utzschneider, who put the young researcher in charge of glass manufacturing at the early age of 22. Joseph von Fraunhofer's major developments include new methods of glass production and processing.

The optical instruments he himself developed, such as the spectrometer and the diffraction grid, enabled Fraunhofer to conduct fundamental research in the fields of light and optics. He was the first scientist to measure the spectrum of sunlight and characterize the appearance of the dark absorption strips: the "Fraunhofer lines".

Fraunhofer IESE Alliances



Fraunhofer eGovernment Center

The Fraunhofer eGovernment Center consists of nine Fraunhofer institutes offering services for eGovernment in Germany and Europe on the basis of the synergies of their individual competencies, which range from application knowledge and technology know-how to solution development.

Each institute involved has many years of experience in the areas of technology and application, and collaborates in various eGovernment application projects. As regional representative of the eGovernment Center in Rhineland-Palatinate, Fraunhofer IESE supports government agencies as well as software developing organizations in establishing, expanding, and improving their eGovernment services. In particular, the following services are offered: support in strategy determination and execution of feasibility analyses, quality assurance and support of realization projects

(with special consideration of system architecture, usability, and IT security issues) as well as support in establishing eGovernment know-how. In order to guarantee optimal coverage of the technological and application-related issues, the projects are performed in cooperation with other institutes of the Fraunhofer eGovernment Center on a case-by-case basis.

The Fraunhofer eGovernment Center is manufacturer-independent. The services offered range from consulting and assessment services to technology evaluation, re-organization of business processes, software development and implementation, evaluation and development of security solutions, to project performance, quality assurance, standardization support, and know-how transfer.

Contact at Fraunhofer IESE

Petra Steffens
petra.steffens@iese.fraunhofer.de

www.egov-zentrum.fraunhofer.de

Fraunhofer Group Information and Communication Technology

The Fraunhofer Group Information & Communication Technology consists of fourteen Fraunhofer institutes with more than 3,000 employees, and has an annual budget of over €190 million. This makes it the largest research association for information and communication technology in Europe and one of the largest in the world.

The value-creating chain of the information and communication technology domain is covered broadly by the complementary foci of the member institutes (New Generation Internet, multi-modal dialogs and new media, knowledge and content engineering, IT security, computing and biology, simulation and virtual engineering, innovative applications and I&C-based services).

Within the Fraunhofer Group Information & Communication Technology, Fraunhofer IESE is particularly active in the areas of eGovernment, IT security (e.g., in the context of the E-Security Network) and software engineering (systematization of requirements; modeling and

design of distributed, parallel, and embedded systems; development of methods and tools, structural assessment of organizations regarding I&C). In addition, Fraunhofer IESE, together with the Virtual Software Engineering Competence Center (which can be accessed on the Internet via www.software-kompetenz.de), bundles the know-how of more than 500 experts who implement new technologies in practice in a sustainable manner.

The Fraunhofer Group Information & Communication Technology makes its competence portfolio available to partners from industry and government. The range of services offered includes custom-tailored IT solutions, competent technology consulting as well as advance research for new products and services. Through international research programs, the member institutes are part of a worldwide network of business and research organizations in the information & communication technology domain.

Contact at Fraunhofer IESE

Prof. Frank Bomarius
frank.bomarius@iese.fraunhofer.de

www.iuk.fraunhofer.de

Fraunhofer Traffic and Transportation Alliance

Since March 2003, the Fraunhofer Traffic and Transportation Alliance has brought together sixteen Fraunhofer institutes with various competencies for coping with traffic- and transportation-related issues. In March 2004, this alliance was strengthened further through the addition of five more Fraunhofer institutes.

The members of the alliance aim at developing and implementing suitable technical and conceptual solutions for public and industrial customers through interdisciplinary research.

By cooperating closely on related issues, holistic and demand-oriented system

and alliance solutions as well as new application areas can be developed in the area of traffic and transportation through know-how transfer.

Fraunhofer IESE's contribution to the alliance consists of its competencies in planning and designing complex systems, which are needed, for example, for distributed traffic management solutions. In addition, there are various application possibilities for solutions originating from the Ambient Intelligence research focus, particularly in the areas of freight transport and logistics.

Contact at Fraunhofer IESE

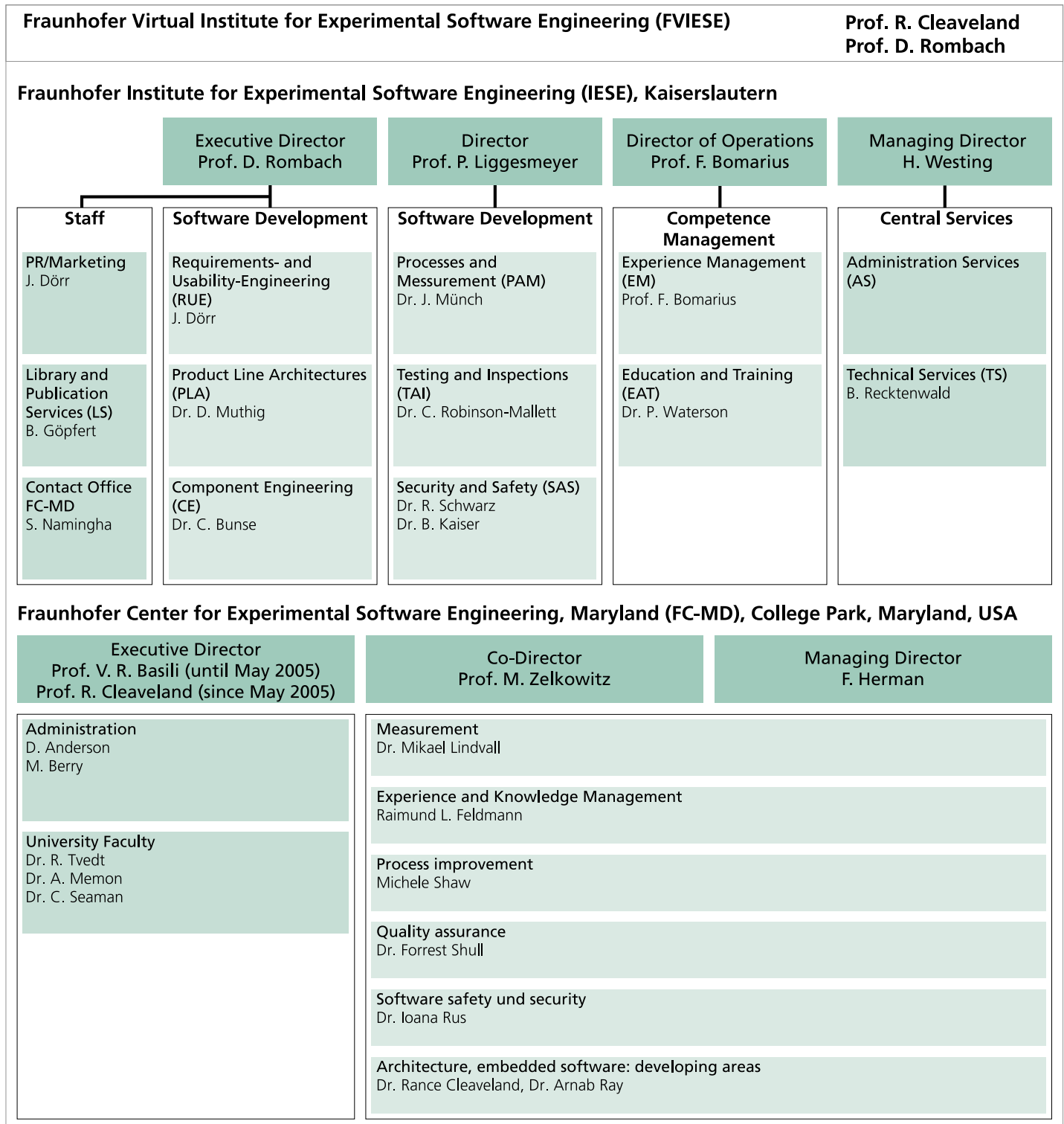
Ralf Kalmar
ralf.kalmar@iese.fraunhofer.de

www.verkehr.fraunhofer.de



On the dot:
 Punctuality as the result of the right traffic and mobility strategies.

Organizational Structure



The Fraunhofer Virtual Institute for Experimental Software Engineering

The Fraunhofer Virtual Institute for Experimental Software Engineering, FVIESE, includes two partner institutions: the Fraunhofer Institute for Experimental Software Engineering (IESE) in Kaiserslautern and the Fraunhofer Center for Experimental Software Engineering, Maryland (FC-MD) in College Park, Maryland, USA. Both institutions are legally independent entities of Fraunhofer-Gesellschaft e. V. and Fraunhofer USA, Inc., respectively. The institute directors of Fraunhofer IESE and Fraunhofer Center Maryland FC-MD jointly coordinate FVIESE.

Departments and Business Areas

To ensure efficient execution of daily operations, the FVIESE institutes – Fraunhofer IESE and FC-MD – are organized into four departmental units plus staff functions, which constitute the institutes' line structures. The Fraunhofer IESE line structure is complemented by a two-dimensional matrix structure. One dimension is assigned to the "Departments", each of which focuses on a cluster of research themes. The other dimension of the matrix is allocated to so-called "Business Areas", each of which is motivated by a group of related customer problems. The departments are dedicated to developing innovative software engineering methods, technologies, and tools, to proving their benefit, and to systematically packaging their research results. Research is typically carried out within public or Fraunhofer base-funded projects. While the departments thus prepare the ground for technology transfer, the business areas are devoted to applying the technologies in industrial practice and to initiating their large-scale roll-out:

- Automotive and Transportation Systems
- Medical Systems
- Telecommunication, Telematics and Service Providers
- Information Systems and Public Sector

The business areas are thus responsible for acquiring, setting up, and monitoring industrial projects, for continuously observing and analyzing market needs, for spotting new business opportunities, and for feeding market requirements back to the departments. Each Fraunhofer IESE scientist belongs to one department and is dynamically assigned to business area projects. Business areas are thus virtual units with no personnel resources of their own (apart from the Business Area Managers), which draw upon the departments for staffing customer projects. One member of the IESE Advisory Board is assigned to each department and to each business area, in order to provide continuous advice and guidance on strategic research and market-related issues.

Due to expanded requirements on flexibility voiced by the business areas, the so-called Competence Development Teams (CDTs) were created. Established for three years at a time, they are under the direction of a business area and are staffed with researchers from at least two departments. CDTs are funded through public projects and free research capacity of the staff (e.g., in the context of Ph.D. projects).

Competence Development Teams currently exist with a focus on Secure Systems, Safety, Ambient Intelligence Applications, Application-oriented Software Quality, Process Documentation, and Visualization of Software Systems.

The Fraunhofer IESE Advisory Board

The Advisory Board consists of representatives of research, industry, and government. The board members support the Institute Directors with advice and counsel.

Research

Prof. Dr. Victor Basili

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

Prof. Manfred Broy

Institute for Computer Science
Technical University of Munich
Munich

Dr. Paul C. Clements

Software Engineering Institute (SEI)
Pittsburgh, PA
USA

Prof. Dr. Werner Mellis

Department of Information Systems
System Development
University of Cologne
Cologne

Prof. Jürgen Nehmer

Department of Computer Science
University of Kaiserslautern
Kaiserslautern

Prof. Helmut Schmidt

President
University of Kaiserslautern
Kaiserslautern

Prof. Mary Shaw

Carnegie Mellon University
Pittsburgh, PA
USA

Industry

Reinhold E. Achatz

Vice President Corporate Technology
Siemens AG
Munich

Dr. Matthias Berg

CEO, Pfaff Industrie Maschinen AG
Kaiserslautern

Dr. Klaus Grimm

Director Software Technology
DaimlerChrysler AG
Berlin

Wolfgang Jung

Head of Development Center West
T-Systems NOVA
Saarbrücken

Dr. Michael Strugala

Robert-Bosch GmbH
Schwieberdingen

Dr. Martin Verlage

Director Online Products
market maker Software AG
Kaiserslautern

Dr. Thomas Wagner

Head of the Advisory Board
Executive Vice President, Corporate
Robert-Bosch GmbH
Stuttgart

Dr. Hans-Ulrich Wiese

Former member of the Executive Board
of Fraunhofer-Gesellschaft e. V.
Gräfelfing

Government

Dr. Rudolf Büllesbach

Directing Ministerial Councilor, Rhine-land-Palatinate State Chancellery
Mainz

Brigitte Klempt

Ministerial Councilor, Ministry of Education, Science and Continuing Education
Mainz

Dr. Ulrich Müller

Directing Ministerial Councilor
Ministry of Economy, Transportation, Agriculture and Viniculture
Mainz

Dr. Bernd Reuse

Ministerial Councilor, Federal Ministry of Education and Research (BMBF)
Bonn

Fraunhofer-Gesellschaft

Dr. Alfred Gossner

Member of the Executive Board
Fraunhofer-Gesellschaft e. V.
Munich

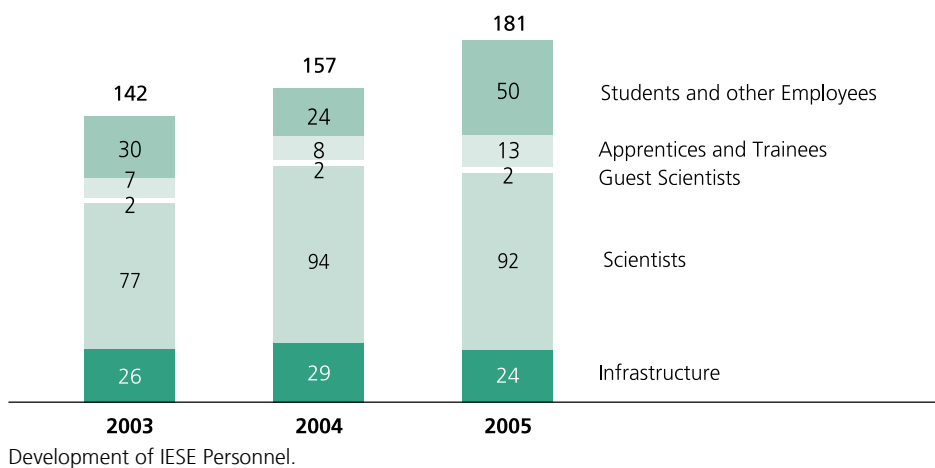
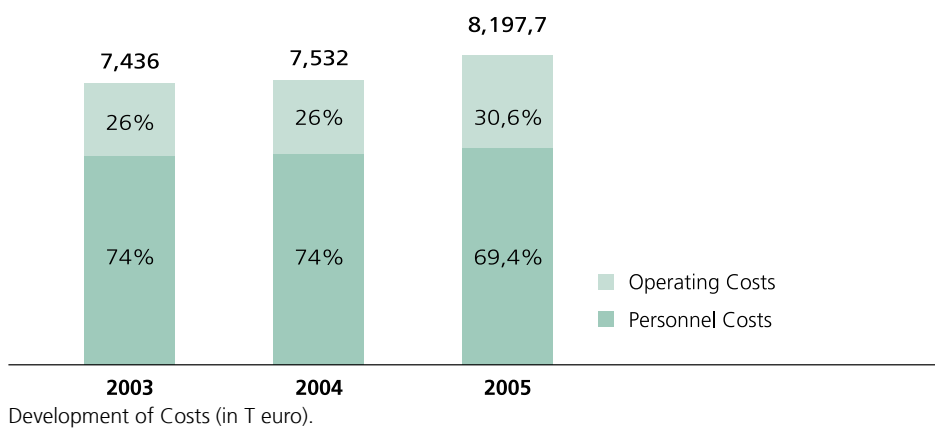
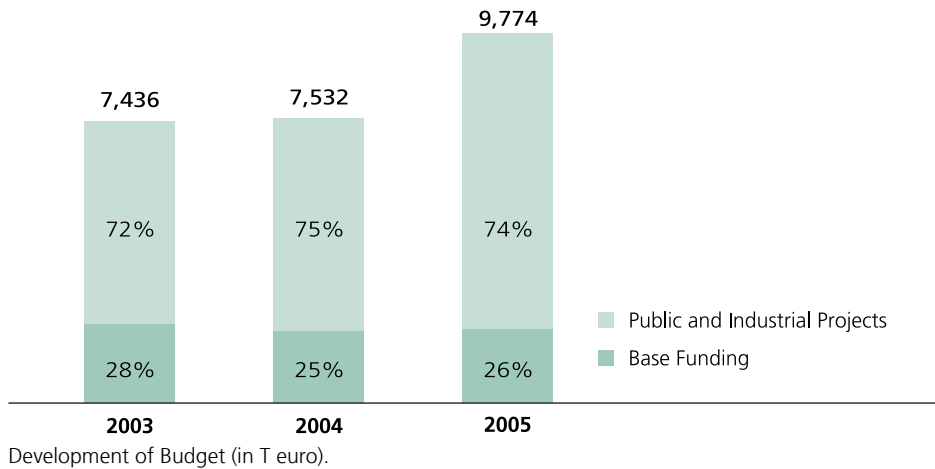
Dr. Dirk-Meints Polter

Member of the Executive Board
Fraunhofer-Gesellschaft e. V.
Munich

Dr. Helmut Seliger

Research Planning
Fraunhofer-Gesellschaft e. V.
Munich

Development of Personnel and Budget

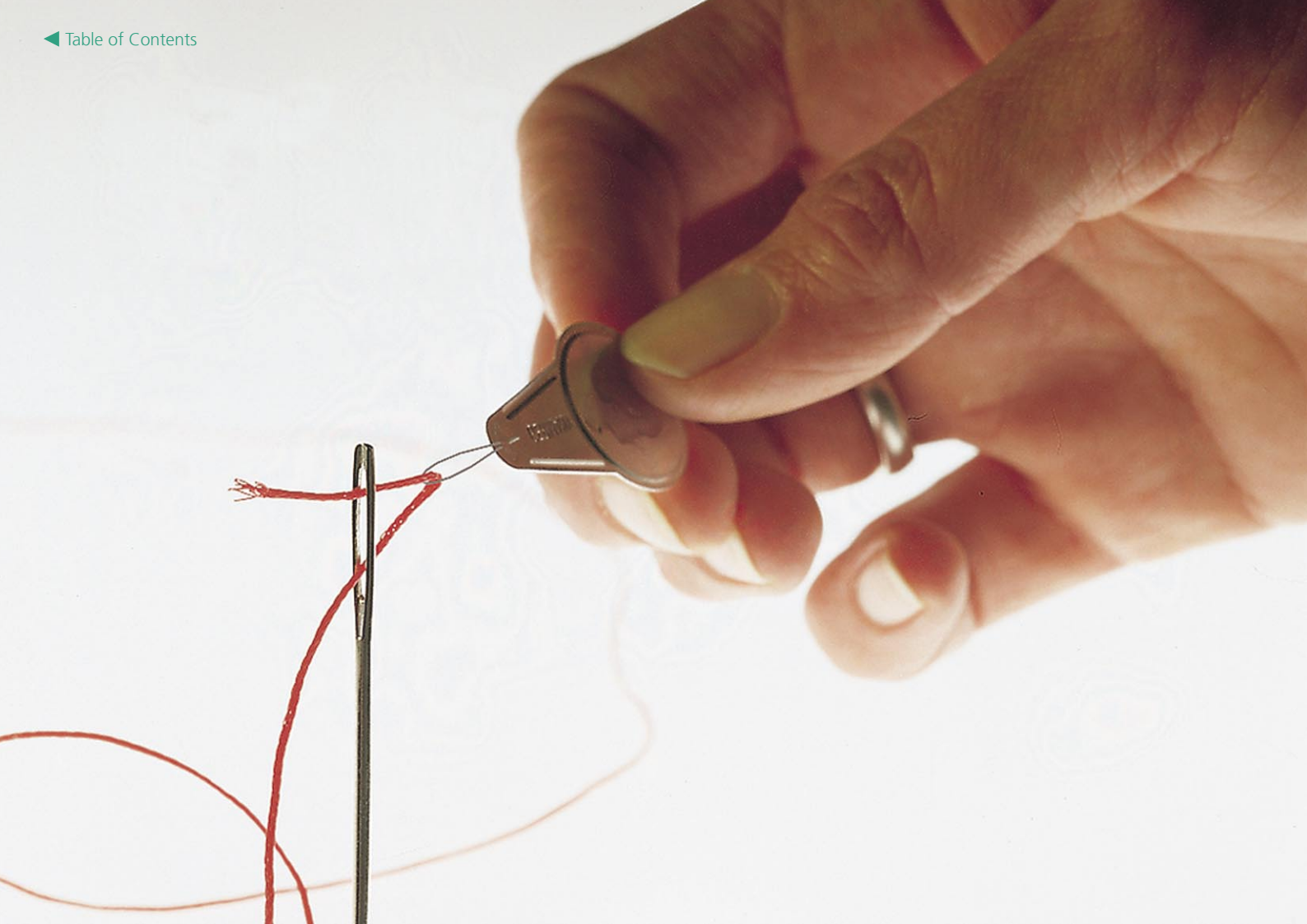


Personnel and Budget Development

In the year 2005, IESE continued to pursue its strategy of moderate personnel growth regarding scientist positions. During the course of the year, IESE employed 181 people, including 92 scientists, 2 guest scientists, 50 student research assistants as well as 13 trainees and interns. The percentage of female employees was 35%.

In 2006, the institute plans to further increase its scientific personnel.

Due to the construction of the new building, a larger part of the overall costs for material/equipment and personnel was spent on the former. However, as a service-oriented institute, the majority (70%) of expenses was spent on personnel.



Departments

Requirements and Usability Engineering (RUE)	36
Product Line Architectures (PLA)	38
Component Engineering (CE)	40
Processes and Measurement (PAM)	42
Testing and Inspections (TAI)	44
Security and Safety (SAS)	46
Experience Management (EM)	48
Education and Training (EAT)	50

Requirements and Usability Engineering (RUE)

Contact

Jörg Dörr
 Phone: +49 (0) 631/68 00-16 01
 Fax: +49 (0) 631/68 00-14 99
 joerg.doerr@iese.fraunhofer.de



Jörg Dörr
 (since March 2006)



Dr. Klaus Schmid
 (until February 2006)

Software to meet the highest demands

In order for a wish to be fulfilled in software development, it must first be voiced in detail. Requirements and Usability Engineering provides the basis for software to do what it is supposed to do, for it to be used without problems, and for it to be adapted to changing requirements.

However, it is not enough to just once capture only the technical requirements. Requirements and Usability Engineering is a multi-step design process, which in the ideal case accompanies software development like the proverbial "red thread". In this context, Fraunhofer IESE is working on the following main topics, with an orientation towards practical application:

- **Usability from scratch** is ensured by eliciting necessary usability properties in the same way as the functional requirements and maintaining them throughout the process.
- **Non-functional system characteristics** such as efficiency, security and safety, or maintainability can be defined completely and measurably with the help of experience-based models.
- **Incremental Requirements Engineering** takes into account future developments and adaptations of software products by integrating itself into the development process together with change management aspects.

- **Requirements Engineering for Product Lines** saves time and money during the development of complete software families, since the requirements on commonalities and variants are considered right from the start of the development process and remain valid across the entire product line.

Competence in Software and Systems Engineering

By combining new software engineering methods, respectively such methods that were further developed or adapted upon a customer's request, in an engineering-style manner, the synergies created by the different processes can be used optimally:

- **Business Processes as the starting point:** Regarding its functionality, software must take its orientation from the business processes that are to be supported by it. Thus it appears reasonable to use business process modeling processes in Requirements Engineering. Empirical studies prove the benefits of this procedure.
- **Usability as the goal of construction:** Precise requirements specification and systematic derivation of the navigation paths and interactions leads to software that fulfills the demands of the user, including usability aspects.
- **Software Product Lines as the basic concept:** Scoping and modeling of variants of a software family in the context of Requirements Engineering results in the rational and consistent design of a product line.

- **Custom-tailored methods as the recipe for success:** Requirements Engineering that is to be suitable in practice is no product to be bought off the rack. An organization’s culture as well as the internal structures of a software developing company are two of many factors that must be taken into account when designing the “ideal” requirements process.

Products and Services

Software and Systems Engineering is the key to winning a competitive edge in a hard-fought market. Fraunhofer IESE helps to optimize development processes and increase product variety while assuring quality at the same time:

- **Definition and adaptation to the requirements processes:** The Requirements Engineering processes must live up to the respective situation in the company in order to support and not obstruct the development process. Company- and project-specific adaptation of requirements processes is therefore one of the most important services we offer in this area.

- **Usability Checks:** The most modern usability analysis and evaluation processes permit solid evaluation of a system’s usability. Tests performed by Fraunhofer IESE throughout the entire process reveal defects early on and allow their cost-efficient elimination.
- **Usability Prototyping:** Together with joint collaboration partners, Fraunhofer IESE designs and develops prototype user interfaces. Thus these can be optimized early on in parallel to the software development itself, and when the product is shipped, a usable user interface is already available.
- **NFR Identification:** Non-Functional Requirements (NFR) are just as important for the quality of a software system as its functionality. Fraunhofer IESE identifies these requirements early on and anchors them in the development process.

- **Scoping of Product Lines:** Product lines allow efficient software development – provided that the requirements process reliably identifies the functional areas that are relevant for the entire software family. Fraunhofer IESE stands for highly profitable product line technology from the requirements to the finished system.
- **Training Sessions and Workshops:** Decision makers and practitioners in software development learn everything about Requirements Engineering and Usability first-hand at special events. In addition, the experts from Fraunhofer IESE develop complete product concepts in creative workshops together with customers from industry and the public sector.



Product Line Architectures (PLA)

Contact

Dr. Dirk Muthig
 Phone: +49 (0) 631/68 00-13 02
 Fax: +49 (0) 631/68 00-13 99
 dirk.muthig@iese.fraunhofer.de



Dr. Dirk Muthig

Custom-Tailored Software

Architectures are the engineering-style blueprints of modern software-based systems. Especially in the case of complex software systems, the underlying architecture is of particular significance; software families can be developed with high efficiency via a product line approach anchored in the architecture and through consistent reuse of already developed artifacts. In order for the practical benefits of product line architectures to take full effect, fundamental advance considerations and goal-oriented accompaniment of the entire development project are necessary. In this context, Fraunhofer IESE is working on the following main topics, with an orientation towards practical application:

- **Development and maintenance of product lines** includes taking into consideration market and customer demands as well as reacting to changes through adaptation of a product line architecture and thus all products derived from it.
- **Architectural patterns and styles** must be flexible enough to already permit tomorrow's product variants today. Suitable processes give preference to the measurable and predictable flexibility of a selected approach over subjective impressions.
- **Systematic variability management** is a central aspect within each product line architecture, since single artifacts of a product line may differ in more or less details. Holistic methods and tool-supported processes provide overview, consistency, and easy adaptability during the development and operation of product line-based software systems.

- **Quality and reuse** are no contradiction if the quality management strategies and techniques used during development are exactly adapted to the product line approach that is being used. Suitable evaluation processes and prediction models capture all characteristics of the system.

Competence in Software and Systems Engineering

The strength of Fraunhofer IESE's software engineering research lies especially in the engineering-style combination of new software engineering methods, respectively such methods that were further developed or adapted upon a customer's request. Thus, the synergies created by the different processes can be used optimally for developing variant-rich software product families in a cost-efficient and time-saving manner through the use of a consistent product line approach:

- **Definition of product line approaches:** Successful product line engineering is always fundamentally anchored in the respective development organization. Factors such as established practices in an organization, existing organizational structures, or the specific characteristics of the intended product line must be taken into account when creating a custom-tailored solution.
- **Definition and documentation of product line architectures:** Systematic considerations regarding the architecture of a software system on the basis of product lines and their complete documentation cover a major industrial demand for functionality, adaptability, and maintainability.

- **Production-integrated migration support:** By performing integrated, step-wise migration to product line development, advance projects such as feasibility or profitability analyses, or the design of processes for component reuse, take place successively during the course of the development while new products are being developed continuously.
- **Architecture evaluation:** The evaluation of the architectures of existing software-based systems of all kinds under requirements aspects and in consideration of customer wishes contributes to a large extent to generating systematic improvement measures.

Products and Services

Software and Systems Engineering is the key to gaining a competitive edge in a hard-fought market. The universal methodology offered by Fraunhofer IESE for high-performance system architectures and extremely efficient product development is **PuLSE® – Product Line Software and Systems Engineering**. With PuLSE®, the development of variant-rich software-based system families is possible without interruption of ongoing development, through a multitude of integrated, high-performance features:

- **Advance analyses and goal definition:** The prerequisite for the successful introduction of a product line are various kinds of preparations that can be integrated directly into the production operation with the help of PuLSE® and thus already benefit the ongoing system development. Fraunhofer IESE accompanies system developers in such matters as determination of the usage sce-

nario, identification of commonalities and differences of the intended product variants, or analysis of the change quota during the course of the development process. Additional support is provided by Fraunhofer IESE in the precise definition of goals and the measurement-based calculation of potential improvements.

- **Support for design, migration, and usage:** Comprehensive support is offered by Fraunhofer IESE, from the initial idea via introduction to the company to the daily use of product lines in industrial software and system development. General architecture design and implementation support, variability management, and product line maintenance are part of the range of services offered by Fraunhofer IESE, as are strategies for the step-wise introduction of product line-based development processes or the optimization of existing development and implementation processes with the use of product line architectures.

- **Success analyses and quality models:** Even what is tried and tested can be improved – for instance, on the basis of organizational experience knowledge that is systematically gathered and packaged. When it comes to design, realization, and documentation, Fraunhofer IESE is the reliable partner for all issues involving evaluation or quantitative analysis of architectures aimed at sustainable improvement of development processes and products.
- **Technology assessment and selection:** Which of the numerous technologies is the right one for a specific system development project? Together with its customers from industry, Fraunhofer IESE analyzes their particular situation under architecture aspects and supports them in selecting suitable modeling and implementation techniques and tools with regard to the best possible use of product line technology.



Component Engineering (CE)

Contact

Dr. Christian Bunse
 Phone: +49 (0) 631/68 00-14 01
 Fax: +49 (0) 631/68 00-14 99
 christian.bunse@iese.fraunhofer.de



Dr. Christian Bunse

Building Blocks for Success

Today, the functionality of technical products is often a complex interaction of hard- and software. In this context, control programs, which are almost completely responsible for the behavior of the overall system, are particularly important. In addition to the functional requirements, they must usually fulfill stringent non-functional requirements such as performance, safety, security, and reliability, while making only minimal demands on their environment.

Developing systems by combining single components, which should be as freely adaptable as possible, via defined interfaces has many advantages. Usage scenarios, reusability, and non-functional characteristics of components are easier to optimize, and complexity problems are easier to handle by dividing large systems into independent sub-units.

With special emphasis on embedded systems and realtime systems, Fraunhofer IESE is working on the following main topics, with an orientation towards practical application:

- **Infrastructures for implementation** can be used profitably in many cases for the systematic development of component-based systems. Especially UML, Corba, J2EE and other technologies promise individual benefits regarding savings in effort and product characteristics, and permit rapid development of systems with a pre-defined quality.
- **Embedded systems** profit particularly from systematic component-based development strategies, e.g., through the consistent reuse of already proven sub-systems.

- **Non-functional characteristics** are just as important as the functionality itself and must be taken into consideration during all phases of system development. Formal methods can help to specify and verify these characteristics during model-based development.
- **Resource optimization**, e.g., with regard to memory demand or energy consumption, is possible for embedded systems with the same modeling processes that are also used in hardware or software development (e.g., UML).
- **Efficient technology transfer** is the basic prerequisite for the profitable use of component-based development in an organization.

Competence in Software and Systems Engineering

The strength of Fraunhofer IESE's software engineering research lies mainly in the engineering-style combination of new software engineering methods, respectively methods further developed or adapted upon customer request, with a focus on the problem at hand. Thus the synergies of the various processes can be used optimally:

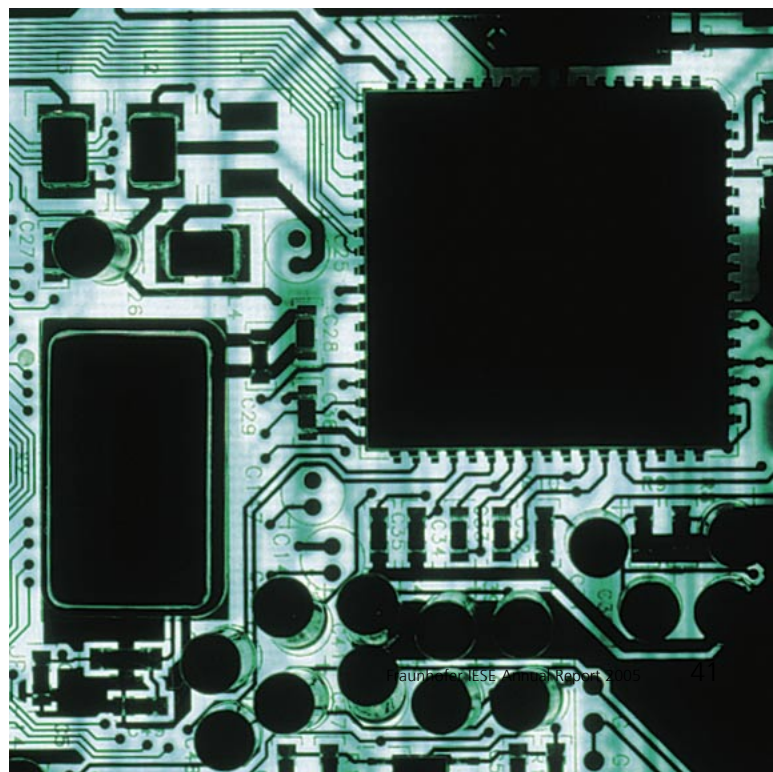
- **Methodological support:** Empirical processes during component-based system development permit goal-oriented optimization of processes, allow companies to profit from practical experience gained in other projects, and avoid known mistakes. Agile methods can also be used, significantly accelerating system development.

- **Hardware-software co-design:** Suitable construction models enable the development of monolithic systems, whose components interact without a problem and which can be developed in a particularly effort-efficient way. Methods and tools for model control (e.g., SPIN) enable automatic correctness checks; so-called Early Development Models permit exact estimation and optimization of resource usage.
- **Perspective-based development:** Depending on the application case, the focus in system development and optimization can be set individually. Which system characteristics receive special emphasis is a question of the customer's perspective.
- **Cost-benefit analyses** show which development strategies have the highest potential in the specific application case.
- **Method introduction:** Successful system development is a question of selecting the right procedure. Fraunhofer IESE helps in introducing component-based processes into existing development processes, e.g., the KobrA method for component-based product families or MARMOT especially for embedded systems. In addition, the institute offers comprehensive support for model-based system development via object-oriented analysis and object-oriented design.
- **Training and coaching:** The Fraunhofer IESE specialists teach component-based development know-how first-hand in training sessions, workshops, web-based learning courses or by direct coaching in the user project. This includes a wide variety of offers involving the Unified Modeling Language (UML), the KobrA method, Agile Methods, and Extreme Programming, as well as techniques for the development and analysis of realtime systems. Target groups include both practitioners from the development and implementation field and project managers tasked with decision-making.
- **Optimization of technology transfer:** Especially in the development of software-based systems, quantitative statements on the profitability of certain methods are indispensable. Adapted empirical processes together with the expertise of the Fraunhofer IESE specialists permit reliable estimation.

Products and Services

Software and Systems Engineering is the key to winning a competitive edge in a hard-fought market. Fraunhofer IESE offers a comprehensive range of support for system developers to design high-quality components and arrange them into complex systems:

- **System analyses:** Detailed studies performed by Fraunhofer IESE experts provide an insight into the performance behavior of existing systems and show improvement potentials, e.g., regarding possibilities for further modularization, resource usage, as well as realtime behavior. Options for systematic tool support can be selected in this context, and techniques for the self-analysis of performance-reducing factors in embedded systems can be taught.



Processes and Measurement (PAM)

Contact

Dr. Jürgen Münch
 Phone: +49 (0) 631/68 00-13 01
 Fax: +49 (0) 631/68 00-13 99
juergen.muench@iese.fraunhofer.de



Dr. Jürgen Münch

Measured and Approved

Every day, software-intensive systems and services take over more tasks and ensure the comfortable and safe functioning of equipment and machines. In order to develop these systems and services in accordance with their requirements, on time and at an acceptable cost, engineering-style processes are indispensable. This includes establishing efficient development processes and checking their effectiveness, as well as continuous process optimization.

In this context, the empirical approach employed by Fraunhofer IESE is particularly important. It provides measurable evidence of the added value of innovative development processes and enables their adaptation to various business goals and constraints. With the objective of achieving higher product quality, cost savings, and faster time-to-market, Fraunhofer IESE is working on the following main topics, with an orientation towards practical application:

- **Measurement systems and predictability models** bring transparency to IT development, so that potential problems can be recognized early and risks can be minimized.
- **Process management and process evolution** are the basis for the definition, introduction, and continuous optimization of development processes.
- **Process and product assessments** analyze development processes and products with regard to their strengths and improvement potential, or with regard to their conformity to standards. Thus, they provide the basis for solid decisions in software and system development.

Competence in Software and Systems Engineering

The strength of Fraunhofer IESE's software engineering research lies especially in the engineering-style combination of new software engineering methods, respectively such methods that were further developed or adapted upon a customer's request. Thus, the synergies created by the different processes can be optimally used:

- **Goal-oriented measurement:** Custom-tailored measurement systems make it possible to focus on relevant measurement data, on the selection of suitable measurement processes, on minimizing the cost of data elicitation, and on the analysis of data with regard to business, project, and improvement goals.
- **Project control centers:** They provide the stakeholders of a system development project online with measurement data packaged and visualized in a meaningful way, data that, through exact adaptation to the development environment, provide significantly higher performance than conventional project management tools.
- **Domain-specific quality models:** Each software or system development project has specific quality requirements depending on the application domain – custom-tailored quality models take this into account.
- **Process improvement:** Industrial software and system development usually follows defined processes, which can be continually optimized through proven processes in combination with innovative approaches.

- **Descriptive process modeling:** The successful development of software-based systems depends on a development process that is modeled systematically and accurately, and on corresponding flexible process management.
- **Process assessments:** What is good about a development process, what could be improved? Tool-supported assessments answer this question, also in accordance with recognized ISO/IEC standards.

Products and Services

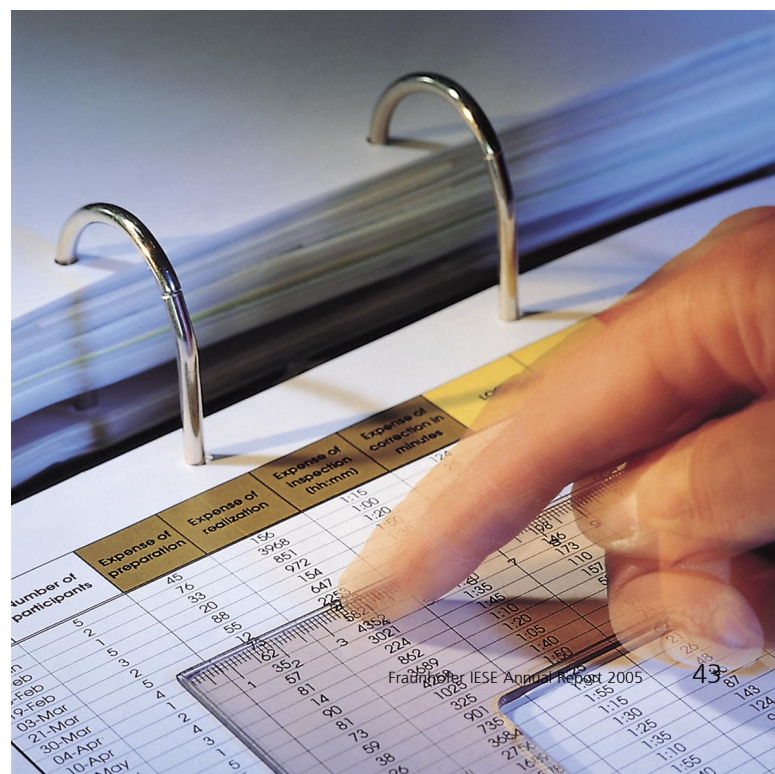
Software and Systems Engineering is one key to gaining a competitive edge in a hard-fought market. Fraunhofer IESE develops and evaluates custom-tailored solutions for optimal software and system development processes that fulfill the highest requirements regarding efficiency, documentability, and conformity to standards, and that can be flexibly adapted to new requirements:

- **Measurement in system development:** Regardless of whether the issue is a measurement system based on the established GQM approaches, benchmarking, or data analysis with the OSR method: Fraunhofer IESE is your competent partner in all matters regarding empirical process monitoring.
- **Quantitative control:** Fraunhofer IESE supports companies of any size in defining and introducing a comprehensive quality assurance strategy for system development, e.g., on the basis of defect flow models or predictability models for process and product characteristics.

- **Effort and cost estimation:** For reliable effort and cost estimation, we offer methods such as the experience- and data-supported CoBRA® method or the Function Point method (e.g., IFPUG or COSMIC-FFP method).
- **Process management and improvement:** Proven development processes constitute important capital for any organization. The Fraunhofer IESE process experts provide support in modeling, defining, analyzing, optimizing, and documenting processes, ensure that process standards are adhered to, and implement continuous improvement programs into a company's practical operations.
- **Process and product assessments:** Before a process or product can be optimized, its current state must be determined as exactly as possible. Fraunhofer IESE performs assessments according to FAME® – the tried and proven Fraunhofer As-

essment Method, and guarantees conformity to standards, e.g., IAW ISO/IEC 15504 (SPiCE). Customer-specific software product assessments and support in implementing CMMI® and Six Sigma are also possible. Systematic product analyses can be performed with the flexible M-System, for instance.

- **Training sessions, workshops and seminars:** The courses offered by Fraunhofer IESE enable decision-makers and practitioners from the area of software and system development to apply measurement processes and process technology on their own. The institute offers one-day or multiple-day events, which can be held either at Fraunhofer IESE or directly at the company site. Topics include, for example, introductory courses or assessor training IAW ISO/IEC 15504, as well as courses on issues such as product metrics, empirical studies, or cost estimation.



Testing and Inspections (TAI)

Contact

Dr. Christopher Robinson-Mallett
 Phone: +49 (0) 631/68 00-22 36
 Fax: +49 (0) 631/68 00-12 99
 christopher.robinson-mallett@iese.fraunhofer.de



Dr. Christopher Robinson-Mallett

Software Quality - a Challenge

Suppliers of high-quality software must permanently prove themselves on the market and continuously face new customer wishes and increasing market pressure: Growing system complexity and shorter innovation cycles along with highest demands on quality and reliability are characteristic of current developments. This requires quality assurance methods with increasing levels of performance and cost efficiency, methods that are optimally tailored to proven and innovative development processes.

Fraunhofer IESE develops such high-performance and cost-efficient solutions for analytical quality assurance for a multitude of application domains, from technical, software-intensive systems to data processing and information systems that fulfill the highest demands. For this purpose, Fraunhofer IESE works on current software technology issues and continually analyzes the state of the art in quality assurance and quality management in the software development domain.

- **Model-based product development** integrates proven, high-performance methods of engineering-style hard- and software development into a cost-efficient overall concept spanning different systems.
- **Product-in-the-loop** can be combined in an ideal manner with model-based product development to create an efficient and flexible software development process.
- **Distributed technical software systems** play an increasingly important role in the development of technical products and call for innovative concepts and strategies for integration.

- **Information systems** are becoming more and more important in everyday life, both in the acquisition of needed information and in business processes and events.
- **Automatic code generation** will find its way into the most critical development areas of software with the increasing use of modern model-based development tools and the availability of cost-efficient, high-performance hardware.
- **Manual analysis and development methods** will continue to remain an economical and powerful means of quality assurance, despite the increasing degree of automation in product development.

Competence in Software and Systems Engineering

Our research and development approaches from the areas of quality management and software technology serve to combine modern methods and specific user knowledge in an engineering style manner, resulting in processes that are suitable for practical usage. This enables savings in costs through the use of synergies resulting from the combination of experience and state-of-the-art research knowledge. Our core competencies allow us to react to customer requirements on short notice and on time:

- **Model-based quality assurance:** Model-based development saves time and money, while software product quality continues to remain high. A powerful, model-based software development process demands an equally powerful, customized quality assurance process.

- **Test automation:** Reusability of test cases and automatic documentation of test runs are prerequisites for a high-performance quality assurance process. The introduction of customized methods and tool chains enables the use and optimization of high-performance testing methods.
- **Planning, adaptation, and improvement of testing and inspection processes:** The introduction of innovative development methods and paradigms is supported by structural adaptations of existing development processes.
- **Reliability modeling:** Based on a powerful software development and quality assurance process, statements on the reliability of a software product and on the defects remaining in it can be derived. This information allows systematic optimization of products and processes.
- **Method introduction and process optimization:** Fraunhofer IESE provides solutions and strategies that are optimally tailored to existing development processes. We assess the actual effects of new methods and technologies on the quality of the end products by means of quantitative and qualitative analyses, and we carefully modify and optimize the existing software development processes.
- **Training sessions and coaching:** Successful development of high-quality software does not only require highly developed quality assurance methods and processes, but also great expertise on the part of the system developers. Fraunhofer IESE offers training sessions, seminars, and workshops on demand and in accordance with current requirements in order to ensure that our customers' level of knowledge is always up to date.
- **Consortium research:** Together with various companies as customers, Fraunhofer IESE develops new software quality assurance concepts, strategies, or methods in pre-competition joint projects. Partners from industry and science contribute their ideas and experiences and jointly benefit from the progressive and powerful solutions.

Products and Services

Fraunhofer IESE offers a comprehensive range of training and support programs for optimizing and introducing testing and inspection processes in an organization:

- **Analysis and strategy development:** In order to work out an efficient testing and inspection strategy for current development projects, Fraunhofer IESE provides support through in-depth analysis of existing practices and processes in concept development as well as through the selection, adaptation, and integration of innovative methods.



Security and Safety (SAS)

Contact

Security

Dr. Reinhard Schwarz
 Phone: +49 (0) 631/68 00-12 04
 Fax: +49 (0) 631/68 00-12 99



Dr. Reinhard Schwarz

Safety

Dr. Bernhard Kaiser
 Phone: +49 (0) 631/68 00-12 03
 Fax: +49 (0) 631/68 00-12 99
 bernhard.kaiser@iese.fraunhofer.de



Dr. Bernhard Kaiser

Risks Come in Many Forms – So Do Safety and Security

In many areas of our lives, software-based systems increase productivity and raise our level of comfort, but they also entail risks, either by failing or malfunctioning in practical operation, or through malicious manipulation by third parties. The more complex the technology used, the more difficult it gets to see all problems emerging in the area of security and safety and to construct systems that prove to be reliable and safe on the one hand (safety), while offering maximum resistance against attacks, intrusion, and manipulation attempts on the other hand (security).

Often, an unreasonably high amount of effort is necessary to stabilize or safeguard finished systems that are unreliable or insecure by construction. The main goal of system development is therefore to take security and safety requirements into consideration in the earliest possible phases of the development process, thus realizing systems with built-in security and safety (“security and safety by construction”). In this context, Fraunhofer IESE is working on the following main topics, with an orientation towards practical application:

- **Security- and safety-related requirements engineering** elicits its system requirements regarding security and safety completely and systematically, respectively analyzes system design quantitatively with respect to whether such requirements are fulfilled.

- **Design and construction patterns** support the system designer in designing reliable and secure software-based systems.
- **Security and Reliability Analyses** evaluate systems from individually determined points of view and requirements.
- **Security and Safety Assessments and Consulting** for system development in conformance to standards, prior to certification, and for optimization of security and safety to be performed by the user on his own.

Competence in Software and Systems Engineering

By combining new software engineering methods, respectively such methods that were further developed upon a customer’s request, in an engineering-style manner, the synergies created by the different processes can be used optimally, such as:

- **Safety from the start:** Analysis and design models, technology assessments, and suitable system architectures ensure (embedded) systems that run smoothly.
- **Provable reliability:** Safety analyses and standard conformity tests to quantitatively determine individual system characteristics or to assess the overall quality of the system.
- **Quality models:** Examination of critical hardware and software systems for relevant security and safety characteristics.

- **Development coaching:** Coaching by experts during all process phases in the development of safety- or security-critical systems, including the possibility for certification.
- **Secure IT network structures and network monitoring:** Design and analysis of secure infrastructures with tool-supported vulnerability recognition.
- **Safety and reliability analyses:** Qualitative and quantitative processes check system designs in accordance with custom-tailored checking criteria: fault trees (component and state event fault trees), FMEA, and other methods are used and supported with tools developed by us or by others. In addition, training on this method is offered.
- **Process and product assessment:** In-depth assessments of development processes and resulting products through experts from the institute provide insight into the security and safety level during system development. In preparation for certification or evaluation regarding conformity to standards, pertinent standards can be considered (e.g., IEC61508, 21 CFR Part 11).
- **Definition of development processes:** Fraunhofer IESE supports organizations in designing development processes for critical systems with special requirements regarding reliability and security against manipulations.
- **Training sessions and workshops:** Decision makers and practitioners in system development learn about security and safety first-hand in special events. As a result, companies are able to address future issues regarding reliability and system security on their own.

Products and Services

In the area of security and safety, as in other areas, software and systems engineering is one key to winning a competitive edge in a hard-fought market. Fraunhofer IESE helps to optimize development processes in multiple ways while improving reliability and security at the same time:

- **Security audits for active network components:** Webservers, routers, firewalls, and operating system configurations must fulfill high requirements especially with regard to security against manipulations. Fraunhofer IESE's tool-supported processes detect even hidden security leaks, which would not be found with a purely manual process, despite high effort.



Experience Management (EM)

Contact

Prof. Dr. Frank Bomarius
 Phone: +49 (0) 631/68 00-12 01
 Fax: +49 (0) 631/68 00-12 99
 frank.bomarius@iese.fraunhofer.de



Prof. Dr. Frank Bomarius

Successful by Experience

Experience – both the good and the bad variety – exists in any organization. Experience is knowledge that has been tried and proven in practice, and that is an indispensable tool in a software and system developer’s daily work. However, it is not sufficient to make an experience and keep it only in your own mind. Knowledge gained from experience must be stored in a suitable form, must be packaged and made available for use by others in order to be really useful. This is where most deficits can be found in a company’s daily operation, since goal-oriented Experience Management (EM) requires careful concepts, a systematic process, and consistent integration into the work processes. With the right processes and tools, it is no problem to support, sometimes even automate the capturing and storing of experience, which is being continuously generated during the workflow anyway. In order to make numerous and possibly very small chunks of experience (“experience packages”) available to human use in an unobtrusive fashion, Fraunhofer IESE is working on the following main topics, with an orientation towards practical application:

- **Reuse of experience** helps to avoid the situation that processes that have already been proven in operation are not used due to ignorance - in other words, that the wheel keeps getting re-invented over and over again. Additionally, this prevents the repetition of known errors.
- **Validation of experience** captures the application context of an experience together with information on how this experience has proven itself in practice. This facilitates its application in a new case.

- **Cataloging and archiving** help to maintain an overview of the multitude of smaller experience packages, thus preventing the “treasure trove of experiences” from becoming a useless heap of information in the end.
- **Business management considerations** ensure that experience management in a company is a worthwhile investment into the future, for instance by focusing on the most relevant core issues and by reducing the costs of capturing experience.

Competence in Software and Systems Engineering

The strength of Fraunhofer IESE’s software engineering research reveals itself especially in the case of experience management systems that are unobtrusively integrated into production:

- **Process and tool integration:** Many practical problems and high effort result from a “side-by-side existence” of system or software development process and experience management. Seamless integration, however, reduces effort, helps maintain the overview, and prevents existing experience from remaining unused. Smart tool support enables necessary experience management steps such as collecting and categorizing experience and making it available in an unobtrusive, yet consistent manner.
- **Scaling and adaptation:** There cannot be one single solution for all application scenarios in experience management, since the requirements of software and system developers on the one hand, and the prerequisites of various development processes for the introduction of methods and tools on the other

hand, vary too much. High-quality approaches are therefore characterized by the ability to first start off with less functionality and then extend it incrementally according to the requirements at hand.

- **Model-based development of EM systems** permits performing the requirements analysis and design of an experience management system in less than one tenth of the time required with conventional methods.
- **Measurement programs:** Experience management has to be integrated into the workflow and must be efficiently maintained in order to remain ready for use at any time. Suitable tools automatically collect the measurement data necessary for optimization during use. Thus, nothing stands in the way of technical, respectively economic, improvement.

– to evaluating and maintaining the implemented solution.

- **Experience-based Information Systems (EbIS):** Beyond its purely methodological competence, Fraunhofer IESE realizes entire experience-based information systems on behalf of its customers. To establish them, the institute's own product line INTERESTS is used, which combines complete scalability with the advantage of individually adaptable user interfaces.
- **EM products for SMEs:** Small and medium-sized enterprises benefit from experience captured and delivered at the right time. With Fraunhofer IESE's EM solution MI-MIR, which is especially tailored to this type of enterprises, a growing knowledge base for a multitude of applications is being created.

- **Knowledge acquisition:** With the help of Fraunhofer IESE's EM experts, gaining experience becomes simpler and more efficient, e.g., through post-mortem analyses for capturing experience from past events. The goal is to automate knowledge acquisition as much as possible.
- **Training sessions and workshops:** In the Knowledge Management seminar, practitioners from industry and service domains learn from Fraunhofer IESE's EM specialists how to recognize, package, and use their company's knowledge.

Products and Services

Software and Systems Engineering is one key to gaining a competitive edge in a hard-fought market. Fraunhofer IESE offers a comprehensive range of support to software and system developers for efficiently establishing EM systems and thus to systematically capture, maintain, and profitably use an organization's own experience:

- **Methodological design of EM systems:** Fraunhofer IESE offers all services for the establishment of strongly workflow-integrated experience management systems. Our services range from making a vision a reality in workshops – by designing knowledge models, developing intelligent features, e.g., for information search or for clustering entries, and determining the architecture



Education and Training (EAT)

Contact

Dr. Patrick Waterson
 Phone: +49 (0) 631/68 00-15 01
 Fax: +49 (0) 631/68 00-15 99
 patrick.waterson@iese.fraunhofer.de



Dr. Patrick Waterson

Competitive through Competence Development

Particularly in highly innovative branches of industry, up-to-date knowledge and competencies are the main factors that have a major influence on competitiveness. Fraunhofer IESE develops, tests, and evaluates needs-oriented and systematic qualification solutions for SE professionals, focusing on approaches that enable timely, flexible, workflow-integrated, and technology-supported learning.

- **Planning, design, and implementation of qualification processes:** Systematic needs analyses, skill profiling, and the analysis of an organization's existing continuing education culture form the basis for the customer-specific design and development of training courses, learning materials, and eContent for network-based learning and education.
- **Evaluation and optimization of qualification processes, programs, and media:** Efficient qualification must be integrated into the respective application context with regard to organizational, individual, and technological issues. Parallel evaluation, technology acceptance studies, and cost-benefit analyses contribute to establishing these firmly in an organization and lead to continuous improvement of the selected programs.

- **Design and development of user documentation:** Software documentation is developed and designed in such a way that, with the help of Single Source Publishing, various types of help systems and learning media for introducing the user to the software described can be efficiently developed.

Competence in Software and Systems Engineering

The strength of Fraunhofer IESE'S applied research lies in the new development, respectively further development, of SE methods and their adaptation and testing in a practical environment. This always centers around the customer's requirements and the problem being faced:

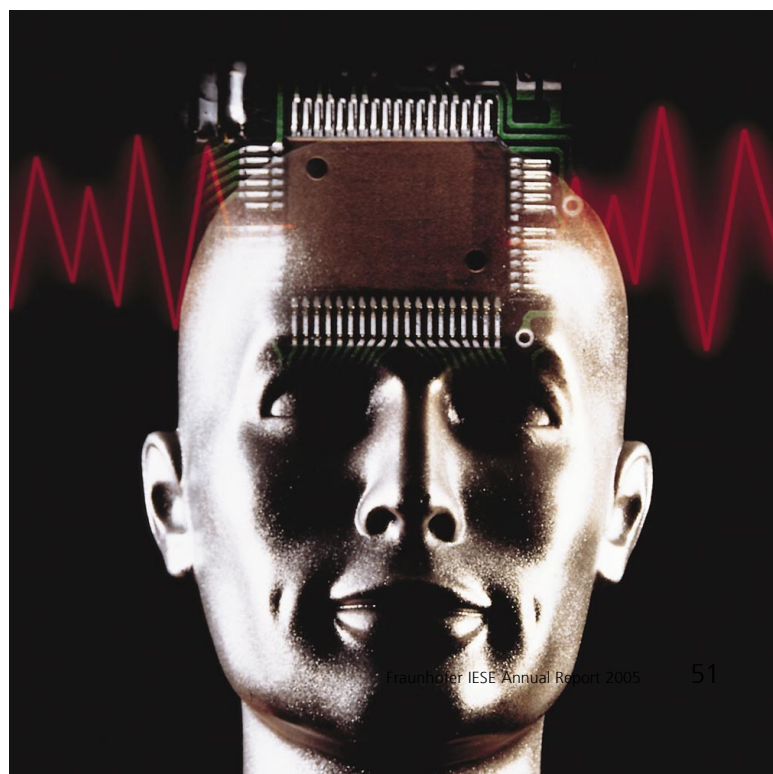
- **Development of courseware and process engineering:** Starting with the requirements analysis and the scoping of the educational needs, qualification programs, (mainly electronic) learning materials, and documentations are designed, implemented, and evaluated in an engineering-style manner. This procedure also makes it possible to analyze and optimize the existing development processes of educational programs, learning software, and documentations.
- **Rapid development:** Systematic re-use of existing materials and media enable the short-term production of high-quality learning systems and user guides without any loss of quality.

- **User support and help systems:** On the basis of structured technologies, multimedial and classical materials for user support and guidance are developed. Help systems and software instructions can be developed via DocBook, DITA or other comparable procedures and settings.
- **Goal-oriented evaluation:** Proven empirical software engineering processes (such as the Goal Question Metric, GQM) are adapted to concrete measurement tasks and provide a quantitative view on the performance of learning systems or help systems, respectively enable systematic improvements regarding the design and execution of qualification processes.
- **Process development and improvement:** Some companies develop their own courseware and documentations. For them, Fraunhofer IESE offers to analyze and improve their development processes via IntView, the integrated development methodology for simultaneous consideration of all dimensions of courseware and documentation development.
- **Support in product selection:** In many cases, sophisticated solutions are already available for specific training or education problems, making expensive new development unnecessary. Fraunhofer IESE systematically compares products available on the market and finds the best learning system for specific task definitions.
- **Software documentation and software training:** Fraunhofer IESE designs, evaluates, and develops all types of software documentation as well as user guidance and training materials, including the configuration of documentation development environments, content development, product testing, and shipping.

Products and Services

Software and Systems Engineering is the key to gaining a competitive edge in a hard-fought market. Fraunhofer IESE develops and evaluates custom-tailored solutions for continuing education and training in the area of software as well as for product support.

- **Development and evaluation of courseware on behalf of customers:** Fraunhofer IESE's range of services includes everything from the elicitation of requirements and needs via the design of educational programs to content generation and evaluation.





Business Areas

Automotive and Transportation Systems	54
Telekommunikation, Telematics and Service Providers	56
Medical Systems	58
Information Systems and Public Sector	60

Automotive and Transportation Systems

Contact

Ralf Kalmar
 Phone: +49 (0) 631/68 00-16 03
 Fax: +49 (0) 631/68 00-16 99
 ralf.kalmar@iese.fraunhofer.de



Ralf Kalmar

Software Technology for a World in Motion

Fraunhofer IESE currently has four business areas specializing in the application and wide-spread dissemination of the technologies developed in the research departments. They make the institute's entire range of research accessible to the various branches of industry and application domains.

Far more than 90% of all microprocessors produced are not installed in "visible" personal computers or servers, but are rather hidden ("embedded") inside those numerous computer-controlled appliances that surround us in our daily lives. The business area "Automotive and Transportation Systems" is especially aimed at the manufacturers and users of embedded systems, primarily in the application domains of automotive and rail technology as well as aerospace. Due to increasing complexity, functional variety, and networking, these domains are faced with growing challenges. The same is true for the manufacturers of industrial

machines and electronic equipment for private and commercial use, for whom integrated computer controls are indispensable.

The requirements on the embedded systems in their multitude of uses are numerous and often hard to reconcile. On the one hand, the systems are supposed to get smaller and cheaper all the time; on the other hand, however, they are supposed to be able to perform a multitude of functions as reliably as possible. This frequently results in complex networks of single systems (a middle-class vehicle, for example, already contains more than 100 electronic controls today), which should be operated reliably and maintained without any problems.

The way of how development is done has also changed: As in other engineering disciplines, complex plants are rarely designed and built by one manufacturer. Buying and subcontracting partial systems, however, leads to new procedural aspects that must be taken into consideration.



Competence in Software and Systems Engineering

Fraunhofer IESE supports the manufacturers and users, resp. integrators, of embedded systems for automotive and transportation systems in all phases of software and system development. Consistent and efficient processes characterize our institute's work, which transfers the scientific results of modern research into a company's practical operations:

- **Process assessments and improvement programs based on measurement data** enable optimization steps in development processes on the basis of empirical findings. Thus, even such aspects as the efficiency and acceptance of methods - which is normally hard to quantify - can be captured and evaluated objectively.
- **Software Product Lines** help to increase product variety while saving resources through consistent reuse at the same time, and rationalize development processes while maintaining constant quality.
- **Requirements and Usability Engineering** ensures that a system demonstrably fulfills a predetermined performance claim of all non-functional properties and is easy to use.

- **Continuous testing procedures and systematic inspections** integrate the mandatory quality assurance into the running development process. There are significant cost benefits compared to performing quality assurance at the end of system development, due to early elimination of defects and optimized processes.
- **Subcontractor Management** minimizes risks when buying and integrating external components (COTS – Commercial-off-the-Shelf).
- **System analyses and architecture assessments** guarantee solid and long-lived systems that resist manipulation.
- **Expert reports and technology evaluation** confirm process and system quality in accordance with international standards and help to realize innovative product ideas.

Products and Services

Software and Systems Engineering is the key to gaining a competitive edge in a hard-fought market. Fraunhofer IESE helps to optimize development processes, increase product variety, and assure quality at the same time:

- With **PuLSE® – Product Line Software Engineering**, our customers get brand quality when it comes to designing product lines. Lower costs per unit through greatly reduced development effort quickly pay off when compared to single system development.
- Systematic checks during the course of assessments have a solid engineering-style basis with **FAME®, the Fraunhofer Assessment Method**. These checks exactly show an organization's improvement potential based on empirical data obtained from its running operation.
- **Measurement systems** have so far merely provided the capability of quantitatively measuring abstract product and process properties that can be estimated, such as "maintainability" or "reliability". Comparable measurements open up far-reaching improvement and adaptation measures, whose effects can again be determined precisely – elaborate "trial and error" processes can be omitted in favor of exact mathematical methods.

Telekommunikation, Telematics and Service Providers

Contact

Dr. Volker Hübsch
 Phone: +49 (0) 631/68 00-16 02
 Fax: +49 (0) 631/68 00-16 99
 volker.huebsch@iese.fraunhofer.de



Dr. Volker Hübsch

Confidence in Critical Systems

Fraunhofer IESE currently has four business areas specializing in the application and wide-spread dissemination of the technologies developed in the research departments. They make the institute's entire range of research accessible to the various branches of industry and application domains.

For the fast and especially smooth flow of modern production and business processes, error-free information processing is of particular importance. Software and the IT infrastructure systems must function correctly under all circumstances, especially since all domains increasingly depend on information and communications technology. The application domains telecommunication, telematics and service providers thus require system environments that are not only highly scalable, available, maintainable, and flexible, but also particularly secure and reliable.

If minor malfunctions can already have major effects, and if the systems to be designed are very complex, then only an engineering-style, systematic development method will do. The risk of major financial losses is too great if, for example, telephone or energy networks

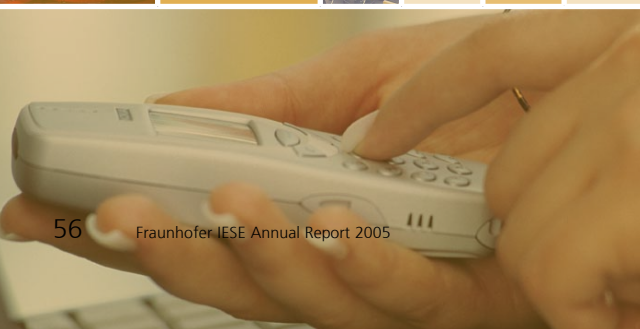
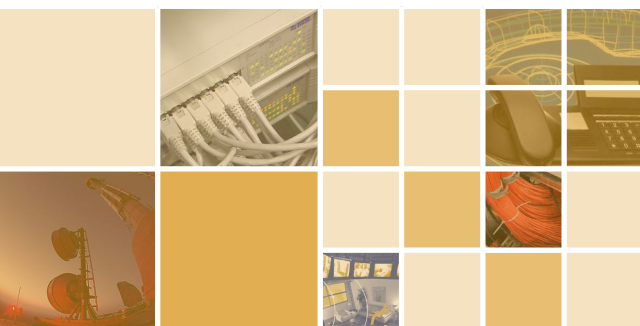
suddenly break down, or if service providers cannot offer their services temporarily due to a data network failure.

Competence in Software and Systems Engineering

Fraunhofer IESE supports the suppliers and sellers of components and equipment in the area of telecommunication and telematics for various application areas in all phases of software and system development. We also support service providers in the design, safeguarding, and implementation of their infrastructure services in the area of information and communications technology.

Our special focus is on security to prevent the potential manipulation of data networks and services, since maximum protection against attacks plays a central role for our customers from those application domains.

Consistent and efficient processes characterize our institute's work, which transfers the scientific results of modern research into a company's practical operations:



- **Security audits and tools for vulnerability analyses** uncover potential security problems in software and software-based systems during the development process already. The concept of “Security by Construction” offers more protection with lower costs than the later safeguarding of existing systems.
- **Process assessments and measurement-based improvement programs** enable optimization steps in development processes on the basis of empirical findings. Thus, even such aspects as the efficiency and acceptance of methods - which are normally hard to quantify - can be captured and evaluated objectively.
- **Software Product Lines** help to increase product variety while saving resources through consistent reuse at the same time, and rationalize development processes while maintaining constant quality.
- **Requirements and Usability Engineering** ensures that a system demonstrably fulfills a predetermined performance claim of all non-functional properties and is easy to use.
- **Systematic experience management** makes proven and tested knowledge - an indispensable tool - available for the daily work of software and system developers.
- **Continuous testing procedures and systematic inspections** integrate the mandatory quality assurance into the running development process. There are significant cost benefits compared to performing quality assurance at the end of system development, due to early elimination of defects and optimized processes.

Products and Services

Software and Systems Engineering is the key to gaining a competitive edge in a hard-fought market. Fraunhofer IESE helps to optimize development processes, increase product variety, and assure quality at the same time:

- In modern production environments, security audits for active network components such as web-servers, routers, firewalls, and operating system configurations must fulfill high requirements especially with regard to security against manipulations. Fraunhofer IESE’s tool-supported processes, for example **CROCODILE®**, the **Cisco Router Configuration Diligent Evaluator**, detect even hidden security leaks, which would not be found with a purely manual process, despite high effort.

- Systematic checks during the course of assessments have a solid engineering-style basis with **FAME®**, the **Fraunhofer Assessment Method**. These checks exactly show an organization’s improvement potential based on empirical data obtained from its running operation.
- With **PuLSE® – Product Line Software Engineering**, our customers get brand quality when it comes to designing product lines. Lower costs per unit through greatly reduced development effort quickly pay off when compared to single system development, and time-to-market is shorter for new product variants.
- Requirements Engineering made simple with **USPIRE - Usable Software Products Based on Innovative Requirements Engineering**. This process integrates the demands and organizational goals of industrial customers with the lowest possible effort. The user-focused procedure results in high usability and wide acceptance of the developed systems and thus guarantees highest customer satisfaction.

Medical Systems

Contact

Christian Denger
 Telefon: +49 (0) 631/68 00-21 96
 Fax: +49 (0) 631/68 00-16 99
 christian.denger@iese.fraunhofer.de



Christian Denger

Software-based Systems for Health and Quality of Life

The usage of information and communications technologies in the field of medicine has revolutionized the possibilities for diagnosis and therapy and has opened up completely new ways of preventing and treating serious illnesses. Computer-controlled robots operate under the most difficult conditions with a maximum of precision, which a human surgeon could never achieve. Numerous embedded systems in treatment and monitoring equipment control and monitor various medical parameters, provide warnings in critical situations, and initiate countermeasures. Computer-supported imaging processes in X-ray and radiation diagnosis surpass all approaches used to date with regard to precision and processing speed, and permit real-time processing in areas where long waiting times used to be common.

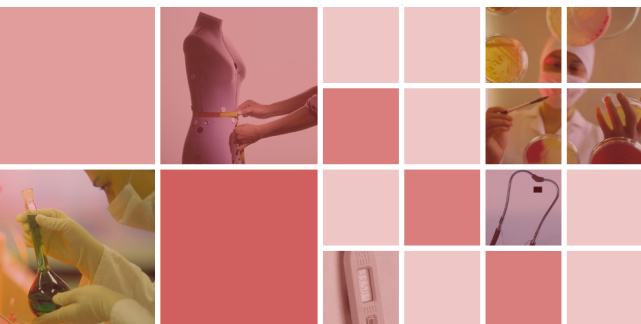
Software-based medical systems make it possible to make a diagnosis earlier and more precisely than ever before. Therapeutic measures are easier to plan and put less strain on the patient – provided that the computers that are used and the necessary software work with absolute correctness and reliability. There exists hardly any other

area of our daily lives where computer technology is so close to humans, and consequently, mistakes can have very serious effects. Even the tiniest shortcomings, which would be no more than irritating in an office application, can have fatal consequences in medical systems – including such consequences as far-reaching liability issues and loss of confidence into an otherwise very promising technology.

Competence in Software and Systems Engineering

Fraunhofer IESE provides support to manufacturers of software-based systems in the area of medical systems in all phases of system development, and supports suppliers and subcontractors in planning, building, and checking highly reliable components for medical equipment and institutions.

We give special attention to the reliability and accuracy of diagnostic and therapy systems, since in each single case, human lives may depend on their correct functioning. Usability also means an increase in safety, since it minimizes the risk of maloperation. Last but not least, there is strong competition on the medical systems market, where only companies with economical development and manufacturing methods will survive.



Consistent and economical processes characterize the work of our institute, which transfers state-of-the-art findings into a company's practical operations:

- **Safety quality models** permit checking critical hardware and software systems for relevant safety characteristics.
- **Development support**, e.g., in the form of coaching by experts in all process phases during the development of safety-critical systems guarantees that state-of-the-art development methods are used, including the possibility of certification.
- **Requirements and Usability-Engineering** creates the basis for a system to demonstrably fulfill a predetermined performance claim of all non-functional properties and to be efficient and easy to use.
- **Continuous testing procedures and systematic inspections** integrate the mandatory quality assurance into the running development process. There are significant cost benefits compared to performing quality assurance at the end of system development, due to early elimination of defects and optimized processes.
- **Process assessments and measurement-based improvement programs** enable optimization steps in development processes on the basis of empirical findings. Thus, even such aspects as the efficiency

and acceptance of methods – which are normally hard to quantify – can be captured and evaluated objectively.

- **Software Product Lines** help to increase product variety while saving resources through consistent reuse at the same time, and rationalize development processes while maintaining constant quality.
- **Subcontractor management** minimizes risks when buying and integrating external components (COTS – Commercial-off-the-Shelf).

Products and Services

Software and Systems Engineering is the key to gaining a competitive edge in a hard-fought market. Fraunhofer IESE helps suppliers and developers of medical systems to design and manufacture high-performance, safe units economically:

- **Safety and reliability analyses:** Qualitative and quantitative processes check system designs in accordance with custom-tailored checking criteria: fault trees (component and state event fault trees), FMEA, and other methods are used and supported with tools.
- Systematic checks of the development processes during the course of assessments have a solid engineer-

ing-style basis with **FAME®**, the **Fraunhofer Assessment Method**. These checks exactly show an organization's improvement potential based on empirical data obtained from its running operation.

- Detailed assessments of development processes and resulting products by experts of the institute performed in the course of a **Process and Product Evaluation** give an insight into the level of safety and security achieved by the system development. In preparation of **certification**, which is particularly vital in the medical field for approval reasons, or for standard conformity evaluations, pertinent standards can be taken into account.
- With **PuLSE® – Product Line Software Engineering**, our customers get brand quality when it comes to designing product lines and benefit from lower costs per unit and faster time-to-market of new products.
- Requirements Engineering made simple with **USPIRE - Usable Software Products Based on Innovative Requirements Engineering**. This user-centered process integrates the demands and organizational goals of industrial customers with the lowest possible effort.

Information Systems and Public Sector

Contact

Information Systems

Michael Ochs
 Phone: +49 (0) 631/68 00-16 04
 Fax: +49 (0) 631/68 00-16 99
 michael.ochs@iese.fraunhofer.de



Michael Ochs

Public Sector

Petra Steffens
 Phone: +49 (0) 631/68 00-21 60
 Fax: +49 (0) 631/68 00-15 99
 petra.steffens@iese.fraunhofer.de



Petra Steffens

Business and Administration in the Age of Information

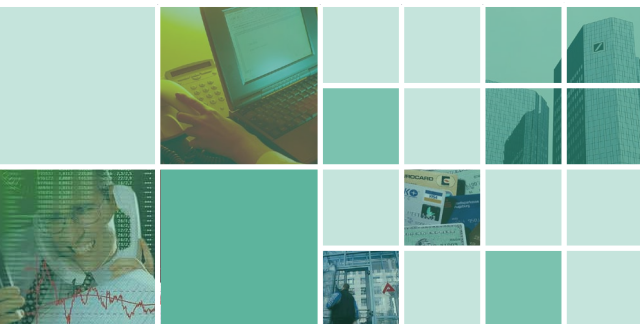
Information systems permeate our daily lives in various ways. Especially in the area of eCommerce and eBusiness, online shops, auction platforms, and banking resp. stock exchange systems, and especially company-internal information systems such as ERP and CRM, perform millions of transactions every day. Operators as well as users hardly take notice of the technology of these highly complex software-based systems and their multitude of interactions, and yet, modern business life is simply unthinkable without functional, secure, and user-friendly software running in the background. In parallel to the expansion of eBusiness, Public Sector institutions and their development partners are also in the process of optimizing the efficiency and quality of administrative processes and services through the use of modern information and communication technology.

As long as information systems or eGovernment solutions are functioning smoothly, their benefit is undeniable. However, if minor malfunctions can already cause major effects, and if the systems to be designed are very complex, then the only option is an engineering-style method. Otherwise,

the risk of major financial losses, incalculable legal consequences, or long-term loss of trust or image is just too great – for example, if bank transfers are wrongly routed, or if electronically processed tax forms end up in the wrong hands.

Competence in Software and Systems Engineering

Fraunhofer IESE supports organizations that develop, maintain, and use company information systems in the design, implementation, quality assurance, and introduction phases, with the goal of increasing the cost efficiency of the development processes of these information systems as well as that of the business processes that are automated by them. Other major goals of Fraunhofer IESE include the achievement of improved software and service quality as well as faster time to market. The range of our customers in this area extends from banks and insurance companies to organizations offering web-based services or ERP systems. Last, but not least, Fraunhofer IESE is a competent partner of the Public Sector when it comes to the incremental transition from conventional administrative processes and services to modern, user-defined eGovernment processes.



Our special emphasis is on fulfilling the high demands on quality, regarding, for example, safety and security, usability, reliability, and maintainability, which characterize the software-based systems in the application domains mentioned above.

Consistent and efficient processes are characteristic of our institute's work, which transfers state-of-the-art, valid scientific findings into a company's practical operations in combination with Best Practices:

- **Process assessments and improvement programs based on measurement data** enable optimization steps in development processes on the basis of empirical findings. Thus, even such aspects as the efficiency and acceptance of methods - which are normally hard to quantify - can be captured and evaluated objectively and transparently.
- **Software Product Lines** help to increase product variety while saving resources through consistent reuse at the same time, and rationalize development processes while maintaining constant quality.
- **Requirements and Usability Engineering** ensures that a system demonstrably fulfills a predetermined performance profile of all non-functional properties and is easy to use.
- **Continuous testing procedures and systematic inspections** integrate the mandatory quality assurance into the running development process. There are significant cost benefits compared to performing quality assurance at the end of system development, due to early elimination of defects and optimized processes.

- **Management of third-party software procurement**, which can be provided either via development through subcontractors or through Commercial-off-the-Shelf products. Both ways entail risks – we minimize these risks inherent in purchasing and subcontracting along the respective process chain.

Products and Services

Software and Systems Engineering is one key to gaining a competitive edge in a hard-fought market. Fraunhofer IESE helps to establish information systems in all areas of industry and business and develops efficient solutions in the area of electronic business for public institutions:

- Fraunhofer IESE's tool-supported processes for checking active network components, for example **CROCODILE®**, the **Cisco Router Configuration Diligent Evaluator**, detect even hidden security leaks, which would not be found with a purely manual process, despite high effort.
- Systematic checks during the course of assessments have a solid engineering-style basis with **FAME®**, the **Fraunhofer Assessment Method**. These checks exactly show an organization's improvement potential based on empirical data obtained from its running operation.
- With **PuLSE® – Product Line Software Engineering**, our customers get brand quality when it comes to designing product lines and profit from lower costs per unit and faster time to market for new products.

- Requirements Engineering made simple with **USPIRE - Usable Software Products Based on Innovative Requirements Engineering**. This user-focused process integrates the demands and organizational goals of industrial customers with the lowest possible effort.
- **Blended Learning** teaches software and system development decision-makers and practitioners everything about topics such as the *Unified Modeling Language* in online and face-to-face courses accompanied by coaching in concrete projects. Here, first-hand know-how serves to build the foundation for a company's ability to develop its own systems in an engineering-style manner.



Infotainment Systems in Automobiles – Product Line Technology at Blaupunkt GmbH	64
Blended Learning for the Introduction of Object-oriented Development Methods at Robert Bosch GmbH	66
ESSaRel – Embedded Systems Safety and Reliability Analyser	69
Software-based Products and Services for the Virtual Office of the Future	71
Function Point-based Effort Estimation for Software Development in the Public Sector	74
CBTesten – Component-based Testing	77
Customized Software Quality – Definition of Efficient Quality Strategies	80

Infotainment Systems in Automobiles – Product Line Technology at Blaupunkt GmbH

Contact

Dr. Dirk Muthig
 Phone: +49 (0) 631/68 00-13 02
 Fax: +49 (0) 631/68 00-13 99
 dirk.muthig@iese.fraunhofer.de



Dr. Dirk Muthig

Situation

Infotainment systems of modern vehicles are subject to heavy cost pressure and strong competition; at the same time, the extent of their functionalities and the ensuing complexity continue to increase all the time. Individual products for every type of vehicle are taken for granted. In order to survive successfully in this kind of environment, it is necessary to drastically reduce effort, complexity, and thus a product's development costs through systematic reuse.

Project Topic

Product line approaches are generally a good idea in this situation. However, designing a product line approach that is useful in practical application and developing efficient strategies to disseminate it on a large scale constitute a major challenge for any organization. Blaupunkt GmbH has therefore turned to Fraunhofer IESE for the definition of a product line methodology that would be suitable in their context.

Results and Outlook

The Fraunhofer PuLSE® approach, which was developed by Fraunhofer IESE and has been tried and proven in practice for several years, served as the basis. It was designed from the start to be customizable. The strategy consisted of using individual product line practices across several pilot projects, i.e., to fit them into the specific project situation of Blaupunkt GmbH, and to test them in practice. After they had been tested successfully, the different processes were documented, i.e., processes were captured in the form of an electronic process handbook and were made available on the company's internal Intranet. In order to ensure wide applicability of the practices documented in this manner, a product line community was initiated, which enables the exchange of experience between pilot projects. The individual practices were then integrated into a product line maturity model via the Fraunhofer PuLSE® framework. This allows single units to individually derive a reasonable migration plan.

A product line group at Blaupunkt GmbH now guides and monitors the organization-wide implementation process in accordance with business aspects.

System development with top modern tools:
 The Travelpilot product line offers different types of system configurations to fulfill many kinds of demands. Its variants cover available functions, ease of use, visual packaging, and interfaces to a vehicle's other systems.
 (Photo: Bosch)



**Multimedia mobility:**

In overland buses, passengers can now get news or watch movies at any time. For this, Blaupunkt has extended its specially designed product program with liquid crystal monitors – fed by modern infotainment systems. Complex software and powerful hardware permit this multitude of functions in the smallest spaces, even on the road. (Photo: Bosch)

Blended Learning for the Introduction of Object-oriented Development Methods at Robert Bosch GmbH

Contact

Christian Peper
 Phone: +49 (0) 631/68 00-22 19
 Fax: +49 (0) 631/68 00-14 99
christian.peper@iese.fraunhofer.de



Christian Peper

Ines Grütznert
 Phone: +49 (0) 631/68 00-21 53
 Fax: +49 (0) 631/68 00-15 99
ines.gruetzner@iese.fraunhofer.de



Ines Grütznert

Situation

Software developing companies do not only need to develop increasingly complex software systems in less and less time, but also need to introduce new technologies and use those efficiently in projects.

One current example of such technological innovation are object-oriented, component- and model-based approaches, which by now play an important role in many areas of software development.

Project Topic

During the past few years, Robert Bosch GmbH has changed system development to object-oriented processes in some of its departments. In parallel to this changeover, Fraunhofer IESE was asked to design and implement a company-internal continuing education

program for software developers on the use of object-oriented development methodologies in a tool-supported environment. The primary goal was the transfer of methodological knowledge into the employees' daily project work.

Results and Outlook

The resulting continuing education program has already been performed several times at Robert Bosch GmbH. The Blended Learning approach used therein, that is, the combination of online and onsite training, was accepted very well by the participants. The training phase was followed by a coaching phase to support the transfer. Here, the employees received support in applying the newly gained skills in ongoing projects. Some of the employees have become in-house experts by now, who act as multipliers in transferring their knowledge to their colleagues.



Background

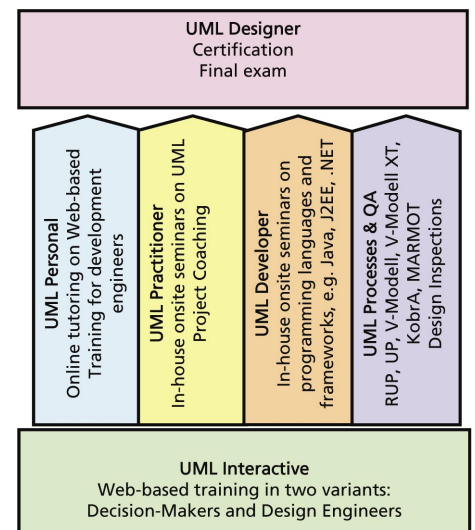
As a supplier of the automotive industry, Robert Bosch GmbH in Stuttgart develops and manufactures control equipment for transmissions with embedded systems. Until a few years ago, the operation of these machine components was still fully mechanical, whereas nowadays they contain entire computers and owe their functionality mostly to sophisticated software. In order to reduce development effort for this software, Robert Bosch GmbH has changed their software development to an object-oriented method, which also integrates component-based modeling via the Unified Modeling Language (UML). One critical factor in this changeover was and is comprehensive training of the employees in how to use the UML and how to develop software according to the new method.

The task of Fraunhofer IESE in this scenario consisted of developing a continuing education concept that would enable the employees affected by the change to efficiently acquire the desired knowledge and skills. The crucial factor for the success and sustainability of the program was the transfer of the newly acquired competencies into daily project work.

The basis for the concept, which was defined according to the constraints provided by Robert Bosch GmbH, was the building kit “Object-oriented Software Development with UML”, which had been developed in the project “Fraunhofer Knowledge and Learning Network (FKN)”.

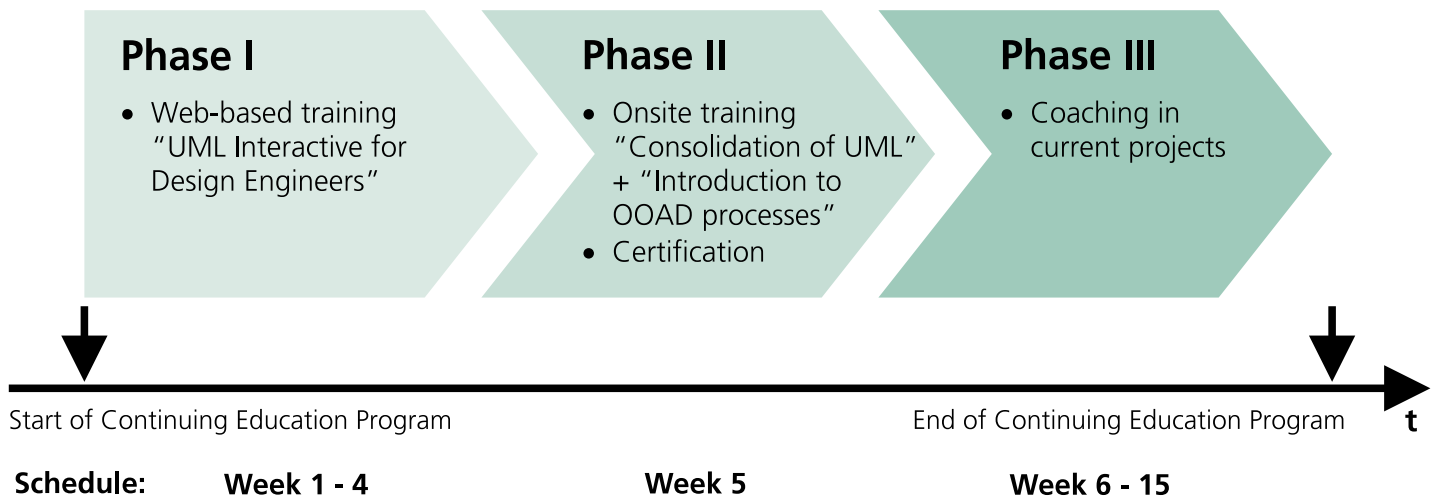
By adapting the elements of the building kit, the continuing education program was matched optimally to the educational needs that had been identified beforehand.

The program started with an online phase in which the participants could work independently with the web-based training “UML Interactive for Design Engineers”. After this preparation phase, whose objective was to even out the employees’ various levels of prior knowledge, only a brief consolidation of the knowledge about UML was necessary during the first part of the subsequent onsite phase. During the second part of the onsite phase, knowledge and skills regarding object-oriented software development and component-based modeling of software for embedded systems were taught systematically.



Modular learning system:

The building kit “Object-oriented Software Development with UML” enables flexible matching of training programs with the actual need for continuing education. The concept of Blended Learning plays a central role.



Training on the Job:
The chart shows the course of the continuing education program at Robert Bosch GmbH.

In order to facilitate the transfer into daily work, the exercises were designed on the basis of real documents from projects of Robert Bosch GmbH.

The onsite phase concluded with a one-day certification, where the participants had to solve a complex task from their area of work in teams of two persons each.

The onsite phase was followed by several weeks of coaching, during which the employees received support on site in transferring and applying the new skills in their daily work.

Feedback from the participants in the program evaluation, which took place simultaneously, was very positive. The combination of online and onsite training and the proximity of the exercises to their real work, in particular, received excellent marks. The coaching was also accepted very well. Some of the employees have turned into in-house experts by now, and are able to transfer their knowledge within the company while maintaining contact with their coach.

ESSaRel – Embedded Systems Safety and Reliability Analyser

Contact

Dr. Bernhard Kaiser
 Phone: +49 (0) 631/68 00-14 03
 Fax: +49 (0) 631/68 00-12 99
 bernhard.kaiser@iese.fraunhofer.de



Dr. Bernhard Kaiser

Situation

Nowadays, hardly any technical system can do without embedded micro-processors with their corresponding software. Some modern vehicles alone contain over 80 microprocessors; the situation is similar in other application domains such as aviation, industrial automation, or medical systems. The selection of the examples illustrates that one of the major quality characteristics of these systems is safety. Since the constructive and analytical technologies for making software-controlled systems really safe are not yet being mastered in a satisfactory manner, the department Security and Safety at Fraunhofer IESE is developing appropriate methods and tools. One central result is the analysis tool ESSaRel and the modeling techniques implemented in it.

Project Topic

Safety analyses of technical systems are all about finding possible risks caused by the system as well as about the quantitative assessment of such risks, i.e., about assessing the probability of accidents. Proven techniques exist for this, such as fault tree technology or the Markov analysis. However, these

were developed during a time when technical systems were still operating in a purely mechanical or electrical fashion, with very limited opportunities for possible malfunctions. In the case of software-controlled systems, the types of defects that may lead to safety-critical events are more varied. The sequence of events, for example, also plays a crucial role. In addition, it should be possible to integrate safety models with typical software development models such as statecharts.

Results and Outlook

Fraunhofer IESE develops safety and reliability models that are based on established standards, but that better map the particular patterns of behavior of software-controlled systems and that can be integrated into the software development process. Component fault trees and state/event fault trees offer compositional and expressive visual descriptions of technical systems and their safety-critical malfunctions. The models allow probabilistic analyses as required in the certification process for safety-critical systems. The tool ESSaRel (Embedded Systems Safety and Reliability Analyser) combines the techniques developed here with various traditional

Energy for everyone:

Reliable supply networks depend on the safety of the computer systems that control and monitor them. Even seemingly minor defects in the software can have far reaching consequences.



techniques in a comfortable interface and offers seamless integration of the various model types.

Background

ESSaRel is a tool developed with the support of Siemens AG Corporate Technology for the generation and analysis of component fault trees, state/event fault trees, Markov chains, and statecharts. It is intended to be applied in an industrial context and offers a comfortable Windows interface with practical and intuitive functions for rapid input and easy administration, even of large analysis projects. It supports structuring of projects according to the component principle as well as reuse of components in future projects. It provides a quantitative analysis of the failure rates or non-availability rates with different algorithms. Siemens AG has successfully used the product in projects from the area of transportation technology and energy generation, and has realized significant simplifications compared to the tool used before. More than 50 interested organizations have already registered for the free evaluation of ESSaRel.

Development began in 2002 at the University of Potsdam and later continued at Fraunhofer IESE. Only state-of-the-art software development technologies were used, since high product quality is indispensable in the context of a safety analysis. The first development phase under the name UWG3 (German for "Ursache-Wirkungs-Graph", i.e., "cause-effect graph") has reached maturity and has been in practical use since 2003. The successor version under the product name ESSaRel is at the prototype stage and is currently being evaluated in industrial environments. Since ESSaRel is an integrative and configurable tool, it can be used industrially as a validation platform for novel types of models on the one hand, and with tried and proven types of models on the other hand.

In connection with the tool, Fraunhofer IESE continues to further develop the safety and analysis techniques adapted to software. Since mathematical models of this complexity cannot be mastered manually, the tool is an integral part of research work and forms the prerequisite for transferring the scientific results into industrial practice.

Software-based Products and Services for the Virtual Office of the Future

Kontakt

Dr. Dirk Muthig
 Phone: +49 (0) 631/68 00-13 02
 Fax: +49 (0) 631/68 00-13 99
 dirk.muthig@iese.fraunhofer.de



Dr. Dirk Muthig

Cooperation Partners

Ricoh Co., Ltd. (Japan), German Research Center for Artificial Intelligence (DFKI) and others

Situation

The future will fundamentally change our offices. Office systems will then no longer need to be activated by people, but will react independently based on situations they recognize on their own. "Ambient Applications" is the name for such applications, which are characterized by context-sensitive, proactive actions and dynamic system configuration. During the past few years, scenarios that benefit from the idea of "Ambience" have been developed in many application areas. One of these is the "Virtual Office of the Future", where different types of end-user equipment act on their own – either based on the identification of certain persons, on messages from other types of equipment, or dependant on higher-level business workflows.

Project Topic

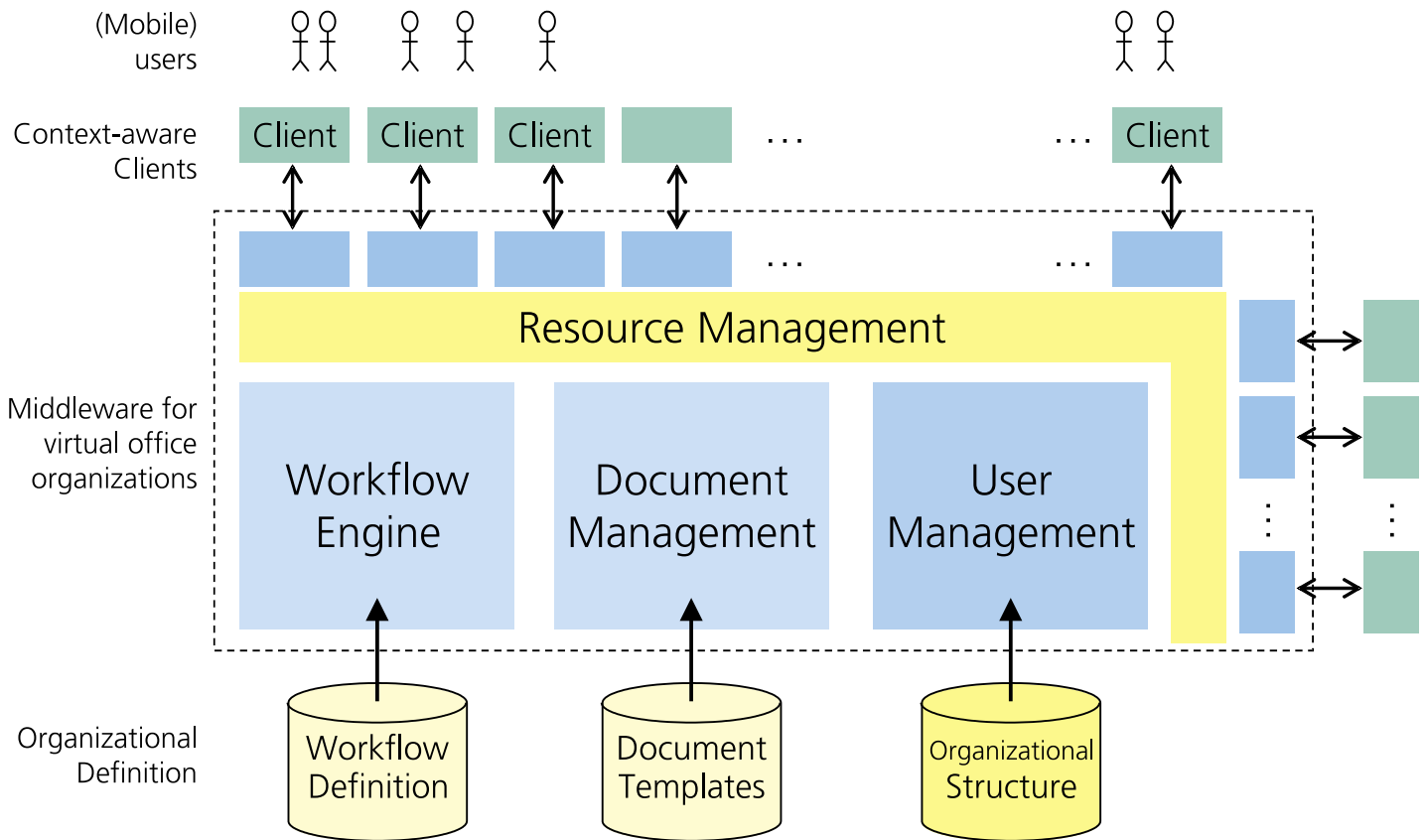
The market for such "intelligent" office applications, which also include eGovernment applications, is expected to experience major growth in the mid-term. In the competence center "Virtual Office of the Future", which is being funded by the state of Rhineland-Palatinate, the Fraunhofer Institute for Experimental Software Engineering (IESE) together with the German Research Center for Artificial Intelligence (DFKI) is building up basic

research competencies to demonstrate the visions of a virtual office, and is developing future software-based products and services for this domain in collaboration with industrial partners.

Results and Outlook

In the context of this project, comprehensive competence is being built up in the area of flexible software architectures, which will be crucial for the efficient technical realization of future office environments. In addition, research needs to be done regarding the (semi-)automated support of an organization's workflows and processes. This is the prerequisite for supplying office end-user equipment with the relevant context information needed to provide proactive and "intelligent" support to the users.

The crucial difference of a virtual office of the future to existing applications will then be the fact that – in addition to efficient and maximal adaptability of all system components and office equipment – the office infrastructure knows about ongoing workflows and therefore offers services in a context-sensitive way, services that enable sensible connections with parallel or subsequent workflows. A simple example: a telephone would "think ahead" by interpreting the meaning of its speed dialing buttons in relation to stored schedules. Depending on whether a colleague is in his office, in one of the conference rooms, at home, or on the road, the phone would always dial the appropriate number.



Optimally interconnected:
Reference architecture for future applications in the virtual office of the future

For implementing the vision of optimally adapted, intelligent office infrastructures, it is important to have a reference architecture that fulfills all the requirements of future office infrastructures and systems, while offering enough flexibility to adapt to the individual demands of different office organizations.

This initially resulted in a generic solution for realizing a product line of office environments. The defined reference architecture is also a benchmark for all companies who want to develop, install, and operate future office infrastructures in collaboration with other

companies. It defines constraints and business models for various roles – regardless of whether these are office organizations (i.e., end customers), small and large suppliers (i.e., partners who supply individual system components), system integrators, maintenance companies, or other service providers.

The tight interconnection of workflows with the office infrastructure requires all systems involved to possess high quality and reliability. Therefore, the reference architecture also inherently includes a generic quality strategy, which defines appropriate quality assurance measures.

Background

The competence center “Virtual Office of the Future” (VoF) aims at providing comprehensive solutions for the development, maintenance, and operation of future office infrastructures and related, fully integrated applications. In 2005, the build-up phase was completed successfully. In addition to several industrial collaborations, the work schedule focused on three issues: the development of a reference architecture for future office applications, the definition of partner roles and business models, and the development of a prototype.

The development of the reference architecture had already started in 2004. Building on this, the final architecture could now be derived as a reference for future office applications. It presents the major components of a future office application and is particularly flexible in order to be adaptable to different real-life environments. It thus serves as an integration basis for components that will be offered in the future by partners of the competence center VoF. The requirements specified for the various components were already mapped to real products in cooperation with industrial partners. They have been implemented in practice and thus been validated.

In order to support the use of the reference architecture by the partners, a complementary methodology for its instantiation was developed on the basis of customer-specific requirements regarding a concrete office application. The appropriate components of the reference architecture that are needed in a specific case are selected

together with the end equipment that is required in principle. Then the products that correspond to these components can be ordered from third-party suppliers. This step is supported to a large extent by the high flexibility of the reference architecture. The result is an application-specific architecture, which is refined component by component in the subsequent design phase. The design phase is then followed by implementation, integration, and testing of the finished office application. Of course, it is important for industrial partners to introduce and offer innovative elements. The methodology has been extended to allow this: Processes for identifying new requirements via creativity techniques, for eliciting and documenting them, and for offering holistic management are now available and have been proven in practice.

The practical implementation of the innovative, complex systems can only be realized if specialized partners collaborate. Therefore, the requirements regarding these partners were documented in the form of role descriptions: Comparable to the business models established in the automotive industry, the context of future office applications also knows the role of the system integrator (OEM) and the role of the suppliers, to name but a few.

Evaluation and demonstration of the results obtained so far from the competence center are being performed in the case study “Virtual Printer” in cooperation with the World Cup office of the city of Kaiserslautern, the University of Kaiserslautern, and the industrial partner Ricoh Co., Ltd. The virtual printer enables the users of mobile computers to print documents on paper within

the city limits of Kaiserslautern without knowing the location of the nearest printer. Using an intelligent infrastructure, each printing job sent to the virtual printer is automatically diverted to the printer that is located closest to the customer.

After the end of the build-up phase in 2005, this year will see innovative application scenarios being developed, and methodological support for efficient development and maintenance activities for office environments will be made available.

Function Point-based Effort Estimation for Software Development in the Public Sector

Contact

Petra Steffens
Phone: +49 (0) 631/68 00 - 21 60
Fax: +49 (0) 631/68 00 - 15 99
petra.steffens@iese.fraunhofer.de



Petra Steffens

Situation

Our government customer, a ministry of a German state, is using a Management Information System that, for reasons of migration technology, will have to be replaced by new software in the mid-term. The state ministry must now make the decision of either joining a development consortium and share the costs, or subcontract for its own development. In order to provide support for this decision, Fraunhofer IESE was commissioned to determine the effort to be expected if the ministry were to develop the software on its own.

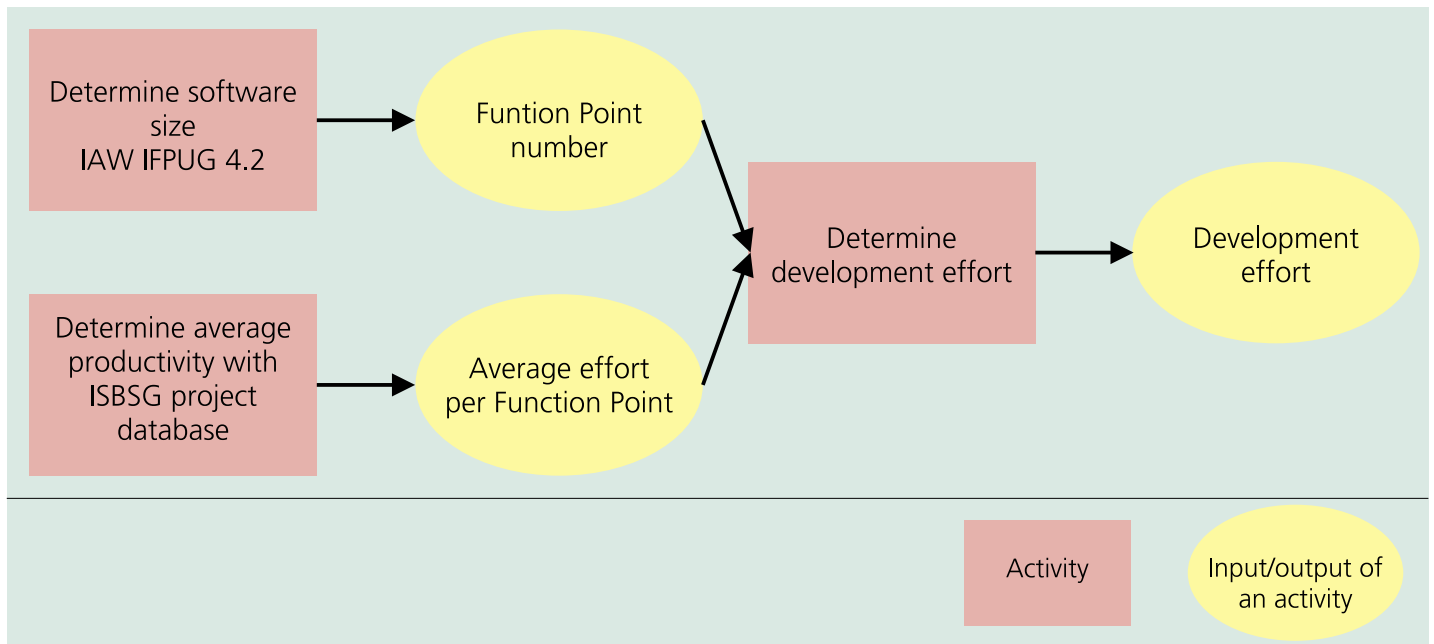
Project Topic

Effort estimations help to support decision-making as well as operational and resource planning, both before the start of a project and during its course. When effort estimation is performed for software projects, it is customary to

first determine the size of the software to be developed. This presumes that the requirements on the software have already been identified. The development effort is then estimated on the basis of this size and on average effort data obtained from comparable projects.

Results and Outlook

Empirically proven effort estimations are frequently neglected in practice. This is one of the reasons why software projects – particularly in the public sector – often go beyond the planned time and budget constraints, or are not completed successfully. The goal of the project described here was to estimate the development effort for a Management Information System to be developed from scratch based on historical project data.



Reliability through measurement data:
 Procedure for determining the development effort for a Management Information System.

Background

The accuracy of effort estimation varies with the quality of the existing requirements documents. If no or only insufficient requirements documents exist, a requirements analysis should be performed first. Since the customer had already performed such a requirements analysis, it was possible to start the effort estimation immediately.

Different methodological approaches exist for estimating the effort needed for software projects. Only a few of these have gained practical relevance. One commonly used approach for effort estimation is a combination of functional determination of the size with the help of the "Function Points method" with the consideration of

effort data from prior projects. This approach was used in the project described here.

The Function Point approach determines the functional extent of a software program from the user's point of view. Function Points are thus a measure for the functional size of a software program. The Function Point approach is independent of the technology used for implementation and can already be used on the basis of requirements documents. In the projects described, the Function Points were determined in accordance with the "Manual of the International Function Point User Group (Version 4.2)".

Effort estimations for an organization's projects are usually the most accurate if they can rely on effort data from that organization itself. If such data do not exist, effort estimation can be performed with the help of a so-called benchmark, i.e., by comparison with project effort data from other organizations. Such a collection of effort data is being administered by the International Software Benchmarking Standards Group (ISBSG). This database contains over 2000 projects from various application domains. Each project is described in detail with a Function Point number, the effort used, and 20 other attributes. With the help of these attributes, the projects with a great degree

of similarity to the project described were identified, so that only data from comparable project were used to perform the effort estimation.

The determination of the size of the software for the Management Information System in question resulted in approximately 10,000 Function Points. Using similar projects from the ISBSG project database as a basis, a factor of 12 hours per Function Point was identified. This corresponds to an expected development effort of about 120,000 hours. With this result, the state ministry now has a concrete basis for its decision for or against developing the software on its own.

CBTesten – Component-based Testing

Contact

Michael Ochs

Phone: +49 (0) 631/68 00-16 04

Fax: +49 (0) 631/68 00-13 99

michael.ochs@iese.fraunhofer.de



Michael Ochs

Situation

Large component-based applications have become increasingly dominant in software development, resulting in such things as more demand for Commercial Off-the-Shelf (COTS) solutions that can be integrated into one's own applications. In order to achieve this goal efficiently, small and medium-sized enterprises (SMEs), in particular, depend on easy-to-use development and QA methods. While being highly dependant on a small number of major customers, their resources are strongly focused on product development and marketing, so that product development delays are critical and sometimes lead to hard-to-resolve conflicts regarding the demand for "quality".

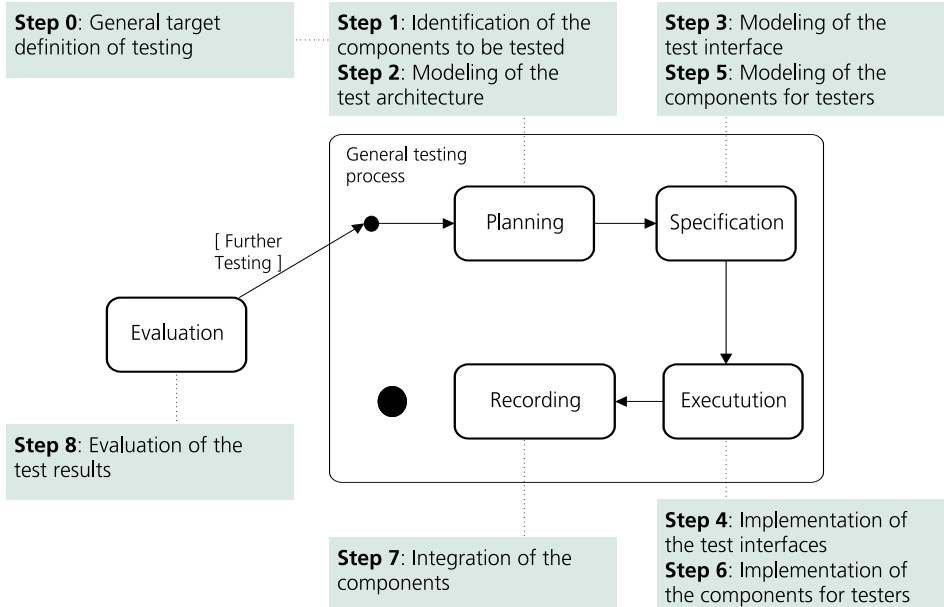
Project Topic

Object-oriented and component-based development methods and programming languages have turned out to be particularly suitable for handling complex development projects. Component orientation, especially, facilitates the reuse of existing solutions and reduces development cycles. If applications are increasingly being developed from existing parts, the effort is shifted from developing functionality to its system integration. On the one hand, effort is saved, but on the other hand, these

savings are consumed again by the work that needs to be performed in integration, system-level testing, and acceptance. For the system test, for example, the tests must be repeated for each change of a component. More efficient methods for regression tests on the level of system and acceptance testing are thus sought.

Results and Outlook

The goal of the project CBTesten, which was funded by the German Federal Ministry of Education and Research (BMBF) in the context of the SE2006 research program, was the development and validation of a method for developing regression tests for system and acceptance testing that is suitable for SMEs. The technology used was "Built-in Testing" (BIT). The companies market maker Software AG (part of the vwd group) and ICT Solutions AG were partners of Fraunhofer IESE in the project consortium and served as partners for the validation. In the partner companies, the BIT methodology for regression tests on the level of system and acceptance testing developed by Fraunhofer IESE was tried and evaluated. One of the results of the evaluation was that the automation of regression tests (system, acceptance) already paid off after the third project in the case of the partner ICT Solutions AG.



Background

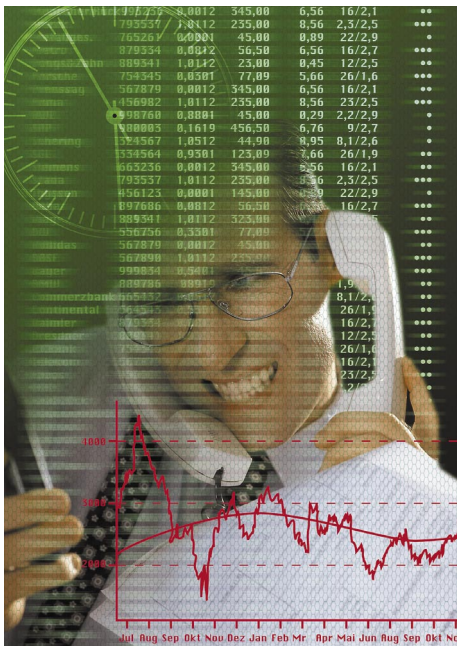
The project CBTesten (Component-based Testing, BMBF grant number 01ISC29) was performed from October 2003 to December 2005 as a consortium research project in the context of the BMBF's research program SE2006. The project consortium consisted of Fraunhofer IESE as the leader of the consortium and the partners ICT Solutions AG and market maker Software AG (part of the vwd group).

The goal of the project CBTesten was the development and validation of efficient, SME-suitable methods for developing regression tests on the level of system and acceptance testing. Both functional aspects and the time-related behavior of the systems were taken into consideration for the development of the tests. In the partner companies, the BIT methodology developed by Fraunhofer IESE was tried and evaluated under different aspects. Finally, a training program for the methodology was developed with real examples, which forms the basis for transferring the methodology and the lessons

learned into industrial application after the project is completed.

After an extensive analysis of the development and testing processes at the two partner companies, the development of the BIT methodology was started. The result of this development phase, the BIT methodology, is shown on an abstract level in its individual steps in the illustration. The individual steps of the BIT methodology are lined up along the known workflow for system tests (from planning to evaluation) and are explained in more detail in the table. It is important to note that not all BIT steps need to be performed in every case. For instance, performing steps five and six is not necessary in every case.

During the project's evaluation phase, regression tests by means of built-in testing were developed at the partner company Partner ICT Solutions AG for the basic functionality of the Content Management Systems (CMS) ICContent developed and marketed by the



Mastering stock exchange data?

In the world of finance, high-performance computer systems together with modern analysis software nowadays do all those jobs that can no longer be performed manually. Sophisticated testing processes ensure that even the tiniest error does not remain undetected in these critical programs. The effort for this stays within reasonable limits - which is particularly important for small and medium-sized development companies.

BIT development step	Brief description of the development step (without input, output, roles, templates, tools, guidelines)
Step 1	Identification of the component interactions to be tested. This requires a model of the system architecture as well as criteria based on which one can determine which interactions will be checked in which way (scenarios) through tests.
Step 2	Definition and modeling of the test architecture. Here, the decision is made about which components will receive components for testers and test interfaces, and how these additional artifacts will be combined with each other. In built-in testing, the test architecture can be understood as part of the system architecture itself.
Step 3	Specification of the test interfaces of the identified components in the specified specification notation (e.g., UML), if these components can be extended (server artifacts). Here, the external access mechanisms that are to support the testing are defined separately for each component.
Step 4	Implementation of the test interfaces in the selected implementation technology (e.g., Java), if this is possible.
Step 5	Specification of the components for testers in the specification notation (client artifacts). Here, the components for testers are planned and modeled in accordance with the test criteria used.
Step 6	Implementation of the components for testers in the selected implementation technology.
Step 7	Integration of the components and execution and recording of the tests. This step includes the actual execution of the developed tests, as part of component integration (deployment).
Step 8	Evaluation of the test results and decision about how to proceed further in the testing process.

partner. The regression tests focused on the system and acceptance tests of the CMS and automated various aspects, such as tests for the development, check-in, and retrieval of content. In the projects performed subsequently (which used the test suite), the development effort required to perform the above-mentioned steps of the BIT methodology was already compensated after three projects. This means that the break-even point is reached a lot earlier than expected and that further savings of effort can be realized afterwards. At the partner company market maker Software AG (part of the vwd group), the evaluation of non-functional properties in the area of time-related behavior was to be achieved via built-in testing. By using the BIT methodology and various tools that enable an injection of test code into existing software even after system integration, it was possible to measure and test the time-related behavior of the product offered by the partner in depth. In this case, it

is difficult to look at break-even, since such an evaluation could not take place in this manner.

In addition to several publications, a training program for the BIT methodology was developed during the project's dissemination and transfer phase, which can be scaled to one or two training days. The lessons learned from the BIT methodology during the evaluation phase as well as the tools used in the area of Java (e.g., BCEL, JMeter) were integrated into the training program, and examples from the system and work contexts of both partners were used in a reduced form in order to realistically reflect content.

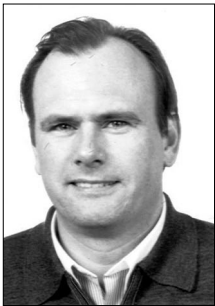
Customized Software Quality – Definition of Efficient Quality Strategies

Contact

Dr. Dirk Muthig
Phone: +49 (0) 631/68 00-13 02
Fax: +49 (0) 631/68 00-13 99
dirk.muthig@iese.fraunhofer.de



Dr. Dirk Muthig



Dr. Mikael Lindvall

Cooperation Partner

Fraunhofer Center Maryland (FC-MD)

Situation

In many areas, the requirements on software quality are becoming higher and more varied. On the one hand, organizations react by increasing their quality assurance measures, and on the other hand, they introduce additional quality assurance techniques in order to cover new quality attributes. The resulting additional costs, however, can only be passed on to the customer to a limited extent.

Project Topic

Organizations thus have an interest in optimizing their quality assurance strategies: Redundancies between different activities and techniques should be eliminated and possible synergies should be identified. To achieve these goals, the existing effectiveness and efficiency of all techniques used and available must be known exactly, which can be done by analyzing their effects on the individual quality attributes. This knowledge makes it possible to select combinations of quality assurance mea-

asures that make sense both technologically and economically, and to choose the proper foci. Especially in an environment that constantly requires more variants of a product, optimization approaches across project and organization boundaries are the declared goal.

Results and Outlook

In a cooperation project between Fraunhofer IESE in Germany and the Fraunhofer Center Maryland (FC-MD), USA, which was funded by Fraunhofer-Gesellschaft, such an optimization approach was developed during the past two years by combining relevant competencies from both sides.

The quality assurance techniques that were studied included both systematic inspections of development artifacts and consistency checks between architecture and implementation. Inspections are oriented towards different quality attributes based on perspectives. For consistency checks, comparative architectural views (perspectives) are generated by means of the tool SAVE (Software Architecture Visualization and Evaluation), which was developed during the project and won the 2005 Innovation Award of the state of Rhineland Palatinate. As a final step, an executable simulation of development processes was developed, which permits predicting the effects of different quality strategies, even over a longer period of time.



What do a space shuttle and a car entertainment system have in common?

Complex computer systems are the prerequisite to making both technical applications possible in the first place – and yet, the quality requirements are very different. Security and safety on the one side, comfort and functionality on the other side: Modern software and systems engineering meets the concern for these factors depending on the situation. In addition, engineering-style processes during development make it possible that quality remains affordable.

Car Entertainment System: Photo: Bosch

Background

The original motivation for Software Engineering stems from the development of systems with very high quality requirements regarding security, safety, and reliability, e.g., from the aerospace domain or the military domain. The primary objective was to fulfill these high requirements in the first place, and to do so in a predictable manner – feasibility issues played a secondary role to maximal system quality.

Today, the fulfillment of high requirements in software and system development is increasingly being taken for granted. Despite the associated challenges for an organization, development cost issues are becoming more and more important. It is not sufficient to systematically develop the required quality attributes and guarantee them, but all contributing activities must also be planned and executed as efficiently and systematically as possible. There must be no redundancies, whereas existing synergies should be used consistently.

In order to address this challenge, a methodological framework was developed during the past two years in cooperation with the Fraunhofer Center Maryland (FC-MD). It takes into account the bidirectional dependencies between the organizational context of the development work performed in an organization and the existing quality requirements, known quality-related software engineering techniques, as well as the existing system architecture. On this basis, a holistic quality strategy was developed, which builds on the following considerations:

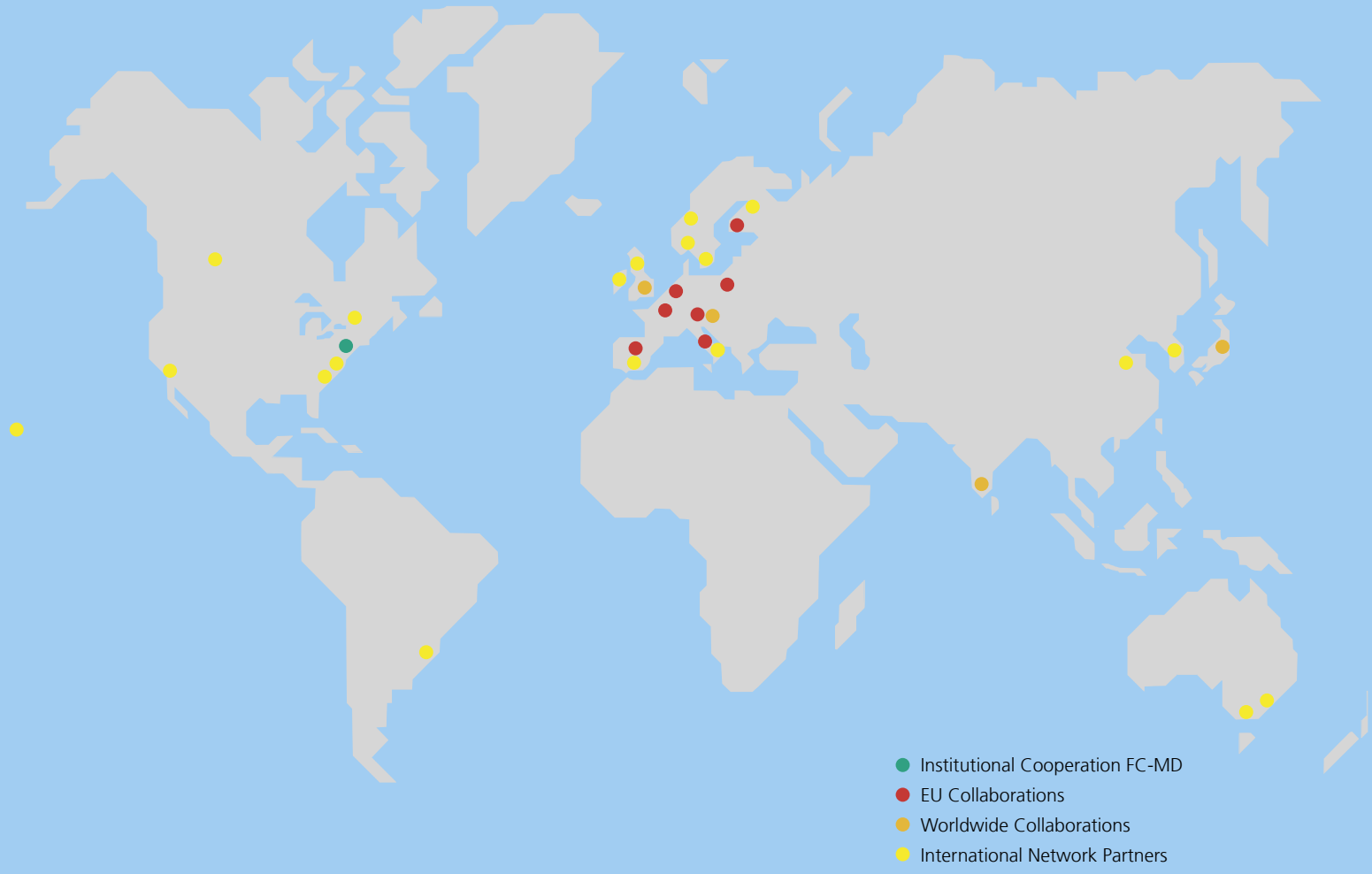
- Defects in development artifacts can be mapped to quality attributes of the end product (in general, not unambiguously).
- Different quality assurance measures and techniques identify different frequencies and types of defects in the development artifacts.
- Different combinations and configurations of various quality assurance activities (quality strategies) therefore lead to qualitatively different end products with differing effort distribution.

In the collaboration project, basic knowledge about typical quality assurance techniques was first established. For this, the two partners' project experiences as well as documented experience reports were assessed. This basic knowledge, together with a stable system architecture, allowed implementing quality strategies that really included the entire project and produced reliable results. From working with the Fraunhofer PuLSE® method, there are far reaching experiences on how to define a uniform architecture for a family of systems and maintain it in the long term.

Due to the central importance of a stable architecture, appropriate methodological support was derived for consistency checking and monitoring between defined architectures and implemented systems. The resulting tool SAVE (Software Architecture Visualization and Evaluation) won the 2005 Innovation Award of the state of Rhineland-Palatinate at the end of the project in 2005.

The multiple dependencies between the system development itself and the quality assurance measures are hard to see in real projects; there is often a certain insecurity regarding existing or detected defects. The executable simulation model realized in the context of the collaboration with FC-MD makes it possible to get an advance overview of the project processes and the effects of different quality strategies.

All results obtained were packaged under the name ArcQuE™ (Architecture-Centric Quality Engineering) in a form that is suitable for technology transfer, and were made available to interested companies in the context of services offered. Further joint activities of Fraunhofer IESE and FC-MD in the context of various research and industrial projects are already in progress.



Research and Globalization	84
Institutional Collaboration with the Fraunhofer Maryland Center (FC-MD)	85
Multinational European Union Collaborations	91
FAMILIES – Software Product Lines for more Efficiency and Productivity	91
International Projects Funded by the European Union	92
Fraunhofer IESE in Worldwide Projects	94
Cooperation with Hungary in the Area of “Ambient Intelligence”	94
Collaborations with Japan	95
Collaborations with India	98
Other Collaborations	99
Fraunhofer IESE in International Networks	100
International Software Engineering Network (ISERN)	100

Research and Globalization

Fraunhofer IESE is one of the leading research institutions in the area of software engineering. A recently published study lists the institute as the best institution in Europe, and in fourth place internationally (The Journal of Systems & Software 76, 2005, pp. 91-97). To a large extent, Fraunhofer IESE owes its worldwide reputation to the international cooperation with other research institutions and project partners, which by now comprises five continents:

- North America, with our sister organization “Fraunhofer Center Maryland FC-MD”, in close cooperation with the University of Maryland and many partners from the International Software Engineering Research Network (ISERN) in the U.S. and Canada
- Europe, with numerous strategic projects (e.g., with Hungary in the area of “Ambient Intelligence”)
- Asia, with the focus on Japan, China, and India
- Australia, with our close cooperation with the National ICT Australia (NICTA)
- South America, with our partners within ISERN

In all regions of the world mentioned, projects with industrial companies and public institutions have been initiated. In the following section, some examples of our participation in international collaborations as well as in global networks will be presented.

Institutional Collaboration with the Fraunhofer Maryland Center (FC-MD)

Fraunhofer Center – Maryland (FC-MD) located in College Park, Maryland is a leading competence center for applied research and technology transfer in experimental software engineering. FC-MD supports research and development in the field of software engineering and its enabling technologies. It collaborates with private-sector companies, government agencies, and academic institutions to develop innovative, actionable approaches to address their software issues.

FC-MD has affiliations with the University of Maryland, College Park as well as the Fraunhofer Institute for Experimental Software Engineering (IESE) located in Kaiserslautern, Germany.

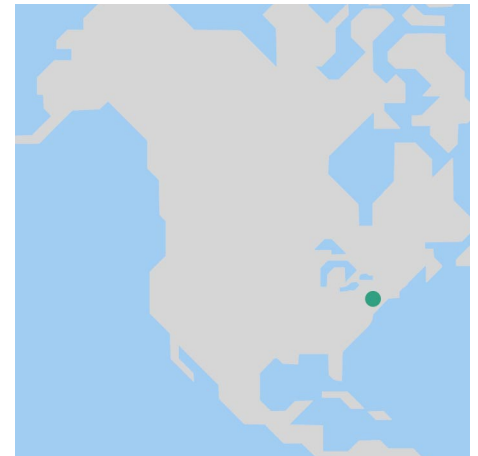
Fraunhofer FC-MD conducts research to advance the state-of-the-art in empirically validated software-engineering technologies and provides project support for organizations that develop, acquire and base their business on software. Projects have come from government agencies such as the Department of Defense and NASA and companies like Boeing, Motorola, DaimlerChrysler, ABB, Nokia, and Fujitsu. FC-MD also supports small- and medium-sized software companies through its close cooperation with the Maryland Department of Business and Economic Development.

FC-MD strives to advance the state of the practice in the evolving world of software development and acquisition by applying state-of-the-art research results. The following list of approaches are the fundamental principles by which FC-MD achieves its goals:

- Applying empirical methods to evaluate processes and products
- Identifying improvement areas and proposing new changes
- Understanding the impact of these changes on measures of success
- Utilizing experience to guide technical and management choices
- Tailoring solutions to meet specific customer contexts
- Transferring proven technologies into practice.

Business Areas and Competencies

- Measurement, Dr. Mikael Lindvall
- Experience and Knowledge Management, Raimund L. Feldmann
- Process Improvement, Michele Shaw
- Quality Assurance, Dr. Forrest Shull
- Software Safety and Security, Dr. Ioana Rus
- Architecture, Embedded Software: developing areas, Dr. Rance Cleaveland, Dr. Arnab Ray



Close cooperation:
Fraunhofer IESE collaborates with the Fraunhofer Center in Maryland

Projects in Progress

Modeling and Simulation of Enterprise Computer Security

Enterprises need to ensure the security of their computer assets and services, and they do this by using a set of countermeasures to defend against attacks. The effectiveness of these countermeasures depends on the enterprise's specific context. All security actions have costs associated to them, including prices to buy and maintain tools, effort and time to install and run them, and personnel training. Given resource constraints, as well as trade-offs between security on the one hand and other operational properties on the other hand, designing a security strategy is a very challenging task and requires extensive knowledge and experience.

To support this decision making task, FC-MD is developing a quantitative executable model of an organization's operational computer/information security. The model helps in understanding security risk reduction in computer systems, diagnosing such systems, and examining the effectiveness of different solutions. This model is based upon systems thinking and systems dynamics principles. It incorporates archetypes that describe common organizational patterns of behavior relevant to security.

The user of the model can set different values for the model parameters, corresponding to different vulnerabilities, attacks, and defense profiles, and can simulate various what-if scenarios. Simulation helps a security manager, security engineer, or system administrator answer questions such as: What combination of methods and tools should

I select and apply for managing my security risks? What is their effectiveness and cost efficiency? How does my security strategy need to change if my system gets attacked more? To what changes in this strategy is my environment most sensitive?

Best Practice Clearinghouse

The Acquisition Best Practices Clearinghouse (BPCh) is an innovative approach to improving the acquisition of software-intensive systems. The BPCh is designed to help programs select and implement proven acquisition, development, and systems engineering practices appropriate to their individual programmatic needs.

Research has shown that existing best-practice resources are not widely utilized for a number of reasons (e.g., the existence of multiple conflicting lists, skepticism on the part of personnel, inadequate data on cost and benefit of the recommendations, lack of support for situation-specific practice selection). The BPCh overcomes these problems by adopting a novel, evidence-based approach that links to existing resources describing how to implement various best practices, rather than recreating the information. The value added that the BPCh provides includes descriptions of the practical results (both good and bad) of applying the practices in various contexts, from which users can learn about the results expected in their environment. All evidence stored is contextualized, so that users can be guided to the lessons relevant to their program, type of problem, or specific environment.

Recommendations from the BPCh are vetted by government, industrial, and academic representatives. However, users also have access to the source materials from which the vetted recommendations will be built, allowing users to be supported as soon as the information is available, although with suitable caveats.

The BPCh project is being developed as a joint effort between FC-MD, the Office of the Secretary of Defense (OSD), and the Defense Acquisition University (DAU).

A Testbed for Experimentation

Experimenting with new software technologies is critical in order to understand their costs and benefits. However, experimentation is often costly.

FC-MD has built a testbed to facilitate experimentation, as part of NASA's High Dependability Computing Program (HDCCP). In addition, in collaboration with various research partners, FC-MD designed and conducted a number of experiments on this testbed. In order to minimize the cost and effort of future experimentation, the testbed itself as well as the designs of the experiments and their results are stored in an experience base.

The testbed is based on the Tactical Separation Assisted Flight Environment (TSAFE), which is a new concept for Automated Air Traffic Control. TSAFE was developed at NASA Ames Research Center, implemented at MIT, and then instrumented and packaged for experi-

mentation by FC-MD in collaboration with the University of Maryland.

FC-MD researchers added a number of experimentation features, e.g., synthesized faults to be seeded in order to characterize and evaluate defect detection technologies. A tool to create artificial test data is also available. They also produced documentation and other artifacts in order to facilitate understanding of how TSAFE works.

The testbed has been used for numerous experiments. For example, we conducted a series of experiments on our software architectural evaluation method. The result was used to identify the technology's strengths and weaknesses, and to develop an improved version of the method. In collaboration with Dr. Tefvik Bultan, professor at the University of California, Santa Barbara, FC-MD staff conducted a series of experiments on model checking in order to characterize and improve this technology.

FC-MD experiences with the TSAFE testbed show that it is a very effective tool that facilitates experimentation with technologies, for example in order to transfer them from the research laboratory to industrial use.

Collaboration Project with IESE: Dependable Software Engineering

As software becomes an integral part of many systems, software dependability is becoming more important. However, dependability needs vary between industries and between systems.

Traditional software engineering was driven by requirements from highly reliable applications that cannot fail, so quality cannot typically be traded for cost or time.

Many new software-based products, however, have other dependability needs.

Thus, dependability needs to be modeled to these needs and dependability attributes frequently need to be traded because it is often too costly to address them all.

In order to address these issues, FC-MD and its sister institute IESE in Kaiserslautern, Germany collaborated on defining new services that better meet customers' needs.

IESE and FC-MD have conducted numerous projects in this area resulting in strongly related and complementary expertise.

Many of the questions related to dependability were, for example, addressed in FC-MD's work on NASA's High Dependability Computing Program.

The business need was to enable real-time knowledge sharing so that it would be easy for a scientist at either FC-MD or IESE to acquire critical knowledge in order to meet a customer demand related to dependable software engineering.

The overall project goal was to align and integrate expertise and assets, and the results are:

- Integration and evolution of inspection services for dependability
- Development of a common understanding around product line architectures
- A unified simulation model for dependability
- Establishment of a common software tool platform for dependability-oriented tools.

The FC-MD /IESE vision is that eventually all services will be offered by both sides, which has already been initiated. Thus, the project has strengthened both institutes' businesses and ability to respond to customer needs, and opened the way for long-term cooperation.

Focus-oriented Information on Demand

Companies have large and continually growing collections of electronically stored information. This information represents years of captured knowledge and experience that is invaluable to the organization. Ideally, such knowledge and experience is characterized and packaged for (re)use in an organization-specific Experience Base. However, not every company runs an Experience Factory organization that constantly maintains and updates such a central repository. Hence, it becomes difficult for employees to quickly find the right information in order to reuse it, answer a certain question based on it, or learn from it. To solve this problem, search tools (e.g., Google desktop) are becoming more and more popular.

In this internal research project, FC-MD staff are taking a look at different tools and approaches available on the market to support users in finding the right information when they need it. They are trying to identify current solutions and future trends. Based on the results, FC-MD will be able to support customers in finding and implementing suitable and up-to-date solutions for their knowledge management issues.

NASA Space Network Project

FC-MD is currently providing support to the NASA Goddard Space Flight Center for the development of the Space Network Access System (SNAS) of the NASA Space Network Project (SNP). The Space Network (SN) is a data communication system comprised of a constellation of Tracking and Data Relay Satellites (TDRSS) in geostationary orbit and a ground terminal complex employing high-gain microwave antennas. The ground stations send and receive commands and data to and from the TDRSS, which in turn receive and relay data from a multitude of low earth orbit (LEO) satellites. The combination of elements comprising the SN provide global telecommunication services for telemetry, tracking, and command between LEO spacecraft and customer control and data processing facilities. SNAS provides a network-based system that allows SN customers to schedule SN support just prior to the required period and also to have support tools to make it easier to schedule long-term planning.

FC-MD's role in the SNAS development effort is in three primary areas:

- 1.) Provide expertise to SNP by supporting the management of selected software development effort(s) in accordance with SNP policies and establish processes necessary to estimate and track cost, schedule, and evaluate software development progress. FC-MD also serves as the primary point of contact with the acquiring organizations and the development contractor.
- 2.) Develop the SNP Software Management Experience Base (SMEB) by maintaining and updating the sizing, effort, and schedule estimation process developed by FC-MD for SNP to include additional SNP systems under development and maintenance as well as historical data from other relevant sources. The major activities performed by FC-MD in this area are the function point analysis of relevant SNP systems under development and maintenance, the refinement of the current SMEB for estimating the effort and cost for software systems under development, and the definition of a process for estimating the effort and cost for systems under maintenance.
- 3.) Provide process evaluation and improvement support to specified development and maintenance efforts including the monitoring of Software Engineering Institute (SEI) Capability Maturity Model (CMM) process capability by performing Software Capability Evaluations

(SCE) for SNP software development contractors where applicable, identifying actions required to fill gaps between the desired maturity level and the assessed maturity level, and the development of plans for implementing the actions and facilitate the implementation of the necessary actions.

NASA Metrics Program

FC-MD staff played a significant role in advancing a high-profile metrics program for NASA Headquarters. First, a top-down analysis studied government and industry measurement programs in order to identify key lessons learned from measurement and the most common success factors. Then the team used our own scenario-based measurement method applying the Goal-Question-Metric (GQM) approach and a bottom-up application component (specific to NASA) to propose a core set of metrics to be collected across all the NASA Centers. The Fraunhofer metrics team created indicator models for the proposed set of metrics. The team continues to be a significant player in deploying the Metrics Program at NASA Headquarters as well as within individual Centers.

Small Business Process Improvement

FC-MD helps organizations to achieve their software process improvement goals through baseline assessments, process modeling, action planning assistance, periodic consulting support, and auditing services. Staff expertise in risk management and lessons learned for process improvement in small organizations and non-traditional software environments plays a significant role in the delivery of these services. Staff are certified by the Software Engineering Institute in performing Software Capability Evaluations and are experienced in assisting organizations to achieve compliance with the Capability Maturity Model® (CMM) and Capability Maturity Model-Integration® (CMMI).

FC-MD also coordinates and manages several software-related consortia to provide a software engineering resource to member companies in advancing the practices of system and software engineering and improving the quality of their software-related products and services. These consortia integrate research and experience into practical improvement, create opportunities to develop and disseminate improvement practices, enhance the competitiveness of member companies, accelerate new software technology adaptation, leverage member company experience, promote inter-corporate cooperation of member organizations, and provide training and education.

Building a Joint Software Measurement Service for Fraunhofer IESE and FC-MD

While most organizations manage their performance using measurement data, the software component within these organizations often does a poor job of relating its performance to the business level goals.

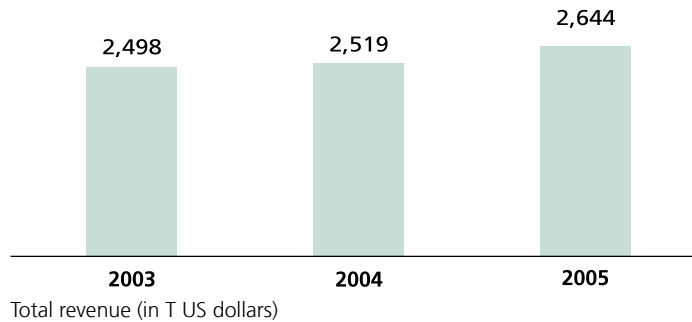
Based on FC-MD /IESE experience from working with software development organizations, the two organizations have concluded that managers need help in identifying the linkages between business goals, the software component of the organization, and software measures. Consequently, a joint project on measurement was launched.

The goal of this project is to build a sustainable software measurement service that will:

1. Help both IESE and FC-MD customers define measurement programs that are appropriate to managing an organization's performance in the context of their specific business and environmental factors, and
2. Create a common measurement program that both organizations can evolve over time and that can act as a basis for generating and sharing applied research ideas and technology transition mechanisms.

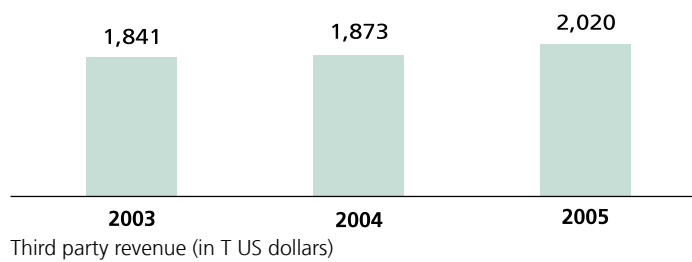
FC-MD in Figures

FC-MD is on track to increase its revenues in 2005 based on growth in both total and third-party revenues from the previous year. Third party revenue accounts for 77% of the total revenue.



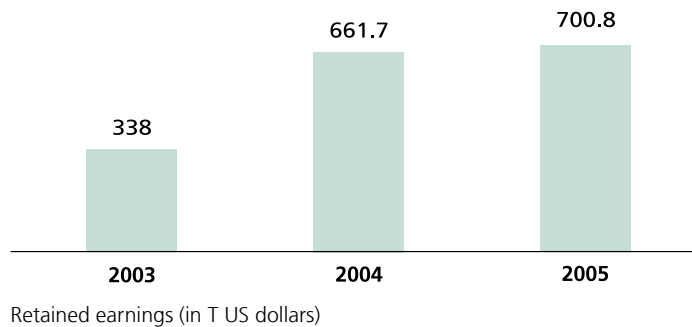
German Partners

- Fraunhofer IESE – Institute for Experimental Software Engineering
- Fraunhofer-Gesellschaft



University Partners

- University of Maryland, Experimental Software Engineering Group
- University of Maryland, Center for Reliability Engineering
- University of California, Santa Barbara
- University of Kaiserslautern



Other Partners

- CeBASE – Center for Empirically Based Software Engineering
- DAU – Defense Acquisition University
- Northrop Grumman

Multinational European Union Collaborations



Since the founding of Fraunhofer IESE in 1996, cooperation projects that are funded by the European Union have created not only international visibility, but also extensive synergy effects by establishing research networks on a European level. These projects with considerably varying amounts of funding primarily serve to market new products and methods and also support the research community with numerous publications at meetings and conferences, in professional journals and books. Scientific research in the context of European consortia increases competitiveness and improves the market opportunities of industry in Europe through up-to-date and demand-oriented research results. At the same time, existing resources can be optimally used in research activities that are coordinated on the European level, and the unavoidable risks for the individual consortium partners can be kept to a manageable level.

FAMILIES – Software Product Lines for more Efficiency and Productivity

Project Topic: Further development of the state of the art and dissemination of software product lines

Results/Goals: Methods for analyzing, identifying, and packaging components; methods for the systematic, quality-oriented definition of architectures; methods for determining the investment value of product line development; tool for modeling product lines; tool for identifying variable requirements from existing documentations

Keywords: software product lines; strategic alliances

Cooperation partners: Siemens AG, Munich (Germany); Robert Bosch GmbH, Stuttgart (Germany); market maker AG, Kaiserslautern (Germany); University of Duisburg-Essen (Germany); Nokia (Finland); University of Helsinki (Finland); VTT Electronics (Finland); MetaCase (Finland); Thales (France); INRIA (France); Ivorium Software S.A. (France); Objectteering Software S.A.

(France); Laboratoire d’Intégration des Systèmes et des Technologies CEA List (France); Technical University of Vienna (Austria); Koninklijke Philips Electronics N.V. (Netherlands); Rijks Universiteit Groningen (Netherlands); IKT-Norge (Norway); SINTEF (Norway); DNV Software (Norway); EDB Telesciences AS (Norway); Ericsson A/S (Norway); SuperOffice ASA (Norway); Visma Software Norge AS (Norway); European Software Institute ESI (Spain); TELVENT (Spain), Universidad Politécnica de Madrid UPM (Spain).

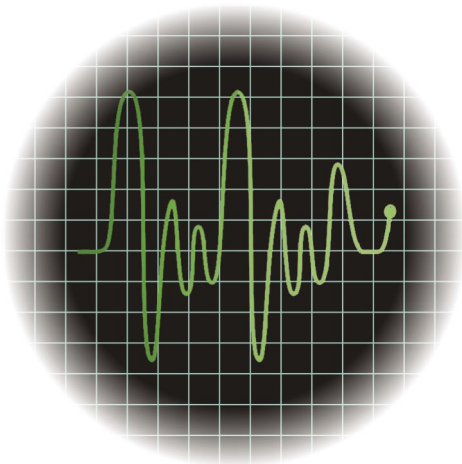
Contact: Isabel John; isabel.john@iese.fraunhofer.de

Grant number: Eureka Σ 2023 Programme, ITEA project ip02009, BMBF grant no. 01 IS 002 B

The international project FAMILIES (FAct-based Maturity through Institutionalisation of Lessons-learned and Involved Exploration of System-family engineering) is the third in a series of projects aimed at further developing the state of the art and the dissemination of software product lines. The two previous projects ESAPS (1999-2001)

and Cafe (2001-2003) created the basis for the European head start in the area of product line development. It was one of the tasks of the project FAMILIES (2003-2005) to consolidate the achieved results and thus facilitate and advance dissemination into other interested organizations. To this end, the results of the project were published in several books, including the first German book on software product lines (Böckle, Knauber, Pohl, Schmid: Software-Produktlinien; Methoden, Einführung und Praxis. Dpunkt-Verlag, 2004).

Major results of the FAMILIES project and its two predecessor projects became part of the PuLSE® method (Product Line Software Engineering) of Fraunhofer IESE. The PuLSE® method and the product line competence gained in the FAMILIES project have been applied successfully in numerous organizations, not only within the project, and continue to be used.



Sound competence made by Fraunhofer:

PuLSE® simplifies the transfer from project-specific development of single systems to the reuse of generic components.

International Projects Funded by the European Union

Upskilling to UML

Project Topic: Development of online and offline material for UML training and new concepts for work-based training in close cooperation between content and educational experts and practitioners in industry. “Upskilling to UML” is co-funded by the European Vocational Training programme „LEONARDO DA VINCI”, priority: developing relevant and innovative e-learning content.

Results/Goals: Online and offline training material for UML in several European languages; new training concepts (work-based learning).

Keywords: UML, vocational training, SME

Cooperation Partners: National College of Ireland (Dublin, Ireland), Institut National Polytechnique (Toulouse, France), New Bulgarian University (Sofia, Bulgaria), Softwin SRL (Bucharest, Romania).

Contact: Sonja Trapp; sonja.trapp@iese.fraunhofer.de

Grant Number: PP 146 369

The software industry is increasingly turning to object-oriented and component-based software development approaches that provide benefits such as improved reuse, short development cycles, and a larger return on software development effort. However, in order to really benefit from object technology, it has to be applied correctly. Therefore, developers do not only have to “think in objects” but also have to be well educated in the relevant technologies. The Unified Modeling Language in its latest version is to become a standard for the whole software domain. The need for upskilling UML applies to the software business as a whole, and to SMEs in Europe in particular, as they are facing the threat of IT services being offshored in order to save costs.

However, “traditional” education is not only cost intensive, but also time consuming. Especially small and medium-sized enterprises with tight development schedules and short release rates will appreciate innovative training concepts that allow on-the-job qualification through work-based learning and training.

Further Information:

www.up2uml.org

Adaptive Service Grids (ASG)

Project Topic: Development of an open platform for the adaptive identification, development, combination, and execution of software-based services

Results/Goals: Adaptive Services Grids (ASG) is a European research project funded in the context of the Sixth Framework Programme of the European Union. The aim of ASG is the development of an open platform for software-based services. The underlying idea is to make services available in a transparent manner, analogous to making electricity available in power networks. Users of the ASG platform describe the services they desire by means of semantic descriptions. The corresponding services are then made available to them by the platform finding existing services, respectively combining existing ones into more complex ones, or by generating new services from the semantic description. Service providers can use the open ASG platform to disseminate their services.

IESE supports the ASG consortium with its competence in the area of method development: IESE coordinates the development of the ASG platform on the one hand, and on the other hand, an ASG application development

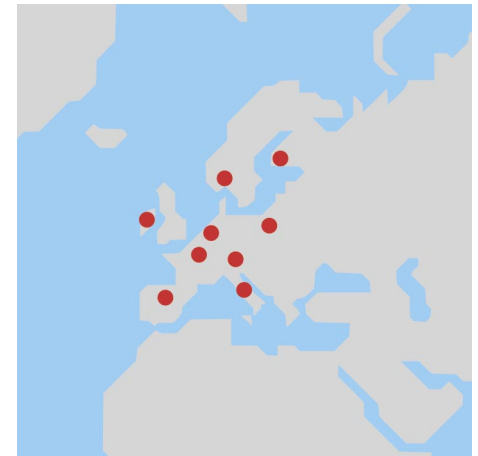
method is being created on the basis of the methods PuLSE® and KobrA, which were developed at IESE. With the help of this development method, service providers can develop applications for the ASG platform.

Keywords: Grid Computing; service-oriented applications

Cooperation Partners: Hasso Plattner Institute (HPI) at the University of Potsdam (Germany); University of Leipzig (Germany); University of Innsbruck (Austria), DaimlerChrysler Research (Germany); National University of Ireland (Ireland); TranSIT GmbH (Germany); NIWA (Austria), Telenor (Norway); Siemens AG (Germany); Rodan Systems (Poland); University of Jyväskylä (Finland); Telekomunikacja Polska (Poland); Marketplanet (Poland); University of Koblenz-Landau (Germany); ASTEC Group (Poland); Poznan University of Economics (Poland); University of Applied Sciences Furtwangen (Germany); Polska Telefonía Cyfrowa (Poland); University of Potsdam (Germany).

Contact: Dr. Joachim Bayer;
joachim.bayer@iese.fraunhofer.de

Grant number: FP6-IST-004617

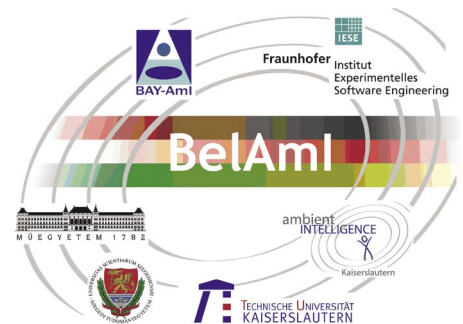


Fraunhofer IESE in Worldwide Projects



Omnipresent micro-processors:

With Ambient Intelligence, the number of computer systems that are almost invisibly integrated into our daily lives will increase even more.



Top research thrives on international cooperation and competition – preferably in worldwide research projects. Fraunhofer IESE has been pursuing this strategy for many years, with great success in numerous countries worldwide. The following pages present some of our more extensive international collaborations.

Cooperation with Hungary in the Area of “Ambient Intelligence”

Project Topic: Technologies for improving energy efficiency, communications systems suitable for Aml, development methods for adaptive systems with strict requirements on service quality, safety and security engineering, architectures & platforms for Aml systems as well as innovative human-machine interfaces

Keywords: strategic networks, ambient intelligence, ubiquitous computing, pervasive computing

Cooperation Partners: Inter-University Centre for Telecommunications and Informatics ETIK, Budapest (Hungary); Technical University of Kaiserslautern (Germany)

Contact:
Prof. Dieter Rombach
dieter.rombach@iese.fraunhofer.de

Professor Nehmer and Professor Rombach (Department of Computer Science) visited the Technical University of Budapest in March of 2004 with the objective of increasingly expanding research collaborations towards Eastern Europe. Due to existing research foci on both sides, a joint topic for cooperation was quickly found: Ambient Intelligence. Due to the wide range of competencies on both sides, technologies for improving energy efficiency, communications systems suitable for Aml, development methods for adaptive systems with strict requirements on service quality, safety and security engineering, architectures & platforms for Aml systems as well as innovative human-machine interfaces were selected as the scientific model projects.

Due to its attractiveness, the resulting project proposal was selected by the Office of the German Chancellor as a pilot project for future-oriented research collaboration with Hungary. The BelAml pilot project – under the leadership of the Fraunhofer Institute for Experimental Software Engineering (IESE) in Germany and the Inter-University Centre for Telecommunications and Informatics (ETIK) in Hungary – was presented to the public in Budapest by the Office of the Chancellor, on the occasion of the 15th anniversary of the day that East German citizens were granted permission to leave the country via the German embassy. In the context

of a visit to Hungary by German Chancellor Gerhard Schröder, German Federal Research Minister Edelgard Bulmahn and the Hungarian Minister of Education Magyar Bálint signed a joint agreement in Budapest on 15 September 2004 to further develop and intensify their collaboration in scientific research and technological development.

The investments for the pilot project in the amount of six million euros will be born in equal parts by the two countries. On the German side, the funds are provided by the German Federal Ministry of Education and Research (BMBF), the state of Rhineland-Palatinate as well as the Fraunhofer-Gesellschaft. The pilot project will be funded for a duration of four years.

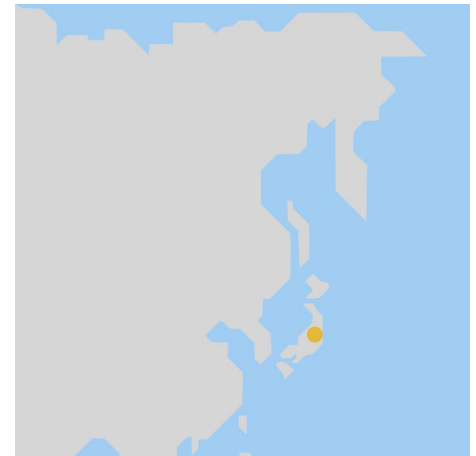
In Kaiserslautern, the work of the German-Hungarian research team is integrated into the research focus "Ambient Intelligence" of the University of Kaiserslautern. In October 2004, the first of a series of four workshops to date on joint scientific model topics and projects already took place in Budapest. Research is concentrated on concrete application scenarios in the areas of Assisted Living, Assisted Working, Assisted Training, Assisted Driving, and Assisted Transportation, according to which the project results are demonstrated in practice.

Collaborations with Japan

The close scientific relationships between Fraunhofer IESE and top Japanese universities in Osaka and Nara, which have existed for many years, and recently also our relationship with the Japanese Ministry of Economy, Trade and Industry METI on the issue of software engineering, have already led to intensive collaborations in the past, such as contract research with companies like Ricoh Co., Ltd. and Fujitsu.

After Fraunhofer IESE signed a collaboration agreement with the Japanese Ministry of Economy, Trade and Industry (METI) in November 2004, more industrial collaborations on various software engineering topics are now getting established.

This intensified cooperation with Japanese research institutes and companies – complemented by the exchange of scientists and students – will strengthen the international reputation of Fraunhofer IESE as a leading software engineering competence center even more. For more than 10 years, there has existed close scientific cooperation with the Nara Institute of Science and Technology NAIST in Nara. Fraunhofer IESE is involved as a partner in the EASE project of the Japanese Ministry of Education (MEXT) under the leadership of Prof. Koji Torii.



The Virtual Office of the Future

Project Topic: Development of future software-based products and services for the virtual office

Keywords: strategic alliances, ambient intelligence, ubiquitous computing, pervasive computing, intelligent office applications, reference architectures

Cooperation partners: Ricoh Co., Ltd. (Japan); German Research Center for Artificial Intelligence (DFKI); and others

Contact: Dr. Dirk Muthig
dirk.muthig@iese.fraunhofer.de

During the past few years, scenarios were developed in many application domains that benefit from the idea of "ambience". One of these is the "Virtual Office of the Future", in which diverse pieces of end user equipment interact on their own – either because certain persons are identified, messages are received from other equipment, or based on the status of higher-level business workflows. According to current prognoses, the market for such "intelligent" office applications, which also include eGovernment applications, will experience strong mid-term growth.

In the competence center "Virtual Office of the Future", which is funded by the state of Rhineland-Palatinate, Fraunhofer IESE is establishing fundamental research competencies for demonstrating the visions of a Virtual Office, and is developing future software-based products and services for this domain in cooperation with industrial partners.

In the context of this project, comprehensive competence is being built up in the area of flexible software architectures, which will be a decisive factor for the efficient technical realization of office environments. Beyond that, research is necessary regarding (semi-) automated support of the workflows and processes in an organization. It takes these to provide office end equipment with the context information needed to support the user in a proactive and "intelligent" manner.

In light of these prospects, the work of the research partners and the collaborating industrial companies from the office application systems domain focused on requirements, reference architectures, and quality assurance. Work concentrated on system- and software engineering aspects dealing with the development and adaptation of IT-based office services and their sup-

port through flexibly adaptable office end equipment.

After an analysis of the application domain and after identification of the services, functionalities, and properties of office infrastructure and end equipment that are typical today, the requirements on future infrastructures were exemplarily juxtaposed to these results. This enabled precise identification of the central new aspects of the approach for the competence center "Virtual Office of the Future". The crucial difference to previous applications – in addition to efficient and maximal adaptability of all system components and office equipment – is that the office infrastructure is informed about the current workflows and thus offers context-sensitive services that can be reasonably combined with parallel or subsequent workflows. For example, a telephone "thinks" by interpreting the meaning of its speed dial buttons depending on the appointment schedules that have been installed. Depending on whether a colleague is in the office, at home, or on the road, the telephone will dial the appropriate number.

The reference architecture designed in the subsequent step should fulfill the requirements of future office infrastructures and office systems, while

allowing as much flexibility as necessary in order to be efficiently adaptable to the individual needs of different office organizations. This resulted in a generic solution for realizing a product line for office environments.

The resultant reference architecture is also an initial fixed point for all companies that want to develop, install, and operate future office infrastructures in cooperation with the competence center. It defines a framework for the different roles, such as office organizations (i.e., end customers), smaller and large suppliers (i.e., partners who provide individual system components), system integrators as well as maintenance companies or other service providers.

For the reference architecture, suitable quality assuring measures were identified and assessed with regard to their usability and usefulness in the area of office applications. Taken together, these result in a generic quality strategy, which is an inherent part of the reference architecture. In order to do justice to the highly flexible reference architecture, static and dynamic quality assurance techniques were developed, which can be used in various contexts.

Strategic Cooperation with the Japan Aerospace Exploration Agency JAXA

Project Topic: Analysis and optimization of highly efficient development processes for software-intensive aerospace systems

Keywords: strategic alliances, international competence networks, aerospace

Cooperation Partner: Japan Aerospace Exploration Agency JAXA, Tokyo (Japan)

Contact: Dr. Jürgen Münch
juergen.muench@iese.fraunhofer.de

In the context of this cooperation, Fraunhofer IESE and the Japan Aerospace Exploration Agency JAXA analyze software development procedures and processes at JAXA and determine their improvement potential. Fraunhofer IESE supports JAXA in organizing internal process assessments and designing an improvement program for the development of safety-critical aerospace applications. This includes the development of a measurement system for the development of highly reliable software and for optimizing system integration processes. Cooperation is further intensified through training sessions and workshops. In this context, Fraunhofer IESE can make valuable experiences regarding the use of established methods in a sensitive and critical context. The know-how created together with the Japanese development experts will also benefit other Fraunhofer IESE projects in the context of the European aerospace domain.

Information-technology Promotion Agency (IPA) / Software Engineering Center (SEC) in Japan

Project Topic: Support of the Japanese Software Engineering Center (SEC)

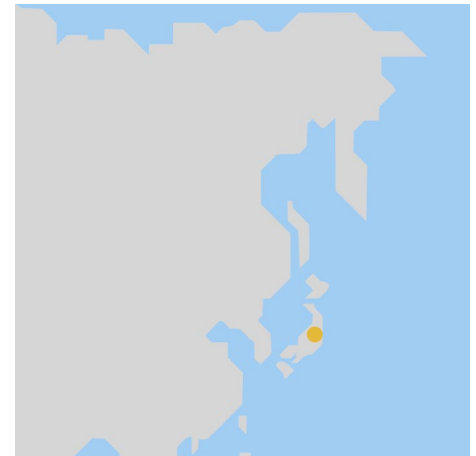
Keywords: strategic alliances, international competence networks

Cooperation Partners: Japanese Ministry of Economy, Trade and Industry METI, Tokyo (Japan), Universities of Osaka and Nara (Japan)

Contact: Prof. Dieter Rombach;
dieter.rombach@iese.fraunhofer.de

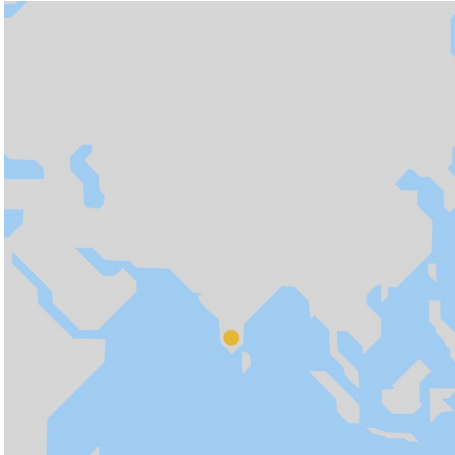
A long-term collaboration agreement exists between the Japanese Ministry of Economy, Trade and Industry (METI) and the Fraunhofer Institute for Experimental Software Engineering (IESE). The topic of the cooperation is support for the Japanese Software Engineering Center (SEC). The SEC is intended as a Japanese research and technology transfer platform for the promotion of industrial software engineering.

In the context of this cooperation, Fraunhofer IESE together with Japanese universities and companies will perform research into software development methods and further develop these; it will also support technology transfer into Japanese companies. From the perspective of Fraunhofer IESE, the agreement with the Japanese ministry of trade serves the goal of further strengthening our own competencies in the exchange with the best scientists in Japan and establishing more industrial



collaborations with Japanese companies. First projects were performed on the topics of “Project Effort Estimation” and “Quantitative Project Management”. The methods and tools OSR (Optimised Set Reduction) and CoBRA (Cost Estimation, Benchmarking, and Risk Assessment) on measurement-based development of effort estimation models, which were developed by Fraunhofer IESE, were used here. Currently, the analysis and adaptation of process assessment procedures for the use in Japanese companies is in progress.

Various pilot projects with Japanese service providers such as OKI Electric Industry Co., Ltd. have already been performed; additional industrial collaboration projects, e.g., with Toyota Motor Corporation, are under preparation.



Collaborations with India

The still young IT industry on the Indian subcontinent has achieved very high maturity since it came into being. Many software companies are categorized as CMMI Level 5, which includes, in particular, quantitative, i.e., measurable tracking of all process steps. In India, companies can choose from a large reservoir of highly motivated and well trained professionals, who develop software at an interesting cost-/performance ratio. One of the outstanding characteristics of the emerging software industry in India is its constant ambition to maintain its own high standards and elevate these even more with the help of modern software engineering processes. Fraunhofer IESE currently provides support for CMMI Level 5-certified Siemens Information System Ltd. SISL in Bangalore to further optimize its development processes, which are all characterized quantitatively.

COMPAS: What comes after capability level 5?

(Cooperation on Measurement-based quantified Processes for Activities in Software Engineering)

Project Topic: Identification of quantitative relationships between software processes and products

Keywords: data-based project management, business intelligence for software organizations

Cooperation Partner: Siemens Information System Ltd. (SISL), Bangalore (India)

Contact: Prof. Peter Liggesmeyer
 peter.liggesmeyer@iese.fraunhofer.de;
 Michael Ochs
 michael.ochs@iese.fraunhofer.de

One characteristic feature of mature software development processes is the enrichment of the process steps, which are initially merely defined qualitatively, with quantitative data (metrics) and, eventually, the control and optimization of the development process on the basis of measurements.

Siemens Information System Ltd. (SISL) in Bangalore has achieved CMMI Level 5, the highest level of capability. The prerequisites for an effective measurement system have been fulfilled; quantitative tracking of all process steps is well established throughout the entire organization. Measurement data are not only being elicited continuously during development, but are also used to influence the process in the sense of a feedback loop.

Nevertheless, even such mature processes offer the potential for optimization that is interesting in both a technical and an economic sense – in the sense of efficiency and effectiveness. The wish of the cooperation partner to optimize the measurement program on their own based on the measurement data elicited and to make accurate predictions regarding properties that cannot be measured directly by using existing data is the basis of the collaboration project with Fraunhofer IESE.

In the context of the cooperation with Siemens Information System Ltd. (SISL), the task is to produce suitable prediction models for the quantitative control of operative projects by combining empirical measurement processes and analyzing the resulting data. How will the effort for the employees change if the development process is performed differently than before in certain areas? Which defect rate will result after release? How will costs and quality change if more or less project management is used?

Whereas in the past, these issues were rather the subject of speculations and purely qualitative estimations, the objective of COMPAS is to find quantitative answers and corroborate them with traceable, measured facts. The transfer of the appropriate competence in these methods through Fraunhofer IESE enables Siemens Information System Ltd. (SISL) to draw conclusions from existing measurement processes and data in order to optimize both their own measurement programs and those products and development processes that clearly go beyond the definition of CMMI Level 5.

Other Collaborations

In addition to the collaborations mentioned above, Fraunhofer IESE has contacts to other research and industry partners in various software engineering contexts. To provide a complete list of all collaboration projects would go beyond the scope of this report; however, upon demand, we will be glad to inform you about our worldwide activities. Below you will find a sample list of running or recently concluded projects in Europe.



Software Inspections Guarantee Quality in Bioinformatics

Project Topic: Definition of customer- and application-specific inspection processes

Keywords: life sciences, software inspections, process engineering

Cooperation partner: LION bioscience Ltd., Cambridge (Great Britain)

Contact: Ralf Kalmar;
ralf.kalmar@iese.fraunhofer.de

International Exchange of Experience via the Software Experience Center (SEC)

Project Topic: International exchange of experience while protecting corporate interests

Keywords: international competence networks

Cooperation partners: ABB Asea Brown Boveri Ltd. (Switzerland); The Boeing Company (USA); DaimlerChrysler Corporation (Germany / USA); Motorola, Inc. (USA); and Nokia (Finland).

Contact: Dr. Dirk Muthig;
dirk.muthig@iese.fraunhofer.de

ForPICS – Formal Methods Solve Critical Problems

Project Topic: Seamless integration of formal methods into existing software development processes of critical industrial applications

Keywords: formal methods, critical systems, safety, software tests

Cooperation partners: Istituto Trentino di Cultura ITC, Trento (Italy); Istituto per la Ricerca Scientifica e Tecnologica IRST, Trento (Italy)

Contact: Thomas Olsson;
thomas.olsson@iese.fraunhofer.de

Fraunhofer IESE in International Networks



Fraunhofer IESE is active in various international research networks. There is a real need for these networks, since usable statements on software engineering methods, especially under different conditions, can only be obtained and then consolidated if they have been applied and observed multiple times. Another objective of worldwide networks is to promote an intensive exchange of experience in the area of software engineering, including, in particular, such an exchange between research and application. The most important software engineering network that is committed to the experimental paradigm is the International Software Engineering Research Network (ISERN). ISERN is under the main direction of Fraunhofer IESE. Furthermore, Fraunhofer IESE is engaged in NICTA (National ICT Australia), JSEC (Japanese Software Engineering Competence Center), in the EASE project (Empirical Approach to Software Engineering) in Japan, in ISERC (International Software Engineering Research Center) in Ireland, and in additional collaborations with SEI in the USA, as well as with partners in Korea and China. Within these collaborations, there is a lively exchange of scientists and students. Within the ISERN network, in particular, Fraunhofer IESE is engaged in an in-



tensive mutual exchange of experience with the following partners: Dr. Frank Houdek (DaimlerChrysler, Germany), Prof. Dr. Marvin Zelkowitz (University of Maryland / Fraunhofer Center Maryland, USA), Prof. Dr. Jyrki Kontio (Helsinki University of Technology, Finland), Prof. Dr. Koji Torii (NAIST, Japan), Mr. Masafumi Katahira (JAXA, Japan), Prof. Dr. Natalia Juristo (Politecnico Madrid, Spain), Prof. Dr. Victor Basili (University of Maryland, USA), Prof. Dr. Ross Jeffery (University of New South Wales, Australia), Prof. Philip Johnson (University of Hawaii, USA), Prof. Dr. Guenther Ruhe (University of Calgary, Canada), Prof. Dr. Dag Sjøberg (University of Oslo, Norway), Prof. Reidar Conradi (NTNU, Norway), Prof. Dr. Markku Oivo (University of Oulu, Finland), Prof. Dr. Barry Boehm (University of Southern California, USA). A list of all ISERN partners completes this overview.

International Software Engineering Network (ISERN)

Project Topic: Exchange of experience and personnel between internationally operating software engineering research groups

Keywords: international competence networks

Collaboration Partners:

- Blekinge Institute of Technology (BTH)
<http://www.bth.se/eng/>
Sweden
- Carleton University
<http://www.carleton.ca/>
Department of System and Computer Engineering
Canada
- Central Research Institute of Electric Power Industry
<http://criepi.denken.or.jp/>
Japan
- COPPE
<http://www.cos.ufrj.br/english/>
Brazil
- DaimlerChrysler Research Center
<http://www.daimlerchrysler.com>
Germany
- Fraunhofer Center Maryland
<http://fc-md.umd.edu/>
USA
- Fraunhofer Institute for Experimental Software Engineering
<http://www.iese.fraunhofer.de/>
- Helsinki University of Technology
<http://www.hut.fi/English/>
Finland
- Japan Aerospace Exploration Agency (JAXA)
http://www.jaxa.jp/index_e.html
Japan
- Lucent Technologies – Bell Laboratories
<http://www.lucent.com/>
USA
- Lund University
<http://www.tts.lth.se/>
Sweden
- Nara Institute of Science and Technology
http://www.naist.jp/index_en.html
Japan
- North Carolina State University
<http://www.ncsu.edu/>
USA
- Norwegian University of Technology & Science
<http://www.idi.ntnu.no/english/>
Norway
- NTT Data Corporation
<http://www.nttdata.co.jp/en/index.html>
Japan
- University Politecnico Madrid
<http://www.upm.es/>
Spain
- SINTEF, Norway
<http://www.sintef.no/>
Norway
- Solid Information Technologies
<http://www.solidtech.com/>
Finland
- SUN Microsystems
<http://www.sun.com>
USA

- Technical University of Vienna
<http://www.tuwien.ac.at/>
Austria
- University of Maryland, Baltimore County
UMBC
<http://www.umbc.edu/>
USA
- University of Technology Sydney
<http://www.uts.edu.au/>
Australia
- University of Castilla-La Mancha
<http://www.uclm.es/>
Spain
- University of Maryland at College Park
<http://www.cs.umd.edu/>
USA
- University of Maryland, Baltimore County
(UMBC)
<http://www.umbc.edu/>
USA
- University of Kaiserslautern
<http://www.uni-kl.de/>
Germany
- University of New South Wales
<http://www.unsw.edu.au/>
Australia
- Università degli Studi di Roma »Tor Vergata«
<http://www.uniroma2.it/>
Italy
- University of Bari
http://www.uniba.it/index_n.php
Italy
- University of Strathclyde
<http://www.cis.strath.ac.uk/>
Scotland
U.K.
- University of Hawaii
<http://www.ics.hawaii.edu/>
USA
- University of Calgary
<http://www.ucalgary.ca/>
Canada
- University of Alberta
<http://www.ualberta.ca/>
Canada
- University of Oslo
<http://www.uio.no/english/>
Norway
- University of Oulu
<http://www.tol.oulu.fi/english/>
Finland
- University of Southern California (USC)
<http://www.usc.edu/>
USA
- Universidade de São Paulo (USP)
<http://www2.usp.br/ingles>
Brazil
- VTT Electronics
<http://www.vtt.fi/ele/indexe.htm>
Finland

Contact: Andreas Jedlitschka;
andreas.jedlitschka@iese.fraunhofer.de

ISERN on the Internet:
www.iese.fraunhofer.de/ISERN

ISERN is an international research network whose objective is the promotion of empirical software engineering based on the joint awareness that software cannot be produced with one standard technology that applies to everything. Instead, software needs to be developed using suitable technologies. Suitable means that the technologies must be adapted to the goals and characteristics of particular projects. Consequently, software engineering research needs to be performed in an experimental context that allows us to observe and experiment with the technologies in use. Only systematic observation allows recognizing a technology's inherent strengths and weaknesses and makes it possible to try to understand their effects. This knowledge is necessary to systematically adapt technologies. Overall, the experimental approach together with empirically gained experience that is packaged for the target group improves the potential for technology transfer in software development.

Several software engineering research groups have made the paradigm shift to an experimental software engineering view and have joined forces in the International Software Engineering Research Network (ISERN). The purpose of ISERN is to promote the exchange of results and personnel between these groups. Specific emphasis is placed on experimentation with development technologies in different environments; the repetition of experiments across environments; and the development and exchange of methods and tools for model building, experimentation, and assessment. The long-term expectation

is that such cooperation will enable the abstraction and unification of environment-specific results and knowledge with the objective of generating the basic components of our discipline.

The founding ISERN members chose the Quality Improvement Paradigm (QIP) as a reference model. The QIP is an experimental framework for software development, based on scientific methods and instantiated in the TAME project at the University of Maryland. It views measurement as essential to the capture and effective reuse of software experience, and assumes that the process is a variable based on the characteristics and goals of the project and organization. This framework views software engineering as a laboratory science, which must be supported by the effective cooperation between academia and industry in order to achieve significant improvements.

ISERN is open to other academic and industrial groups worldwide that are active in experimental software engineering research and are willing to adopt the experimental framework. There is no membership fee. The individual network members are responsible for funding the collaboration through existing local or future joint grants.



How to find us	104
Fraunhofer IESE Contact Persons	106
Information Service	109

How to find us

Fraunhofer-Institut für Experimentelles Software Engineering

Fraunhofer-Platz 1
 67663 Kaiserslautern
 Germany
 Telefon: +49 (0) 631/68 00-60 00
 Fax: +49 (0) 631/68 00-10 99
 info@iese.fraunhofer.de
 www.iese.fraunhofer.de

By car
 Coming from the West on Autobahn A6, take the exit Kaiserslautern-West (15), then go towards downtown and follow the signs towards the university. Before you get to the university, you will reach the building complex of the Fraunhofer Center a few hundred meters down Trippstadter Straße, on the right side of the street.

Coming from the East on Autobahn A6, go to the Autobahn Interchange ("Autobahndreieck") Kaiserslautern, and take the exit Kaiserslautern-Centrum (16a). Then first follow the signs towards Betzenberg Soccer Stadium, then towards the university. It is best to use the detour behind the train station via Zollamtstraße; at the end of the street, continue straight ahead into Trippstadter Straße. The building complex of the Fraunhofer Center is located approx. 500m down the street on the right side.

Getting there by means of electronic navigation: Since most likely, the Fraunhofer-Platz is not yet listed in most electronic navigation systems, we recommend using "Trippstadter Straße 125" as the destination instead. The Fraunhofer Center is located directly across the street.

By rail and bus
 Proceed to the main train station, Kaiserslautern Hauptbahnhof, and then either take a taxi or take TWK city bus no. 6 (towards Mölschbach) or no. 15 (towards Universität), getting off at the stop "Fraunhofer-Zentrum".

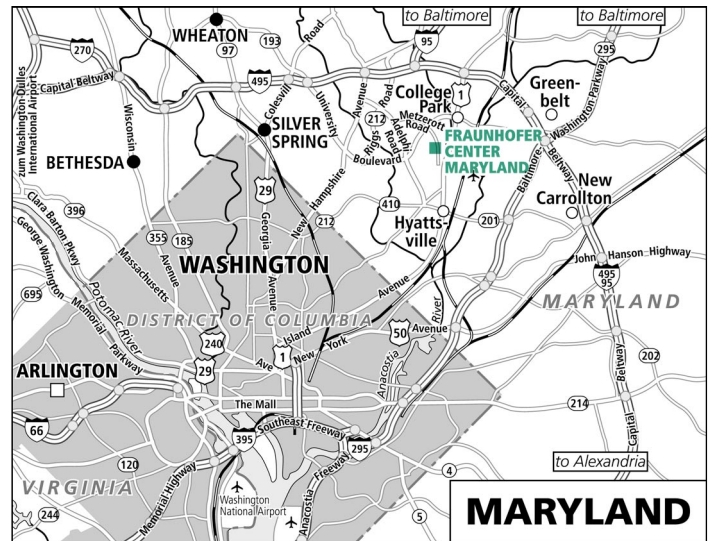
By air
 From Frankfurt Rhein Main Airport, either by train (approx. 2 hours) or by rental car (approx. 1.5 hours).



Map of Kaiserslautern

Fraunhofer USA Center for Experimental Software Engineering University of Maryland

4321 Hartwick Road, Suite 500
 College Park, MD 20742-3290
 Phone: (301) 403-2705
 Fax (301) 403-8976
 info@fc-md.umd.edu
 http://fc-md.umd.edu/fcmd/index.html



By car
 Directions from Points North:
 Follow I-95 South to the point where it merges with I-495. Follow the signs for Exit No. 27-Richmond (I-95/495 South). Then follow the Exit 27 signs staying to the left so you can take the special Rt.1/College Park exit lane. This will briefly put you back on I-95. Stay to the right and take Exit No. 25 onto Route 1 South (towards College Park).
 For directions from this point on, see "Further directions" on this page!

Directions from Points South:
 Follow I-95 North to the point where it merges with I-495. Follow the signs for Baltimore (I-95/495 North). Take Exit No 25 onto Route 1 South (towards College Park).
 For directions from this point on, see "Further directions" on this page!

By train (15 minute walk)
 Exit College Park Metro station by turning right after you exit the turnstile and going through a tunnel to Calvert Rd. Take Calvert Rd. for 4-5 blocks to Rt. 1. (Calvert ends there). Cross Rt. 1 and go right a block to Hartwick Rd. Turn right (there's a Kinko's Copy sign on the corner). Our building (4321) is on the left.

By plane
 B.W.I. airport (about 45 minutes by car):
 Exit the airport on I-195 (main road out of airport). After a few miles, take I-95 South towards Washington.
 From this point, follow directions from Points North.

National Airport (about 90 minutes by car; also a stop on the Yellow Metro line):
 Exit the airport towards I-395 North towards Washington, D.C. Continue on I-395 North to New York Avenue. Turn right onto New York Avenue (US Rt. 50 East) to MD Rt. 295/Baltimore-Washington Parkway for approximately six miles. Stay on BWI Parkway to the exit for Maryland Rt. 193. This is Greenbelt Road/Rt. 193. Take Rt. 193 East to Rt. 1 South.
 For directions from this point on, see "Further directions" below!

Further directions:
 Stay on Rt.1 South, going past the University of Maryland. After passing the University, you will encounter 2 stop lights – the 2nd one being Knox Rd. Take the next right after Knox onto Hartwick Rd (there's a Kinko's Copy sign on the corner). Our building (4321) is on the left – turn left past the building into the parking lot and park anywhere.

We're on the 5th floor – directly opposite the elevator.

Fraunhofer IESE Contact Persons

Dial Phone No. +49 (0) 631/68 00- ...

Executive Board

1001 Prof. Dieter Rombach
Executive Director
dieter.rombach@iese.fraunhofer.de



1101 Prof. Peter Liggesmeyer
Director
peter.liggesmeyer@iese.fraunhofer.de



1201 Prof. Frank Bomarius
Stellvertretender Institutsleiter
frank.bomarius@iese.fraunhofer.de



1205 Holger Westing
Managing Director
Department Head Central Services
holger.westing@iese.fraunhofer.de



Staff Functions

6000 Jörg Dörr
Public Relations
joerg.doerr@iese.fraunhofer.de



2239 Sonnhild Namingha
Contact Office FC-MD (USA)
Student Exchange Program
sonnhild.namingha@iese.fraunhofer.de



Dial Phone No. +49 (0) 631/68 00- ...

Department Heads

1601 Jörg Dörr
Requirements and Usability Engineering (RUE)
joerg.doerr@iese.fraunhofer.de



1302 Dr. Dirk Muthig
Product Line Architectures (PLA)
dirk.muthig@iese.fraunhofer.de



1401 Dr. Christian Bunse
Component Engineering (CE)
christian.bunse@iese.fraunhofer.de



1301 Dr. Jürgen Münch
Processes and Measurement (PAM)
juergen.muench@iese.fraunhofer.de



2236 Dr. Christopher Robinson-Mallett
Testing and Inspections (TAI)
christopher.robinson-mallett@iese.fraunhofer.de



1204 Dr. Reinhard Schwarz
Security and Safety (SAS)
reinhard.schwarz@iese.fraunhofer.de



1203 Security and **Safety** (SAS)
Dr. Bernhard Kaiser
bernhard.kaiser@iese.fraunhofer.de



1201 Prof. Frank Bomarius
Experience Management (EM)
frank.bomarius@iese.fraunhofer.de



1501 Dr. Patrick Waterson
Education and Training (EAT)
patrick.waterson@iese.fraunhofer.de



Dial Phone No. +49 (0) 631/68 00- ...

Business Area Managers

1603 Ralf Kalmar
Automotive and Transportation Systems
ralf.kalmar@iese.fraunhofer.de



1602 Dr. Volker Hübsch
Telecommunication, Telematics and Service Providers
volker.huebsch@iese.fraunhofer



2196 Christian Denger
Medical Systems
christian.denger@iese.fraunhofer.de



1604 Michael Ochs
Information Systems and Public Sector
michael.ochs@iese.fraunhofer.de



Information Service

Fraunhofer-Institut für
Experimentelles Software Engineering
Fraunhofer-Platz 1

67663 Kaiserslautern
Germany

To receive further information, please
fax us a copy of this page.

Fax: +49 (0) 631/68 00-16 99

Further Information

- Annual Report 2005 of Fraunhofer IESE, print version (German)
- Annual Report 2005 of Fraunhofer IESE, print version (English)
- Annual Report 2005 of Fraunhofer IESE, CD-ROM version (German & English)
- Fraunhofer IESE: Overview
- The Fraunhofer-Gesellschaft from A-Z
- Annual Report of Fraunhofer-Gesellschaft
- STI Software Technology Initiative Kaiserslautern e.V.
- Please add my address to your information distribution list.

A pdf file of the Fraunhofer IESE Annual Report 2005 and other publications (e.g., technical reports, press releases, previous Annual Reports) are available at

www.iese.fraunhofer.de

Fraunhofer IESE Point of Contact:

Jörg Dörr
Public Relations
Phone: +49 (0) 631/68 00-60 00
Fax: +49 (0) 631/68 00-16 99
info@iese.fraunhofer.de

Return Address

Title

Last Name, First Name

Company

Position

Department

Address

Zip Code / City

Phone

Fax

E-mail

Date and Signature



Table of Content

Network in Science and Industry	112
Industrial Partners	112
National Research Partners	113
International Research Partners	114
International Software Engineering Research Network (ISERN)	115
Visitors Hosted	116
Professional Contributions	117
Lecturing Assignments	117
Editorial Boards	117
Committee Activities	118
Scientific and Technological Advisory Boards	120
Memberships in Industrial Advisory Boards	120
Participation in Delegations	120
Memberships in Professional Associations	121
Keynotes	121
Presentations	121
Scientific Publications	125
Books	125
Articles in Books	125
Articles in Journals	127
Published Dissertations	128
Contributions to Conference Proceedings	128
Standards	134
Fraunhofer IESE Reports	134
Doctoral Theses	137
Diploma and Master Theses	138
Project Theses	138
Awards	139
Internal	139
External	139
Appointments and Honors	139
Events	139

Network in Science and Industry

Industrial Partners¹

- ABB Corporate Research Ltd., Baden-Dättwil, Switzerland
- andrena objects ag, Karlsruhe
- Atmos MedizinTechnik GmbH, Lenzkirch
- Aucotec Bremen GmbH, Bremen
- Audi Electronics Venture GmbH, Gaimersheim
- Axess AG, Salzburg, Austria
- a3 systems GmbH, Zweibrücken
- BERGHOF Automatisierungstechnik GmbH, Eningen
- BigLever Software Inc., Austin, USA
- Blaupunkt GmbH, Hildesheim
- BMW AG, München
- BMW Car IT GmbH, München
- Boehringer Ingelheim Pharma KG, Ingelheim
- Boeing Company, Seattle, USA
- brainbot Technologies AG, Mainz
- Business + Innovation Center Kaiserslautern GmbH, Kaiserslautern
- Carmeq GmbH, Berlin
- CENIT AG Systemhaus, Stuttgart
- Commerzbank AG, Frankfurt
- DaimlerChrysler AG, Ulm
- DCON Software & Service AG, Kaiserslautern
- DCXNet, Stuttgart
- Delta Softwaretechnologie GmbH, Schmallingenberg
- Deutsche Post AG, Bonn
- Deutsche Telekom AG, Darmstadt
- Deutscher Gewerkschaftsbund Rheinland-Pfalz, Mainz
- Diamant Software GmbH & Co. KG, Bielefeld
- empolis knowledge management gmbh, Gütersloh
- Diamant Software GmbH & Co. KG, Bielefeld
- ESA European Space Agency, Darmstadt
- Fidelity Investments Institutional Services Company Inc., Boston, USA
- FIDUCIA IT AG, Karlsruhe
- FinanzIT GmbH, Hannover
- Freudenberg Anlagen und Werkzeugtechnik GmbH, Laudenbach
- FUJITSU Enabling Software Technology GmbH, München
- GEF-RIS AG, Leimen
- gekko mbH, St. Augustin
- Giesecke & Devrient GmbH, München
- Greengate AG, Windeck
- Gruner + Jahr AG & Co KG, Hamburg
- Healy Hudson GmbH, Hochspeyer
- Hitachi Ltd., Tokyo, Japan
- Hofmann Maschinen- und Anlagenbau GmbH, Worms-Rheindürkheim
- Human Solutions GmbH, Kaiserslautern
- IAE GmbH, Mainz-Kastel
- IBS AG engineering consulting software, Höhr-Grenzhausen
- ICTeam Internet Consulting AG, Trier
- IHK Zetis GmbH, Kaiserslautern
- Infoteam Software GmbH, Bubenreuth
- Inos Automatisierungssoftware GmbH, Herrenberg
- Insiders GmbH, Kaiserslautern
- Intershop Communications AG, Jena
- Jyvaskylan Yliopisto, Jyvaskyla, Finland
- Kapsch CarrierCom AG, Salzburg, Austria
- KEIPER GmbH & Co. KG, Kaiserslautern
- KORAMIS GmbH & Co. KG, St. Ingbert
- Kugler Maag + Comp. Ltd. & Co. KG, Kornwestheim
- KUKA Schweissanlagen GmbH, Augsburg
- LION bioscience AG, Heidelberg
- LogControl GmbH, Pforzheim
- Lucent Technologies Network Systems GmbH, Nürnberg
- market maker Software AG, Kaiserslautern
- maxess systemhaus gmbh, Kaiserslautern
- method park Software AG, Erlangen
- Microsoft Deutschland GmbH, Unterschleißheim
- Motorola, Inc., Schaumburg, USA
- M2K Informationsmanagement, Kaiserslautern
- NIWA-WEB Solutions Niederacher & Wahler OEG, Vienna, Austria
- Nokia Corporation, Helsinki, Finland
- Nokia GmbH, Bochum
- Pfaff Industriemaschinen AG, Kaiserslautern
- proALPHA Software AG, Weilerbach
- Psipenta Software Systems GmbH, Berlin
- OrgaTech Unternehmensberatung, Lünen
- Otwarty Rynek Elektroniczny S.A., Warsaw, Poland
- Polarion Software GmbH, Stuttgart
- PSI Logistics GmbH, Aschaffenburg
- QA Systems GmbH, Stuttgart
- Q-Labs GmbH, Stuttgart
- Ricoh Company Ltd., Tokyo, Japan
- Robert-Bosch GmbH, Stuttgart
- Rodan Systems Spolka Akcyjna, Warsaw, Poland
- ROSEN Swiss AG, Stans, Switzerland
- RWE Umwelt Südost GmbH & Co. KG, Wiesbaden
- SAC Sirius Advanced Cybernetics GmbH, Karlsruhe
- SAP AG, Walldorf
- SAS Institute GmbH, Heidelberg
- Schraml GmbH, Vagen
- Seidel GmbH & Co. KG, Marburg
- Siemens AG, München
- Siemens Information Systems Limited, Mumbai, India
- Siemens Medical Solutions Health Service AG, Erlangen
- SODALIA S.p.A., Trento, Italy
- SOFTWIN S.R.L., Bukarest, Romania

1) Industrial Partners are located in Germany unless stated otherwise.

- SOLID INFORMATION TECHNOLOGY, Oulu, Finland
- SQS Software Quality Systems AG, Köln
- Stadt Kaiserslautern, Kaiserslautern
- Stadtparkasse Kaiserslautern, Kaiserslautern
- Stadtwerke Lemgo GmbH, Lemgo
- Steinbichler Optotechnik GmbH, Neubeuern
- Süddeutsche Klassenlotterie, München
- SWA Software Akademie AG, Kaiserslautern
- Telekomunikacja Polska S.A., Warsaw, Poland
- Telenor ASA, Fornebu, Norway
- Testo AG, Lenzkirch
- Thomson Broadcast & Media Solutions GmbH, Weiterstadt
- T-Online International AG, Darmstadt
- T-Systems International GmbH, Frankfurt
- T-Systems Multimedia Solutions GmbH, Dresden
- UNISERV, Pforzheim
- Valeo Schalter und Sensoren GmbH, Wemding
- Verit Informationssysteme GmbH, Kaiserslautern
- Vision Tools GmbH, Waghäusel
- Vodafone D2 GmbH, Düsseldorf
- Wellington Partners Venture Capital GmbH, München
- WIKON Kommunikationstechnik GmbH, Kaiserslautern

National Research Partners

- Brandenburgische Technische Universität Cottbus, (Technical University of Brandenburg), Cottbus
- Deutsches Forschungszentrum für Künstliche Intelligenz GmbH (DFKI) (German Research Center for Artificial Intelligence GmbH), Kaiserslautern
- European Space Agency (ESA), Darmstadt
- Fachbereich Elektrotechnik und Informatik, Fachhochschule Münster (Department of Electrical Engineering and Informatics, Muenster University of Applied Sciences), Münster
- Fachbereich Informatik, Fachhochschule Mannheim (Department of Computer Science, University of Applied Sciences Mannheim), Mannheim
- Fachbereich Maschinenbau, Fachhochschule Kaiserslautern (Department of Mechanical Engineering, Kaiserslautern University of Applied Sciences), Kaiserslautern
- Fachhochschule Furtwangen (Furtwangen University of Applied Sciences), Furtwangen
- Forschungszentrum Informatik (FZI) (Research Center for Information Technologies), Karlsruhe
- Fraunhofer Gruppe Informations- und Kommunikationstechnik (IuK) (Fraunhofer Group Information and Communication Technology), Berlin

- Georg-August-Universität Göttingen (Georg-August-University Göttingen), Göttingen
- Hasso-Plattner-Institut für Software-systemtechnik, Universität Potsdam (Hasso-Plattner-Institute for Software Systems Engineering, University of Potsdam), Potsdam
- Institut für Automation und Kommunikation e.V. (ifak) (Institute for Automation and Communication), Magdeburg
- Institut für Informatik IV, Technische Universität München (Institute for Computer Science, Technical University of Munich), München
- Institut für Mathematik und angewandte Informatik, Lehrstuhl für Intelligente Informationssysteme, Universität Hildesheim (Institute for Mathematics and Applied Computer Science, Laboratory of Intelligent Information Systems, University of Hildesheim), Hildesheim
- Institut für Technologie und Arbeit, Technische Universität Kaiserslautern (Institute for Technology and Work, University of Kaiserslautern), Kaiserslautern
- Lehrstuhl für Software Systeme, Universität Duisburg-Essen (Institute for Computer Science and Information Systems, University of Duisburg-Essen), Essen
- L3S Learning Lab Lower Saxony, Universität Hannover (Learning Lab Lower Saxony, University of Hannover, Hannover)
- Technische Universität Kaiserslautern (University of Kaiserslautern), Kaiserslautern

- Thüringer Anwendungszentrum für Software, Informations- und Kommunikationstechnologie GmbH (Thüringen Application Center for Software and Technology of Information and Communication), Ilmenau
- Universität-Gesamthochschule Paderborn (University of Paderborn), Paderborn
- Universität Karlsruhe (University of Karlsruhe), Karlsruhe
- Universität Leipzig (University of Leipzig), Leipzig
- Universität Potsdam (University of Potsdam), Potsdam

International Research Partners

- Akademia Ekonomiczna W Poznaniu, Poznan, Poland
- Bay Zoltan Foundation for Applied Research, Budapest, Hungary
- Carleton University, Ottawa, Canada
- National ICT Australia (NICTA), Australian Technology Park, Eveleigh, Australia
- Centre for Object Technology Applications and Research (COTAR), Sydney University of Technology, Sydney, Australia
- Departamento de Informatica, Universidade Federal do Para, Belem, Brazil
- Department of Informations Systems, Nara Institute of Science and Technology, Ikoma, Japan
- Dipartimento Automatica e Informatica, Politecnico di Torino, Torino, Italy
- Dipartimento di Informatica, Università di Bari, Bari, Italy
- Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland
- Eidgenössische Technische Hochschule Zürich, Zurich, Switzerland
- European Software Institute (ESI), Bilbao, Spain (formal affiliation agreement)
- Experimental Software Engineering Group of the University of Maryland (UMD/ESEG), University of Maryland, College Park, USA (formal affiliation agreement)
- Facultad de Informatica, Universidad Politecnica de Madrid, Madrid, Spain
- Faculty of Electrical Engineering,

University of Banja Luka, Banja Luka, Boznia Herzegovina

- Faculty of Electrical Engineering, University of Tuzla, Tuzla, Boznia Herzegovina
- Faculty of Informatics, University Dzemal Bijedic, Mostar, Boznia Herzegovina
- Faculty of Information Technology, University of Akureyri, Akureyri, Iceland
- Helsinki University of Technology, Espoo, Finland
- Information-technology Promotion Agency, Tokyo, Japan
- Institute for Information Technology, National Research Council of Canada, Ottawa, Canada
- Institut National Polytechnique de Toulouse, Toulouse, France
- ITEA Office, Eindhoven University of Technology, Eindhoven, The Netherlands
- Japan Aerospace Exploration Agency JAXA, Tokyo, Japan
- Johannes Kepler Universität, Linz, Austria
- Katholieke Universiteit Leuven, Leuven, Belgium
- Kunglia Tekniska Hoegskolan, Stockholm, Sweden
- Laboratory for Software Engineering Decision Support, University of Calgary, Calgary, Canada
- National College of Ireland, Dublin, Ireland
- National University of Ireland, Galway, Ireland
- New Bulgarian University, Sofia, Bulgaria
- Norwegian University of Science and

- Technology, Trondheim, Norway
- Open University, Milton Keynes, United Kingdom
- Politecnico di Milano, Milan, Italy
- School of Mathematics, Statistics and Computer Science, University of New England, Armidale, Australia
- Software Process Support Lab, University of Calgary, Calgary, Canada
- SQI Software Quality Institute, Brisbane, Australia
- Swinburne University of Technology, Harthorn, Australia
- Tampere University of Technology (Pori), Pori, Finland
- Universidad de Lleida, Lleida, Spain
- Universidad Nacional Autónoma de México, Mexico City, Mexico
- Universidade do Vale do Itajai - UNIVALI, San Jose, Brazil
- Universität für Bodenkultur Wien, Vienna, Austria
- University of Innsbruck, Innsbruck, Austria
- University of Limerick, Limerick, Ireland
- VTT Electronics, Oulu, Finland (formal affiliation agreement)
- Wirtschaftsuniversität Wien, Vienna, Austria

International Software Engineering Research Network (ISERN)

- Blekinge Institute of Technology, Sweden
- Carleton University, Canada
- Central Research Institute of Electric Power Industry, Japan
- COPPE, Brazil
- DaimlerChrysler Research Center, Germany
- Fraunhofer Center Maryland, USA
- Fraunhofer Institute for Experimental Software Engineering, Germany
- Helsinki University of Technology, Finland
- Lucent Technologies – Bell Laboratories, USA
- Lund University, Sweden
- Nara Institute of Science and Technology, Japan
- Japan Aerospace Exploration Agency, Japan
- North Carolina State University, USA
- Norwegian University of Technology and Science, Norway
- NTT Data Corporation, Japan
- SINTEF, Norway
- Solid Information Technologies, Finland
- SUN Microsystems, USA

- Technical University of Vienna, Austria
- University Politechnico Madrid, Spain
- University of Alberta, Canada
- University of Bari, Italy
- University of Calgary, Canada
- University of Castilla - La Mancha, Spain
- University of Hawaii, USA
- University of Kaiserslautern, Germany
- University of Maryland, Baltimore County, USA
- University of Maryland at College Park, USA
- University of New South Wales, Australia
- University of Oslo, Norway
- University of Oulu, Finland
- University of Rome - Tor Vergata, Italy
- University of São Paulo, Brazil
- University of Southern California, USA
- University of Strathclyde, United Kingdom
- University of Technology Sydney, Australia
- VTT Electronics, Finland

Visitors Hosted

Kathrin Berg, University of Pretoria, Pretoria, South Africa, January - March

Naomi Kikuchi, OKI & IPA/SEC, Tokyo, Japan, February 22-25

Dr. Seishiro Tsuruho, Katsutoshi Shintani, Yasushi Ishigai, IPA/SEC, Tokyo, Japan, February 28

Ton Dekkers, Sogeti Nederland B. V., President of the International Software Benchmark Standards Group (ISBSG), February and April

Xiao Li Zhi, Shanghai University, Jinyuan You, Shanghai Jiaotong University, Liu Qun Fan, Tongji University, Hui Zhu Bao, Shanghai Asia & Pacific Co., Deng Xiang Zhong, Central Research Academy of SVA Group, Yuan Zhang Zheng, Shanghai Ship and Shipping Research Institute, Shanghai, China, April 1

Dr. Forrest Shull, Fraunhofer Center Maryland, College Park, Maryland, April and September

Norihisa Okada, Ricoh Co., Ltd., Tokyo, Japan, April 4-29

Zhi Gang Ding, Yu Qin Cai, Shanghai Development Center of Computer Software Technology, Jue Ming Wang, Shanghai Institute of Computer Technology, Jing Lin Yan, East-China Institute of Computer Technology Science Committee, Zhang Long Chen, Fudan University, Xin Biao Hui, SMEG Technology Development Co., Xiang Gang Jiang, East-China Institute of Computer Technology, Shanghai, China, April 5

Patricia Costa, Fraunhofer Center Maryland, College Park, Maryland, July

Victor Pankratius, University of Karlsruhe, Inst. AIFB, Karlsruhe, Germany, August 18

Minister Karl Peter Bruch, Ministry of the Interior and of Sports of Rhineland-Palatinate, Mainz, Mayor Bernhard Deubig, City of Kaiserslautern, Kaiserslautern, Germany, September 9

JUSE Team, Japanese Union of Scientists and Engineers, Tokyo, Japan, September 26

Zoran, Stejic, Ricoh Co., Ltd., Tokyo, Japan, October 10-28

Christian Democratic Union (CDU) Delegation, Kaiserslautern, Germany, November 23

Social Democratic Party (SPD) Delegation, Kaiserslautern, Germany, November 29

Ross Jeffery, University of New South Wales and National ICT Australia, Australia, December 7-8

Professional Contributions

Lecturing Assignments

Bunse, C.:

Lecture
Software Prozesse,
Computer Science Department,
University of Applied Sciences
Mannheim, Winter 2004/2005

Bunse, C.; Schneider, D.; Peper, C.:

Lecture
Unified Modeling Language,
Online Study Course Winfoline,
University of Göttingen,
Quarter 1 & 4, 2005

Liggesmeyer, P.:

Lecture
Entwicklung von Software-Systemen I,
Computer Science Department,
University of Kaiserslautern,
Winter 2004/2005

Lecture
Entwicklung von Software-Systemen II,
Computer Science Department,
University of Kaiserslautern,
Summer 2005

Lecture
Software Engineering I,
Computer Science Department,
University of Kaiserslautern,
Winter 2005/2006

Münc, J.:

Lecture
Process Modeling,
Computer Science Department,
University of Kaiserslautern,
Summer 2005

Muthig, D.:

Lecture
Software Product Lines,
Computer Science Department,
University of Kaiserslautern,
Winter 2004/2005 and
Winter 2005/2006

Rombach, D.:

Lecture
Software Engineering I,
Computer Science Department,
University of Kaiserslautern,
Winter 2004/2005

Lecture
Software Engineering II,
Computer Science Department,
University of Kaiserslautern,
Summer 2005

Lecture
Software Management and Quality
Assurance,
Computer Science Department,
University of Kaiserslautern,
Summer 2005

Lecture
Project Management and Quality
Assurance,
Computer Science Department,
University of Kaiserslautern,
Winter 2004/2005 and
Winter 2005/2006

Lecture
Empirical Model Building & Methods,
Computer Science Department,
University of Kaiserslautern,
Winter 2005/2006

Schmid, K.:

Lecture
Requirements Engineering,
Computer Science Department,
University of Kaiserslautern,
Summer 2005

Editorial Boards

Bomarius, F.:

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

Liggesmeyer, P.:

Editor, it – information technology,
Oldenbourg-Verlag, München,
since 2003

Member, Editorial Board, Lecture Notes
in Informatics (LNI), Gesellschaft für
Informatik GI, Springer-Verlag,
since 2003

Editor, Informatik – Forschung und
Entwicklung, Springer-Verlag,
since 2000

Member, Editorial Board, Ph.D. Theses
in Experimental Software Engineering,
Fraunhofer IRB Publishing Company,
since 2004

Rombach, D.:

Associate Editor, IEEE Transactions on
Software Engineering, since 2003

Associate Editor, ACM TOSEM,
since 2003

Member, Editorial Board, IEEE
Computer Magazine, since 1999

Associate Editor, International Journal
of Empirical Software Engineering,
Springer-Verlag, since 1996

Member, Editorial Board, International
Journal of Software Process:
Improvement and Practice, John Wiley
and Sons, since 1994

Member, Editorial Board, Informatik:
Forschung und Entwicklung,
Gesellschaft für Informatik GI,
Springer-Verlag, since 1993

Editor, Editorial Board, Ph.D. Theses in
Experimental Software Engineering,
Fraunhofer IRB Publishing Company,
since 2000

Committee Activities

Bella, F.:

Workshop Chair, Workshop on Software Productivity Measurement, Frankfurt, Germany, June 1

Workshop Chair, 2nd Workshop Software-Produktivitätsmessungen und Wiederverwendung von Software, Kaiserslautern, Germany, November 14

Bomarius, F.:

Program Co-Chair, PROFES 2005, Oulu, Finland, June 13-15

Bunse, C.:

Member, Program Committee, IASTED Int. Conference on Software Engineering, Innsbruck, Austria, February 14-16

Member, Program Committee, QoSA 2005, Erfurt, Germany, September 20-22

Member, Program Committee, MODELS/UML 2005, Montego Bay, Jamaica, October 2-7

Member, Program Committee, EuroSPI 2005, Budapest, Hungary, November 9-11

Ciolkowski, M.:

Member, Program Committee, CSEET 2005, Ottawa, Canada, April 18-20

Co-Chair, WSESE 2005, Oulu, Finland, June 13

Member, Program Committee, SEKE 2005, Taipei, Taiwan, July 14-16

Member, Program Committee, SPPI 2005, Porto, Portugal, August 30 - September 3

Member, Program Committee, METRICS 2005, Como, Italy, September 19-22

Member, Program Committee, EuroSPI 2005, Budapest, Hungary, November 9-11

Decker, B.:

Main Workshop Organizer, IOA 2005 at WM 2005, Kaiserslautern, Germany, April 12

Denger, C.:

Member, Program Committee, SPPI 2005, Porto, Portugal, August 30 - September 3

Member, Program Committee, METRICS 2005, Como, Italy, September 19-22

Girard, J.-F.:

Member, Program Committee, CSMR 2005, Manchester, United Kingdom, March 21-23

Jedlitschka, A.:

Member, Program Committee, SEKE 2005, Taipei, Taiwan, July 14-16

Member, Program Committee, ISESE 2006, Rio de Janeiro, Brazil, September 21-22

Member, Program Committee, ESELAW 2005, Uberlandia, Brazil, October 3

Co-Chair, GI-Workshop "Adaptivität und Benutzermodellierung in interaktiven Softwaresystemen" ABIS 2005, Saarbrücken, Germany, October 4-10

Member, Program Committee, ICSEA 2006, Tahiti, French Polynesia, October 29 - November 1

Member, Program Committee, ISESE 2005, Noosa Head, Australia, November 17-18

John, I.:

Workshop Chair, SPLYR 2005, Rennes, France, September 26

Liggesmeyer, P.:

Program Chair, SE 2005, Essen, Germany, March 8-11

Program Chair, Net.ObjectDays 2005, Erfurt, Germany, September 19-22

Program Chair, 24th International Conference on Conceptual Modeling ER 2005, Klagenfurt, Austria, October 24-28

Program Chair, SEA 2005, Phoenix, Arizona, USA, November 14-17

Münch, J.:

Member, Program Committee, SMEF 2005, Rome, Italy, March 2-4

Member, Program Committee, ProSim 2005, St. Louis, Missouri, USA, May 15-21

Member, Program Committee, QoSA 2005, Erfurt, Germany, September 1

Member, Program Committee, EUROMICRO/SPPI 2005, Porto, Portugal, August 30 - September 3

Member, Program Committee, EuroSPI 2005, Budapest, Hungary, November 1

Member, Program Committee, MetriKon 2005, Kaiserslautern, Germany, November 14-16

Co-Organizer, WESoC 2006, Tokyo, Japan, February 24-27, 2006

Member, Program Committee, Short Paper Track, CSEET 2006, Hawaii, USA, April 19-21, 2006

Member, Program Committee, SMEF 2006, Rome, Italy, March 10-12, 2006

Member, Program Committee,
SPW/ProSim 2006, Shanghai, China,
May 20-21, 2006

Member, Program Committee,
Experience Track, ICSE 2006, Shanghai,
China, May 20-28, 2006

Program Co-Chair and Member,
PROFES 2006, Amsterdam, The Nether-
lands, June 12-14, 2006

Member, Program Committee, ICSR9,
Torino, Italy, June 12-15, 2006

Member, Program Committee,
EUROMICRO/SPPI 2006, Cavtat/
Dubrovnik, Croatia, August 28 -
September 1, 2006

Member, Program Committee,
EuroSPI 2006, Joensuu, Finland,
October 11-13, 2006

Member, Program Committee,
APSEC 2006, Bangalore, India,
December 6-8, 2006

Muthig, D.:

Member, Program Committee,
NetobjectDays 2005, Erfurt, Germany,
September 1

Member, Program Committee,
SPLC 2005, Rennes, France,
September 26-29

Member, Program Committee,
ICSE 2006, Shanghai, China,
May 20-28, 2006

Nick, M.:

Conference Manager, WM 2005,
Kaiserslautern, Germany, April 10-13

Member, Program Committee,
IOA 2005 at WM 2005, Kaiserslautern,
Germany, April 12

Member, Program Committee,
GWEM 2005 at WM 2005,
Kaiserslautern, Germany, April 12

Member, Program Committee,
WMSE 2005 at GI-Jahrestagung
Informatik 2005, Bonn, Germany,
September 19-22

Pfahl, D.:

Member, Program Committee,
IASTED SE 2005, Innsbruck, Austria,
February 15-17

Member, Program Committee,
ECBS 2005, Greenbelt, Maryland, USA,
April 4-7

Member, Program Committee,
LSO 2005, Kaiserslautern, Germany,
April 10-13

Program Co-Chair, ProSim 2005,
St. Louis, Missouri, USA, May 14-15

Member, Program Committee,
PROFES 2005, Oulu, Finland,
June 13-16

Member, Program Committee, Invited
Session on Knowledge-Based
Technology in Web-Based Education at
KES 2005, Melbourne, Australia,
September 14-16

Ras, E.:

Workshop Organizer, LOKMOL 2005
at WM 2005, Kaiserslautern, Germany,
April 12

Member, Program Committee, Work-
shop on Human and Social Factors of
Software Engineering, ICSE 2005,
St. Louis, Missouri, USA, May 16

Member, Program Committee,
Special Track on Integrating Working
and Learning, I-Know 2005, Graz,
Austria, June 29 - July 1

Member, Program Committee, Markt-
platz Internet: Vom e-Learning bis
e-Payment, Leipziger Informatik-Tage,
Leipzig, Germany, September 21

Rombach, D.:

Member, Steering Committee,
METRICS Conference Series,
since 2002

Member, Program Committee,
SQM 2005, Düsseldorf, Germany,
April 6-8

Member, Program Committee,
ICSE 2005, St. Louis, Missouri, USA,
May 15-21

Program Co-Chair, World Congress on
Software Quality 2005, Munich,
Germany, September 26-30

Member, Program Committee,
SQM 2006, Düsseldorf, Germany,
May 10-12, 2006

Program Co-Chair, ICSE 2006,
Shanghai, China, May 20-28, 2006

Program Chair, Experience Track,
ICSE 2008, Leipzig, Germany, 2008

Schmid, K.:

Member, Program Committee,
HICSS 2005, Honolulu, Hawaii, USA,
January 3-6

Steffens, P.:

Publicity Co-Chair, PROFES 2005, Oulu,
Finland, June 13-15

Scientific and Technological Advisory Boards

Kerkow, D.:

Member, Steering Committee, German Chapter Usability Professionals' Association, Germany, since 2004

Co-Leader, UPA Regional Group Saar-Pfalz of the German Chapter Usability Professionals' Association, Germany, since 2004

Kohler, K.:

Co-Leader, UPA Regional Group Saar-Pfalz of the German Chapter Usability Professionals' Association, Germany, since 2004

Liggemeyer, P.:

Member, Steering Committee, Gesellschaft für Informatik, Germany, since 1999

Chair, GI Special Interest Group "Softwaretechnik", Germany, since 1999

Münch, J.:

Member, Diploma Thesis Awards Committee, DASMA e.V., Germany, since 2005

Rombach, D.:

Member, Technologiebeirat TBR ("Technology Advisory Board") for the Government of the State of Rhineland-Palatinate, Germany, since 1993

Coordinator, ISERN (International Software Engineering Research Networks), since 1996

Member, Advisory Board, Fraunhofer Center Maryland, College Park, USA, since 1998

Chair, Advisory Board, Arbeitsgemeinschaft der Bayerischen Forschungsverbände (Association of Bavarian Research Cooperations), München, Germany, 2002 - 2005 (Member since 1999)

Member, Advisory Board, Otto A. Wiprecht-Stiftung, Germany, since 1999

Member, Scientific Advisory Board, Simula Research Lab, Oslo, Norway, since 2001

Member, Steering Committee, Fraunhofer ICT Group, Germany, since 2001

Member, Advisor & Expert Group for the Governor of Rhineland-Palatinate, Germany, since 2002

Member, Board, SEI Process Achievement Award, since 2003

Member, Scientific Research Board, Kaiserslautern University of Applied Sciences, Germany, since 2003

Coordinator, German-Hungarian Cooperation of the University of Kaiserslautern, Germany, since 2004

Memberships in Industrial Advisory Boards

Rombach, D.:

Member, Advisory Board, Stiftung der Gasanstalt, Kaiserslautern, Germany, since 2002

Member, Advisory Board, Stadtparkasse Kaiserslautern, Kaiserslautern, Germany, since 2004

Participation in Delegations

Liggemeyer, P.:

Member, Delegation of the University of Kaiserslautern, Pusan National University, Korea, April

Rombach, D.:

Member, Delegation of the Mayor of Kaiserslautern Bernhard Deubig, Tokyo, Japan, October 22-27

Member, Delegation of the Prime Minister of Rhineland-Palatinate Kurt Beck, Washington, DC, USA, October 1-10

Memberships in Professional Associations

ACL – Association for Computational Linguistics

ACM – Association of Computing Machinery

AGBC – American-German Business Club Deutschland e.V.

AMS – American Mathematical Society

BV-Päd. – Bundesverband der Diplom-Pädagoginnen und Diplom-Pädagogen e.V.

DASMA – German Software Metrics and Effort Estimation Association

DGI – Deutsche Gesellschaft für Informationswissenschaft und Informationspraxis e.V.

EAMT – European Association for Machine Translation

GDM – Gesellschaft für Didaktik der Mathematik

GI – Gesellschaft für Informatik

IEEE – Institute of Electrical and Electronic Engineers

IMA – Institute of Mathematics and its Application

LAP – Liberty Alliance Project

Nesma – Dutch Software Metrics User Association

OMG – Object Management Group

Spider – Dutch Software Process Improvement Network

STI – Software Technologie Initiative e.V.

Tekom – Fachverband für technische Kommunikation und Dokumentation

Keynotes

Rombach, D.:

“Engineering Software: Trends in Research & Practice”, 10th Siemens Conference, Years of the Software Initiative – Past Achievements and Future Directions, Munich, Germany, December 5

Presentations

Becker, M.:

“Evaluierung von Werkzeugen für die Feature-basierte Produktableitung”, Invited Talk, Bosch Arbeitskreis Requirements Engineering, Stuttgart, Germany, May 9

“Technology, Architecture and Industry Capabilities”, Invited Talk, STI Arbeitskreis, Kaiserslautern, Germany, July 6

“Ambient Intelligente Lösungen im Gesundheits- u. Pflegebereich”, Invited Talk, STI Arbeitskreis, Kaiserslautern, Germany, November 25

Bella, F.:

“Project Management in New Domains through Process-oriented Collection and Analysis of Effort Data”, Paper, MetriKon 2005, DASMA, Kaiserslautern, Germany, November 16

Bunse, C.:

“Komponentenbasierte Entwicklung eingebetteter Systeme – Die MARMOT Methode”, Industry Seminar, Jahrestagung Software im Automobil, Stuttgart, Germany, May

“Applying a Blended Learning Strategy for Software Engineering Education”, Conference Presentation, CSEET&T 2005, Ottawa, Canada, May

Ciolkowski, M.:

“Accumulation and Presentation of Empirical Evidence: Problems and Challenges”, Proceedings, REBSE 2005, St. Louis, Missouri, USA, May 17

Decker, B.:

“A Community Based Approach for Organizing Software Product Line Evolution”, Paper, WM 2005 / Workshop LSO, Kaiserslautern, Germany, April 5

“Management von Anforderungsdokumenten mittels semantischer Wikis”, Paper, LWA/FGML 2005, Saarbrücken, Germany, October

“Erfahrungsmanagement: Status Quo und Herausforderungen an die Unterstützung durch Erfahrungsdatenbanken”, Paper, LWA/FGML 2005, Saarbrücken, Germany, October

“Nutzung von Wikis für das Requirements Engineering”, Presentation, RISE Infotag, Berlin, Germany, November 4

“Self-organized Reuse of Software Engineering Knowledge Supported by Semantic Wikis”, Paper, ISWC 2005, Galway, Ireland, November 6

Dörr, J.:

“Qualität in Software & Systemen”, Presentation, GI Fachgruppentreffen Requirements Engineering, Gesellschaft für Informatik, Hannover, Germany, November 24

Eisenbarth, M.:

“Definition und Modellierung von Anforderungen für IT-unterstützte Geschäftsprozesse”, Tutorial Presentation, ReConf 2005, HOOD, Munich, Germany, March 7-9

“From Requirements to Knowledge Engineering: Challenges for Adaptive Systems”, Workshop, RE 2005, IEEE, Paris, France, August 30

Freimut, B.:

“An Industrial Case Study of Implementing and Validating Defect Classification for Process Improvement and Quality Management”, Paper, METRICS Conference, Como, Italy, September 19

Ganesan, D.:

“Towards Testing Response Time of Instances of a Web-based Product Line”, Workshop, International Workshop on Software Product Line Testing 2005, Rennes, France, September

Grützner, I.:

“Learner- and Goal-Oriented E-Learning does not have to be expensive – The IntView Methodology for Systematic Courseware Development”, Invited Talk, Student Seminar, UNAM 2005, Mexico City, Mexico, May 6-16

“Learner- and Goal-Oriented E-Learning does not have to be expensive - Examples of Courseware”, Invited Talk, Student Seminar, UNAM 2005, Mexico City, Mexico, May 6-16

Jedlitschka, A.:

“A Community Based Approach for Organizing Software Product Line Evolution”, Paper, LSO 2005, Kaiserslautern, Germany, April 10-13

“Adapting PROFES for Use in an Agile Process: An Industry Experience Report”, Paper, PROFES 2005, Oulu, Finland, June 14-15

“Guidelines for empirical work in SE”, Paper, WSESE 2005, PROFES 2005, Oulu, Finland, June 14-15

“Reporting Guidelines for Controlled Experiments”, Paper, ISESE 2005, Noosa Head, Australia, November 17-18

Keuler, T.:

“Efficient Implementation of Intelligent Office Appliances with Software Product Lines”, Workshop, WM 2005, Kaiserslautern, Germany, April

Knodel, J.:

“Predicting and Measuring Resource Consumption of Embedded System Software”, Paper, Embedded World Conference 2005, Nuremberg, Germany, February 24

“Comparing Design Alternatives from Field-Tested Systems to Support Product Line Architecture Design”, Paper, CSMR 2005, Manchester, Great Britain, March 23

“A Systematic Approach for Comparing and Reusing Design Alternatives”, Workshop WSR 2005, Bad Honnef, Germany, May 2

“Static Evaluation of Software Architectures – A Short Summary”, Paper, WICSA 2005, Pittsburgh, USA, Nov 8

“Asset Recovery and Their Incorporation into Product Lines”, Paper, WCRE 2005, Pittsburgh, USA, November 10

“Analyzing Product Line Adequacy of Existing Components”, Workshop, R2PL 2005, Pittsburgh, USA, November 10

“Identifying Domain-Specific Reusable Components from Existing OO-System to Support Product Line”, Migration Workshop, R2PL 2005, Pittsburgh, USA, November 10

Koenig, T.:

“Definition und Modellierung von Anforderungen für IT-unterstützte Geschäftsprozesse”, Tutorial Presentation, ReConf 2005, HOOD, Munich, Germany, March 7-9

“Mehrwertorientiertes eGovernment durch Task Oriented Requirements Engineering” (TORE)”, Paper, SQM 2005, SQS, Düsseldorf, Germany, April 6-8

“Qualität in Software & Systemen – Ein praxiserprobter Ansatz zur Erhebung und Spezifikationen von Nicht-funktionellen Anforderungen”, Paper, SQM 2005, SQS, Düsseldorf, Germany, April 6-8

“Adapting Business Processes to Varying Business Needs: Some Case Studies”, Workshop, RE 2005, IEEE, Paris, France, August 30

Kolb, R.:

“Introducing the PuLSE Approach to an Embedded System Population at Testo AG”, Paper, ICSE 2005, St. Louis, Missouri, USA, May 14-21

“A Case Study in Refactoring a Legacy Component for Reuse in a Product Line”, Paper, ICSM 2005, Budapest, Hungary, September 26-29

Liggismeyer, P.:

“Software-Qualitätsmessung: Von der Theorie zur Empirie”, MetriKon 2005, Kaiserslautern, Germany, November 15

“Agile vs. disziplinierte Prozesse in der Softwareentwicklung”, Bitkom, Berlin, Germany, November 18

Münc, J.:

“Entwicklung von Software-Systemen in (räumlich) verteilten Umgebungen”, Talk, KMU-Förderung für Software-Engineering-Themen, STI, Kaiserslautern, Germany, January 19

“Improving Cost Estimation Capabilities in System Organizations: Transparent Cost Estimation Modeling With Cobra”, Talk, WOCS, Japan Aerospace Exploration Agency JAXA, Tokyo, Japan, January 28

“Towards Quantitative Software Project Management”, Talk, MELCO, Tokyo, Japan, January 31

“Project Management and Business Analysis”, Talk, Working Group “Software and Systems Engineering”, STI, Kaiserslautern, Germany, March 16

“Improving Cost Estimation Capabilities: Cost Modeling With CoBRA”, Talk, SEC, Schaumburg, IL, USA, May 12

“Goal-oriented Composition of Software Process Patterns”, Talk, ProSim 2005, St. Louis, Missouri, USA, May 14

“Workshop on SW Process Simulation and Modeling Accumulation and Presentation of Empirical Evidence: Problems and Challenges”, Talk, REBSE 2005, St. Louis, Missouri, USA, May 17

“Acquisition of a Project-Specific Process”, Talk, PROFES 2005, Oulu, Finland, June 15

“Perspective-Based Evaluation of Software Process Model Management Tool Suites”, Talk, WCSQ 2005, Munich, Germany, September 29

“Effective Process Integration for Space-related Software Development”, Talk, WOCS 2005, JAXA, Tokyo, Japan, November 5

“Empirical Software Engineering and Software Quality in Europe”, Tutorial, JUSE, Tokyo, Japan, November 5

“Vom Geschäftsziel zum Messziel”, Talk, STI Jahrestreffen, Kaiserslautern, Germany, November 25

Muthig, D.:

“Product Line Engineering in Practice”, Tutorial Presentation, SAICSIT 2005, White River, South Africa, September 22

“Product Line Engineering in Practice”, Tutorial Presentation, Software Quality Week 2005, Munich, Germany, September 26

“Von Standardsoftware zur Individualisierung – “SAP Net Weaver” als Produktlinienplattform”, Talk, Objektforum, Karlsruhe, Germany, December 05

Nick, M.:

“Experience-based Support for Code Inspections”, Paper, LSO 2005, Kaiserslautern, Germany, April

“Maintaining Experience to Learn: Case Studies on Case-Based Reasoning and Experience Factory”, Paper, FGML 2005, Saarbrücken, Germany, October

Ocampo, A.

“Tracing Process Model Evolution: A Semi-Formal Process Modeling Approach”, Paper, ECDMA Traceability Workshop, SINTEF, Nuremberg, Germany, November 08

Peine, H.:

“Faustregeln zur Entwicklung sicherer Software”, Presentation, CAST-Forum, Darmstadt, Germany, May 19

“Rules of Thumb for Secure Software Engineering”, Tutorial Presentation, ICSE 2005, St. Louis, Missouri, USA, May 15-21

Peper, C.:

“UML 2.0 – Vom Modellieren zum Programmieren”, Talk, Seminar Lehrerweiterbildung Informatik, Schloss Dagstuhl – Universität Saarbrücken, Dagstuhl, Germany, December 8

Pfahl, D.:

“System Dynamics Simulation – A Tool in Support Risk Assessment and Decision Support”, Tutorial Presentation, IASTED Intern. Conference on Software Engineering SE 2005, Innsbruck, Austria, February 16-17

“Towards an Agile Development Method for Software Process Simulation”, Paper Presentation, ProSim 2005, St. Louis, Missouri, USA, May 13-16

Ras, E.:

“Workshop Motivation: Trends and Future Issues on E-Learning and KM”, Workshop Presentation, LOKMOL 2005, Kaiserslautern, Germany, April 05

“Integration of E-Learning and Knowledge Management – Barriers, Solutions and Future Issues”, Conference Presentation, I-Know 2005, Graz, Austria, June 29 - July 1

“Just-in-time Learning with Situational Content Objects”, Conference Presentation, ELEARN 2005, Vancouver, Canada, October 24-28

“Setting up your own Learning Object Environment”, Tutorial Presentation, ELEARN 2005, Vancouver, Canada, October 24-28

Rombach, D.:

“Practical Software Engineering Approaches”, Colloquium, University of Rome “Tor Vergata”, Italy, May 6

“IT’s Impact on Human Society: Interoperability”, Presentation, Science & Technology in Society Forum, Kyoto, Japan, September 12

“Competence Base Kaiserslautern”, Talk, Symposium on International Conversion Projects, German Embassy, Washington, DC, USA, October 3

“Software Engineering in Kaiserslautern”, Talk, Workshop, TÜV Deutschland, Yokohama, Japan, October 24

“Lessons Learned from Empirical Studies at IESE”, Talk, Session on Guidelines for Empirical Research, ISERN Workshop, Noosa Heads, Australia, November 14

Schmid, K.:

“Moderne Techniken der Anforderungsanalyse: Herausforderungen, Lösungsansätze, Fördermöglichkeiten”, STI Arbeitskreis, STI, Kaiserslautern, Germany, February 2

“Neue Ansätze bei der Anforderungserfassung und -analyse für die Entwicklung komplexer Produkte”, Forum Softwareprozesse, DaimlerChrysler, Ulm, Germany, April 20

“A Competition of Software Product Line Economic Models”, Panel-Statement, SPLC 2005, Rennes, France, September 28

Schwarz, R.:

“Prüfen von IOS Konfigurationen mit dem Werkzeug CROCODILE”, Presentation, TECH DAY Wacker, Wacker Chemie Burghausen, Germany, April 13

“CROCODILE – Sicherheitsanalysen von Routerkonfigurationen mit einem Prüfwerkzeug”, Presentation, CAST-Forum, Workshop Netzwerksicherheit, Darmstadt, Germany, April 21

Steffens, P.:

“FLOrIp – internetbasiertes Geo-Informationssystem für Landwirtschaft und Weinbau”, Speakers Corner Rheinland-Pfalz, CeBIT 2005, Hanover, Germany, March 10-16

“eGovernment für Verwaltung und Wirtschaft – Vom Bedarf zur akzeptierten Lösung”, Fraunhofer-Forum eGovernment, CeBIT 2005, Hanover, Germany, March 10-16

“Mehrwert für Wirtschaft und Verwaltung: Flächeninformationen Online in Rheinland-Pfalz”, econique – Verwaltungsgipfel Modernisierung & eGovernment 2, Bergisch Gladbach, Germany, June 15-16

“Branchengetriebenes und nutzenorientiertes eGovernment in Rheinland-Pfalz: Erfahrungen und weiteres Vorgehen”, Impulsreferat, Multimedia-kongress 2005, ZDF-Konferenzzentrum, Mainz-Lerchenberg, Germany, September 8

“FLOrIp – Land Parcel Information Online for Farmers and Administration”, T-Systems International University Conference 2005, Neuss, Germany, October 10-11

“Wie finden eGovernment-Lösungen Akzeptanz in der Wirtschaft?”, eGovernmentForum, SYSTEMS 2005, Munich, Germany, October 24-28

Steinbach-Nordmann, S.:

“Blended Learning-Erfahrungen aus der innerbetrieblichen Bildung”, Conference Presentation, Auftaktveranstaltung Modellprojekt „Blended Learning in KMU“, Berliner Senat, Combi Consult GmbH, Deutschland, Berlin, Germany, October 18

Thomas, L.

“Courseware Development Using a Single Source Approach”, Conference Presentation, Ed-Media 2005, Montreal, Canada, June 26-30

“The XML Way. Courseware Development Using XML and Open Source Software”, Conference Presentation, Online-Educa 2005, Berlin, Germany, November 30 - December 2

Trapp, S.

“IT Technical Writer”, Product & Services Presentation, Fit for the Future: E-Learning in der IT-Weiterbildung, Berlin, Germany, June 2

Vollmers, C.:

“Requirements Engineering for Communities of Practice: Aufbau der Reqman Community”, GeNeMe 2005, Dresden, Germany, October 6-7

Waterson, P.:

“The Human Side of Software Engineering”, STI-Arbeitskreis Presentation, STI, Kaiserslautern, Germany, October 19

Scientific Publications²

Books

Althoff, K.-D.; Dengel, A.; Bergmann, R.; **Nick, M.;** Roth-Berghofer, T. (eds.); Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI): 3rd Conference on Professional Knowledge Management – Experiences and Visions, WM 2005, Kaiserslautern, Proceedings. Kaiserslautern, 2005 ISBN 3-00-016020-5

Althoff, K.-D.; Dengel, A.; Bergmann, R.; **Nick, M.;** Roth-Berghofer, T. (eds.): Professional Knowledge Management, 3rd Biennial Conference, WM 2005. 3rd Conference on Professional Knowledge Management – Experiences and Visions, WM 2005, Kaiserslautern, Revised Selected Papers. Berlin, Springer-Verlag, 2005 (Lecture Notes in Artificial Intelligence – Subseries of Lecture Notes in Computer Science 3782) ISBN 3-540-30465-7

Atkinson, C.; **Bunse, C.;** **Groß, H.-G.;** **Peper, C. (eds.):** Component-Based Software Development for Embedded Systems. An Overview of Current Research Trends: State-of-the-Art Survey. Berlin, Springer-Verlag, 2005 (Lecture Notes in Computer Science 3778) ISBN 3-540-30644-7

Boehm, B.; **Rombach, H. D.;** **Zelkowitz, M. V. (eds.):** Foundations of Empirical Software Engineering: The Legacy of Victor R. Basili. Berlin, Springer-Verlag, 2005 ISBN 3-540-24547-2

Bomarius, F.; Komi-Sirviö, S. (eds.): 6th International Conference on Product Focused Software Process Improvement, Profes 2005, Oulu, Proceedings. Berlin, Springer-Verlag, 2005 (Lecture Notes in Computer Science 3547) ISBN 3-540-26200-8

Harning, M. B.; Kazman, R.; **Kerkow, D.;** **Kohler, K.;** Gulliksen, J. (eds.): Workshop on Integrating Software Engineering and Usability Engineering, Rome, Proceedings. Rome, 2005

Liggesmeyer, P.; Pohl, K.; Goedicke, M. (eds.); Gesellschaft für Informatik (GI): Software Engineering 2005, Fachtagung des GI-Fachbereichs Software-technik, Essen, Proceedings. Bonn, GI - Gesellschaft für Informatik, 2005 (GI-Edition – Lecture Notes in Informatics (LNI) – Proceedings Volume P-64) ISBN 3-88579-393-8

Liggesmeyer, P.; **Rombach, H. D. (eds.):** Software Engineering eingebetteter Systeme. Grundlagen – Methodik – Anwendungen. Heidelberg, Elsevier, Spektrum Akademischer Verlag, 2005 ISBN 3-8274-1533-0

Pfahl, D.; Raffo, D. M.; **Rus, I.;** Wernick, P. (eds.): ProSim'05, 6th International Workshop on Software Process Simulation and Modeling, St. Louis, USA. 2005 ISBN 3-8167-6761-3

Articles in Books

Armbrust, O.; Berlage, T.; Hanne, T.; Lang, P.; **Münc, J.;** **Neu, H.;** Nickel, S.; **Rus, I.;** Sarishvili, A.; van Stockum, S.; Wirsén, A.: Simulation-based Software Process Modeling and Evaluation. In: Chang, S.-K. (ed.): Handbook of Software Engineering & Knowledge Engineering: Vol. 3, Recent Advances. Singapore, World Scientific, 2005, pp. 333-364

Atkinson, C.; **Bunse, C.;** **Peper, C.;** **Groß, H.-G.:** Component-Based Software Development for Embedded Systems – An Introduction. In: Atkinson, C.; **Bunse, C.;** **Groß, H.-G.;** **Peper, C. (eds.):** Component-Based Software Development for Embedded Systems. An Overview of Current Research Trends: State-of-the-Art Survey. Berlin, Springer-Verlag, 2005, pp. 1-7 (Lecture Notes in Computer Science 3778)

Decker, B.; John, M.: Informations- und Kommunikationstechnologie. In: Fraunhofer Wissensmanagement Community: Wissen und Information 2005. Stuttgart, Fraunhofer IRB Verlag, 2005, pp. 75-95

Decker, B.; Finke, I.; John, M.; Joisten, M.; Schnalzer, K.; Voigt, S.; Wesoly, M.; Will, M.: Zusammenfassung. In: Fraunhofer Wissensmanagement Community: Wissen und Information 2005. Stuttgart, Fraunhofer IRB Verlag, 2005, pp. 97-104

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

Denger, C.; Olsson, T.:

Quality Assurance in Requirements Engineering.

In: Aurum, A.; Wohlin, C. (eds.): Engineering and Managing Software Requirements. Berlin, Springer-Verlag, 2005, pp. 163-185

Groß, H.-G.; Mayer, N.; Riano, J. P.:

Assessing Real-Time Component Contracts Through Built-in Evolutionary Testing.

In: Atkinson, C.; Bunse, C.; Groß, H.-G.; Peper, C. (eds.): Component-Based Software Development for Embedded Systems. An Overview of Current Research Trends: State-of-the-Art Survey. Berlin, Springer-Verlag, 2005, pp. 107-122 (Lecture Notes in Computer Science 3778)

Grunske, L.; Kaiser, B.; Reussner, R.: Specification and Evaluation of Safety Properties in a Component-Based Software Engineering Process.

In: Atkinson, C.; Bunse, C.; Groß, H.-G.; Peper, C. (eds.): Component-Based Software Development for Embedded Systems. An Overview of Current Research Trends: State-of-the-Art Survey. Berlin, Springer-Verlag, 2005, pp. 249-274 (Lecture Notes in Computer Science 3778)

Grützner, I.; Paech, B.:

Requirements Engineering for Courseware Development.

In: Maté, J. Luis; Silva, A. (eds.): Requirements Engineering for Sociotechnical Systems. Hershey, Information Science Publishing, 2005, pp. 170-188

Kerkow, D.; Dörr, J.; Paech, B.;

Olsson, T.; Koenig, T.:

Elicitation and Documentation of Non-Functional Requirements for Sociotechnical Systems.

In: Maté, J. L.; Silva, A. (eds.): Requirements Engineering for Sociotechnical Systems. Hershey, Information Science Publishing, 2005, pp. 284-302

Liggesmeyer, P.:

Einleitung und Überblick.

In: Liggesmeyer, P.; Rombach, H. D. (eds.): Software Engineering eingebetteter Systeme. Grundlagen – Methodik – Anwendungen. Heidelberg, Elsevier, Spektrum Akademischer Verlag, 2005, pp. 1-12

Liggesmeyer, P.:

Prüfung eingebetteter Software.

In: Liggesmeyer, P.; Rombach, H. D. (eds.): Software Engineering eingebetteter Systeme. Grundlagen – Methodik – Anwendungen. Heidelberg, Elsevier, Spektrum Akademischer Verlag, 2005, pp. 205-225

Mäckel, O.; Kaiser, B.:

Sicherheits- und Zuverlässigkeitsanalysetechniken.

In: Liggesmeyer, P.; Rombach, H. D. (eds.): Software Engineering eingebetteter Systeme. Grundlagen – Methodik – Anwendungen. Heidelberg, Elsevier, Spektrum Akademischer Verlag, 2005, pp. 281-315

Münch, J.; Rombach, H. D.:

Entwicklungsprozesse für eingebettete Software.

In: Liggesmeyer, P.; Rombach, H. D. (eds.): Software Engineering eingebetteter Systeme. Grundlagen – Methodik – Anwendungen. Heidelberg, Elsevier, Spektrum Akademischer Verlag, 2005, pp. 13-38

Münch, J.:

SEV. Simulation-based evaluation and improvement of software development processes: Simulation of Software Development.

In: Fraunhofer Information and Communication Technology Group (ICT): Living and Working in a Networked World. Report on Results. Berlin, 2005, pp. 86-87

Münch, J.; Heidrich, J.:

Tool-based Software Project Control.

In: Chang, Shi-Kuo (eds.): Handbook of Software Engineering & Knowledge Engineering : Vol. 3, Recent Advances. Singapore, World Scientific, 2005, pp. 477-512

Muthig, D.:

Das virtuelle Büro der Zukunft. Jahrbuch Verwaltungsmodernisierung 2005/2006, Monitoring eGovernment & Öffentliches Auftragswesen in Deutschland.

Berlin, Wegweiser, 2005, p. 242

Paech, B.; Denger, C.; Kerkow, D.; Knethen, A.:

Requirements Engineering for Technical Products: Integrating Specification, Validation and Change Management.

In: Maté, J. L.; Silva, A. (eds.): Requirements Engineering for Sociotechnical Systems. Hershey, Information Science Publishing, 2005, pp. 153-169

Paech, B.; Koenig, T.; Borner, L.; Aurum, A.:

An Analysis of Empirical Requirements Engineering Survey Data.

In: Aurum, A.; Wohlin, C. (eds.): Engineering and Managing Software Requirements. Berlin, Springer-Verlag, 2005, pp. 427-452

Rombach, H. D.:

Learning Organization and Experience Factory.

In: Boehm, B.; **Rombach, H. D.;**

Zelkowitz, M. V. (eds.):

Foundations of Empirical Software Engineering: The Legacy of Victor R. Basili. Berlin, Springer-Verlag, 2005, pp. 176-178

Waterson, P.; Weibelzahl, S.; Pfahl, D.:

Software Process Modelling: Socio-Technical Perspectives.

In: Acuña, S. T.; Juristo, N. (ed.):

Software Process Modeling.

New York, Springer-Verlag, 2005,

pp. 111-139

(The Kluwer International Series in Software Engineering 10)

Articles in Journals

Althoff, K.-D.; Decker, B.; Hanft, A.; Mänz, J.; **Nick, M.;** **Rech, J.;** Schaaf, M.: Intelligente Informationssysteme für wissensintensive Dienstleistungen: Einblick in die Forschungsarbeit des Bereichs „Intelligente Informationssysteme“.

In: Uni Hildesheim, Das Magazin (2005), 9, pp. 5-8

Bauer, T.; Herrmann, J.; **Liggemeyer, P.;** **Robinson-Mallett, C.:**

A Flexible Integration Strategy for In-Car Telematics Systems.

In: ACM SIGSOFT Software Engineering Notes 30 (2005), 4, 7 p.

Bayer, J.:

Aufbau und Einsatz einer Erfahrungsdatenbank zur systematischen, organisationsweiten Verbesserung von Software-Dokumentationen.

In: KI – Künstliche Intelligenz 19 (2005), 3, pp. 70-72

Choi, Y.:

Model Checking Flight Guidance Systems: from Synchrony to Asynchrony.

In: Electronic Notes in Theoretical Computer Science 133 (2005), pp. 61-79

Ciolkowski, M.; **Münch, J.:**

Accumulation and Presentation of Empirical Evidence: Problems and Challenges.

In: ACM SIGSOFT Software Engineering Notes 30 (2005), 4, 3 p.

Denger, C.; Paech, B.; **Freimut, B.:**

Achieving high quality of use-case-based requirements.

In: Informatik - Forschung und Entwicklung 20 (2005), pp. 1-2, pp. 11-23

Heimdahl, M. P. E.; **Choi, Y.;**

Whalen, M. W.:

Deviation Analysis: A New Use of Model Checking.

In: Automated Software Engineering 12 (2005), 3, pp. 321-347

Knodel, J.; **Forster, T.;** **Girard, J.-F.:**

A Systematic Approach for Comparing and Reusing Design Alternatives.

In: Softwaretechnik-Trends 25 (2005), 2, pp. 29-30

Kolb, R.; **Muthig, D.;** Yamauchi, K.:

Migration existierender Softwarekomponenten in eine Produktlinie.

In: OBJEKTSpektrum. Die Zeitschrift für Web- und Objekttechnologie (2005), 4, pp. 74-79

Münch, J.; **Pfahl, D.;** **Rus, I.:**

Virtual Software Engineering Laboratories in Support of Trade-off Analyses.

In: Software Quality Journal 13 (2005), 4, pp. 407-428

Muthig, D.:

Systematischer Aufbau und Einsatz von Wissen zur effizienten Entwicklung von Software-Varianten.

In: KI - Künstliche Intelligenz 19 (2005), 2, pp. 66-68

Nick, M.:

Feedback-based Experience Maintenance for Closed-Loop Reuse Processes.

In: KI – Künstliche Intelligenz (2005), 4, pp. 54-57

Ocampo, A.; **Bella, F.;** **Münch, J.:**

Software process commonality analysis.

In: Software Process – Improvement and Practice 10 (2005), 3, pp. 273-285

Ras, E.; Avram, G.; Waterson, P.; Weibelzahl, S.:

Using Weblogs for Knowledge Sharing and Learning in Information Spaces.
In: Journal of Universal Computer Science J.UCS 11 (2005), 3, pp. 394-409

Paech, B.; Dörr, J.; Koehler, M.:
Improving Requirements Engineering Communication in Multiproject Environments.
In: IEEE Software 22 (2005), 1, pp. 40-47

Robinson-Mallett, C.; Liggesmeyer, P.; Mücke, T.; Goltz, U.:
Generating Optimal Distinguishing Sequences with a Model Checker.
In: ACM SIGSOFT Software Engineering Notes 30 (2005), 4, 7 p.

Schmid, K.; Biffl, S.:
Systematic Management of Software Product Lines.
In: Software Process - Improvement and Practice 10 (2005), 1, pp. 61-76

Published Dissertations

Nick, M.:
Experience Maintenance through Closed-Loop Feedback.
Stuttgart, Fraunhofer IRB Verlag, 2005 (PhD Theses in Experimental Software Engineering Vol. 16). ISBN 3-8167-6927-6

Trapp, M.:
Modeling the Adaptation Behavior of Adaptive Embedded Systems.
München, Verlag Dr. Hut, 2005 ISBN 3-89963-214-1

Contributions to Conference Proceedings

Althoff, K.-D.; Mänz, J.; Nick, M.:
Maintaining Experience to Learn: Case Studies on Case-Based Reasoning and Experience Factory.
In: Bauer, M.; Kröner, A.; Brandherm, B. (eds.); Gesellschaft für Informatik (GI): Lernen – Wissensentdeckung – Adaptivität (LWA) 2005. Workshop-woche der GI-Fachgruppen/Arbeitskreise: Adaptivität und Benutzermodellierung in Interaktiven Softwaresystemen (ABIS), Knowledge Discovery (AKKD), Maschinelles Lernen (FGML). Saarbrücken, 2005, pp. 118-125

Angkasaputra, N.; Pfahl, D.:
Towards an Agile Development Method for Software Process Simulation.
In: **Pfahl, D.;** Raffo, D. M.; **Rus, I.;** Wernick, P. (eds.): The 6th International Workshop on Software Process Simulation and Modeling, ProSim 2005. 2005, pp. 83-92

Angkasaputra, N.; Bella, F.; Riddle, W. E.:
Perspective-based Evaluation of Software Process Management Tool Suites.
In: International Software Quality Institute GmbH (iSQI): 3rd World Congress for Software Quality 2005, Proceedings, Volume II. Erlangen, 2005, pp. 275-285

Armbrust, O.; Ocampo, A.; Soto, M.:
Tracing Process Model Evolution: A Semi-Formal Process Modeling Approach.
In: Oldevik, J.; Agedal, J. (eds.): Traceability Workshop, ECMDA-TW 2005, Proceedings. Trondheim, 2005, pp. 57-66 (SINTEF Report STF90 A05133)

Bauer, T.; Herrmann, J.; Liggesmeyer, P.; Robinson-Mallett, C.: A Flexible Integration Strategy for In-Car Telematics Systems. Proceedings, 2nd International Workshop on Software Engineering for Automotive Systems, SEAS 2005. New York, ACM Press, 2005, 7 p.

Bella, F.; Ocampo, A.; Münch, J.: Project Management in New Domains through Process-oriented Collection and Analysis of Effort Data. In: Büren, G.; Bundschuh, M.; Dumke, R. (eds.): MetriKon 2005, Praxis der Software-Messung, Tagungsband des DASMA Software Metrik Kongresses. Aachen, Shaker Verlag, 2005, pp. 171-182 (Magdeburger Schriften zum Empirischen Software Engineering)

Berg, K.; Bishop, J.; Muthig, D.: Tracing Software Product Line Variability – From Problem to Solution Space. In: Bishop, J.; Kourie, D. (eds.): Research for a Changing World. Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists, SAICSIT 2005, Proceedings. Pretoria, South African Institute for Computer Scientists and Information Technologists, 2005, pp. 182-191

Bunse, C.; Denger, C.: Improving the Quality of Embedded Systems through the Systematic Combination of Construction and Analysis Activities. In: Klein, T.; Rumpe, B.; Schätz, B. (eds.): Technische Universität Braunschweig, Institut für Software Systems Engineering: Tagungsband des Dagstuhl-Workshops „Modellbasierte Entwicklung eingebetteter Systeme“, MBEES 2005. Braunschweig, 2005, pp. 85-96 (Technischer Bericht. Institut für Software Systems Engineering, Technische Universität Braunschweig, TUBS-SSE-2005-01)

Ciolkowski, M.; Münch, J.: Accumulation and Presentation of Empirical Evidence: Problems and Challenges. Workshop on Realising Evidence-Based Software Engineering, REBSE 2005, Proceedings. New York, ACM Press, 2005, 3 p.

Decker, B.; Muthig, D.: A Community Based Approach for Organizing Software Product Line Evolution. In: **Althoff, K.-D.**; Dengel, A.; Bergmann, R.; **Nick, M.**; Roth-Berghofer, T. (eds.); Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI): 3rd Conference Professional Knowledge Management – Experiences and Visions, WM 2005, Proceedings. Kaiserslautern, 2005, pp. 62-66

Decker, B.; Ras, E.; Rech, J.; Klein, B.; Reuschling, C.; Höcht, C.; Kilian, L.; Traphöner, R.; Haas, V.: A Framework for Agile Reuse in Software Engineering using Wiki Technology. In: **Althoff, K.-D.**; Dengel, A.; Bergmann, R.; **Nick, M.**; Roth-Berghofer, T. (eds.); Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI): 3rd Conference Professional Knowledge Management – Experiences and Visions, WM 2005, Proceedings. Kaiserslautern, 2005, pp. 411-414

Decker, B.: Management von Anforderungsdokumenten mittels semantischer Wikis: Vortrags-Abstract. In: Bauer, M.; Kröner, A.; Brandherm, B. (eds.); Gesellschaft für Informatik (GI): Lernen – Wissensentdeckung – Adaptivität (LWA) 2005. Workshopwoche der GI-Fachgruppen/Arbeitskreise: Adaptivität und Benutzermodellierung in Interaktiven Softwaresystemen (ABIS), Knowledge Discovery (AKKD), Maschinelles Lernen (FGML). Saarbrücken, 2005, pp. 145-146

Decker, B.; Nick, M.; John, M.: Erfahrungsmanagement: Status Quo und Herausforderungen an die Unterstützung durch Erfahrungsdatenbanken. In: Bauer, M.; Kröner, A.; Brandherm, B. (eds.); Gesellschaft für Informatik (GI): Lernen – Wissensentdeckung – Adaptivität (LWA) 2005. Workshopwoche der GI-Fachgruppen/Arbeitskreise: Adaptivität und Benutzermodellierung in Interaktiven Softwaresystemen (ABIS), Knowledge Discovery (AKKD), Maschinelles Lernen (FGML). Saarbrücken, 2005, pp. 147-150

Diekmann, H.; Knodel, J.; Ganesan, S.: Predicting and Measuring Resource Consumption of Embedded System Software. In: Grote, C.; Ester, R. (eds.): Embedded World 2005 Conference, Proceedings. Poing, WEKA Fachzeitschriften-Verlag, 2005, pp. 741-750

Dörr, J.; Kerkow, D.; Koenig, T.; **Olsson, T.;** Suzuki, T.: Non-Functional Requirements in Industry – Three Case Studies Adopting an Experience-based NFR Method. In: IEEE Computer Society: 13th IEEE International Requirements Engineering Conference, RE 2005, Proceedings. Los Alamitos, IEEE Computer Society, 2005, pp. 373-382

- Fægri, T. E.; **Decker, B.**; Dingsøy, T.; Jaccheri, L.; Lago, P.; **Muthig, D.**; Vliet, H.:
Exploring Communities of Practice for Product Family Engineering.
In: **Althoff, K.-D.**; Dengel, A.; Bergmann, R.; **Nick, M.**; Roth-Berghofer, T. (eds.):
3rd Biennial Conference on Professional Knowledge Management, WM 2005, Revised Selected Papers.
Berlin, Springer-Verlag, 2005, pp. 96-105
(Lecture Notes in Artificial Intelligence – Subseries of Lecture Notes in Computer Science 3782)
- Freimut, B.**; **Denger, C.**; Ketterer, M.:
An Industrial Case Study of Implementing and Validating Defect Classification for Process Improvement and Quality Management.
11th International Software Metrics Symposium, Metrics 2005, Proceedings.
Los Alamitos, IEEE Computer Society, 2005, 10 p.
- Ganesan, D.**; Maurer, U.; **Ochs, M. A.**; **Snoek, B.**; Verlage, M.:
Towards Testing Response Time of Instances of a web-based Product Line.
In: Geppert, B.; Krüger, C.; Trew, T. (eds.):
International Workshop on Software Product Line Testing, SPLiT 2005, Proceedings.
2005, pp. 23-34
(Avaya Labs Research Technical Report ALR-2005-017)
- Ganesan, D.**; **Knodel, J.**:
Identifying Domain-Specific Reusable Components from Existing OO Systems to Support Product Line Migration.
In: Graaf, B.; O'Brien, L.; Capilla, R. (eds.):
1st International Workshop on Re-engineering towards Product Lines, R2PL 2005, Proceedings.
Pittsburgh, 2005, pp. 16-20
- Geißner, G.; Hammes, R.; **Steffens, P.**:
Flächeninformationen Online – FLOr/p in Rheinland-Pfalz – Perspektiven für Landwirte, Dienstleister und Verwaltung.
In: Kuratorium für Technik und Bauwesen in der Landwirtschaft e.V. (KTBL):
KTBL-Tagung 2005, Landwirtschaft – Visionen 2015, Standortentwicklung für die Landwirtschaft.
Landwirtschaftsverlag, 2005, pp. 131-136
(KTBL-Schrift 438)
- Grunske, L.; **Kaiser, B.**:
An Automated Dependability Analysis Method for COTS-Based Systems.
In: Franch, X.; Port, D. (eds.):
4th International Conference on COTS-Based Software Systems, ICCBSS 2005, Proceedings.
Berlin, Springer-Verlag, 2005, pp. 178-190
(Lecture Notes in Computer Science 3412)
- Grunske, L.; **Kaiser, B.**; Papadopoulos, Y.:
Model-Driven Safety Evaluation with State-Event-Based Component Failure Annotations.
In: Heineman, G. T.; Crnkovic, I.; Schmidt, H. W.; Stafford, J.; Szyperki, C.; Wallnau, K. (eds.):
8th International Symposium on Component-Based Software Engineering, CBSE 2005, Proceedings.
Berlin, Springer-Verlag, 2005, pp. 33-48
(Lecture Notes in Computer Science 3489)
- Grützner, I.**; **Waterson, P.**; **Vollmers, C.**; **Trapp, S.**; **Olsson, T.**:
Requirements Engineering für Communities of Practice: Aufbau der ReqMan Community.
In: Meißner, K.; Engelien, M. (eds.):
Workshop Virtuelle Organisation und Neue Medien, GeNeMe2005 – Gemeinschaften in Neuen Medien.
Dresden, Technische Universität Dresden, 2005, pp. 161-172
- Haan, D.; **Waterson, P.**; **Trapp, S.**; **Pfahl, D.**:
Integrating needs assessment within next generation e-learning systems: Lessons learnt from a case study.
In: Nicholson, P.; Thompson, J. B.; Ruohonen, M.; Multisilta, J. (eds.):
5th Working Conference on eTRAIN Practices for Professional Organizations, eTrain 2003.
Dordrecht, Kluwer Academic Publishers, 2005, pp. 113-120
- Hamdan, A.; **Heidrich, J.**; Stauner, T.; **Wickenkamp, A.**:
Erfahrungen mit der Messung der Wartbarkeit von Steuergeräte-Software.
In: Cremers, A. B.; Manthey, R.; Martini, P.; Steinhage, V. (eds.):
Gesellschaft für Informatik (GI):
Beiträge der 35. Jahrestagung der Gesellschaft für Informatik e.V. (GI), Informatik 2005, Proceedings, Band 2.
Bonn, GI – Gesellschaft für Informatik, 2005, pp. 171-175
(GI-Edition – Lecture Notes in Informatics (LNI), Proceedings Volume P-68)
- Heidrich, J.**; **Münch, J.**:
Goal-oriented Data Visualization with Software Project Control Centers.
In: Büren, G.; Bundschuh, M.; Dumke, R. (eds.):
MetriKon 2005, Praxis der Software-Messung, Tagungsband des DASMA Software Metrik Kongresses.
Aachen, Shaker Verlag, 2005, pp. 65-75
(Magdeburger Schriften zum Empirischen Software Engineering)

Jaufmann, O.; **Münc**, J.:
Acquisition of a Project-Specific Process.
In: **Bomarius, F.**; Komi-Sirviö, S. (eds.):
6th International Conference on
Product Focused Software Process Im-
provement, Profes 2005, Proceedings.
Berlin, Springer-Verlag, 2005,
pp. 328-342
(Lecture Notes in Computer Science
3547)

Jedlitschka, A.; **Hamann, D.**; Göhlert,
T.; Schröder, A.:
Adapting PROFES for Use in an Agile
Process: An Industry Experience Report.
In: **Bomarius, F.**; Komi-Sirviö, S. (eds.):
6th International Conference on
Product Focused Software Process Im-
provement, Profes 2005, Proceedings.
Berlin, Springer-Verlag, 2005,
pp. 502-516
(Lecture Notes in Computer Science
3547)

Jedlitschka, A.; **Pfahl, D.**:
Reporting guidelines for controlled
experiments in software engineering.
4th International Symposium on
Empirical Software Engineering,
ISESE 2005, Proceedings.
Los Alamitos, IEEE Computer Society,
2005, pp. 95-104

John, M.; Schmidt, S.; **Decker, B.**:
Community-Management in Unter-
nehmen mit Wiki- und Weblog-
technologien.
In: Meißner, K.; Engelen, M. (eds.):
Virtuelle Organisation und Neue
Medien 2005, Workshop Gemein-
schaften in Neuen Medien,
GeNeMe2005.
Dresden, Technische Universität
Dresden, 2005, pp. 105-119

Kaiser, B.:
Extending the expressive power of
fault trees.
The International Symposium on
Product Quality & Integrity, Annual
Reliability and Maintainability Sym-
posium 2005, Proceedings.
Los Alamitos, IEEE Computer Society,
2005, pp. 468-474

Kaiser, B.; Zocher, A.:
BDD complexity reduction by
Component Fault Trees.
In: Kolowrocki, K. (ed.):
Advances in Safety and Reliability, Euro-
pean Safety and Reliability Conference,
ESREL 2005, Proceedings, Volume I.
Leiden, Balkema Publishers, 2005,
pp. 1011-1019

Kerkow, D.; Schmidt, K.; Wiebelt, F.:
Requirements for the Integration of
UE Methods in SE Processes from the
Perspective of Small and Medium-sized
Enterprises (SMEs).
In: Harning, M. B.; Kazman, R.;
Kerkow, D.; **Kohler, K.**;
Gulliksen, J. (eds.):
Workshop on Integrating Software
Engineering and Usability Engineering
2005, Proceedings.
Rom, 2005, 11 p.

Keuler, T.; **Lehner, T.**; **Decker, B.**;
Muthig, D.:
Efficient Implementation of Intelligent
Office Appliances with Software
Product Lines.
In: **Althoff, K.-D.**; Dengel, A.; Berg-
mann, R.; **Nick, M.**; Roth-Berghofer, T.
(eds.); Deutsches Forschungszentrum
für Künstliche Intelligenz (DFKI):
3rd Conference Professional Know-
ledge Management – Experiences and
Visions, WM 2005, Proceedings.
Kaiserslautern, 2005, pp. 51-54

Keuler, T.; **Lehner, T.**; **Decker, B.**;
Muthig, D.:
Efficient Implementation of Intelligent
Office Appliances with Software
Product Lines.
In: **Althoff, K.-D.**; Dengel, A.; Berg-
mann, R.; **Nick, M.**; Roth-Berghofer, T.
(eds.):
3rd Biennial Conference on Professional
Knowledge Management, WM 2005,
Revised Selected Papers.
Berlin, Springer-Verlag, 2005,
pp. 60-69
(Lecture Notes in Artificial Intelligence –
Subseries of Lecture Notes in Computer
Science 3782)

Klein, B.; Höcht, C.; **Decker, B.**:
Beyond Capturing and Maintaining
Software Engineering Knowledge –
„Wikitology“ as Shared Semantics.
In: Baumeister, J.; Seipel, D. (eds.):
Knowledge Engineering and Software
Engineering, Workshop 2005.
Koblenz, 2005, pp. 49-57
(Fachberichte INFORMATIK)

Knodel, J.; **Forster, T.**; **Girard, J.-F.**:
Comparing Design Alternatives from
Field-Tested Systems to Support Product
Line Architecture Design.
9th European Conference on Software
Maintenance and Reengineering,
CSMR 2005, Proceedings.
Los Alamitos, IEEE Computer Society,
2005, pp. 344-353

Knodel, J.; **Muthig, D.**:
Analyzing the Product Line Adequacy
of Existing Components.
In: Graaf, B.; O'Brien, L.;
Capilla, R. (eds.):
1st International Workshop on Re-
engineering towards Product Lines,
R2PL 2005, Proceedings.
Pittsburgh, 2005, pp. 21-25

- Knodel, J.; John, I.; Ganesan, D.;**
Pinzger, M.; Usero, F.; Arciniegas, J. L.;
Riva, C.:
Asset Recovery and Their Incorporation
into Product Lines.
12th Working Conference on Reverse
Engineering, WCRE 2005, Proceedings.
Los Alamitos, IEEE Computer Society,
2005, pp. 120-129
- Kolb, R.; Muthig, D.; Patzke, T.;**
Yamauchi, K.:
A Case Study in Refactoring a Legacy
Component for Reuse in a Product
Line.
In: IEEE Computer Society:
21st IEEE International Conference on
Software Maintenance, ICSM 2005,
Proceedings.
Los Alamitos, IEEE Computer Society,
2005, pp. 369-378
- Kühner, M.; **Kerkow, D.;** Wallach, D.:
How to Prototype: Eine explorative
Anwendungsstudie in deutschen Unter-
nehmen.
In: Hassenzahl, M.; Peissner, M.;
German Chapter der Usability Profes-
sionals Association e.V.:
Usability Professionals 2005, Berichts-
band des dritten Workshops des
German Chapters der Usability Profes-
sionals Association e.V.
2005, pp. 162-165
- Li, J.; Conradi, R.; Slyngstad, O. P. N.;
Bunse, C.; Khan, U.; Torchiano, M.;
Morisio, M.:
An Empirical Study on Off-the-Shelf
Component Usage in Industrial
Projects.
In: **Bomarius, F.;** Komi-Sirviö, S. (eds.):
6th International Conference on
Product Focused Software Process Im-
provement, Profes 2005, Proceedings.
Berlin, Springer-Verlag, 2005,
pp. 54-68
(Lecture Notes in Computer Science
3547)
- Münch, J.:**
Improving Cost Estimation Capabilities
in System Organizations – Transparent
Cost Estimation Modeling with
CoBRA®.
4th Workshop of Critical Software,
WOCS 2005.
Tokyo, 2005, pp. 89-92
- Münch, J.:**
Goal-oriented Composition of Software
Process Patterns.
In: **Pfahl, D.;** Raffo, D. M.; **Rus, I.;**
Wernick, P. (eds.):
The 6th International Workshop on
Software Process Simulation and
Modeling, ProSim 2005.
2005, pp. 164-168
- Münch, J.:**
Effective Process Integration for Space-
related Software Development.
High Reliable Software Week, 2nd
Advanced Information Technology
Workshop AITW, 5th Workshop of
Critical Software, WOCS 2005.
Tokyo, 2005, pp. 147-152
- Münch, J.; Wickenkamp, A.:**
M-System NT – Ein flexibles, daten-
bank-basiertes Mess- und Analyse-
System.
In: Büren, G.; Bundschuh, M.;
Dumke, R. (eds.):
MetriKon 2005, Praxis der Software-
Messung, Tagungsband des DASMA
Software Metrik Kongresses.
Aachen, Shaker Verlag, 2005,
pp. 55-64
(Magdeburger Schriften zum Em-
pirischen Software Engineering)
- Nejmeh, B. A.; **Riddle, W. E.:**
A Framework for Coping with Process
Evolution.
Software Process Workshop 2005,
Proceedings.
Beijing, 2005, pp. 193-207
- Nick, M.; Denger, C.; Willrich, T.:**
Experience-based Support for Code
Inspections.
In: **Althoff, K.-D.;** Dengel, A.; Berg-
mann, R.; **Nick, M.;** Roth-Berghofer, T.
(eds.); Deutsches Forschungszentrum
für Künstliche Intelligenz (DFKI):
3rd Conference Professional Know-
ledge Management – Experiences and
Visions, WM 2005, Proceedings.
Kaiserslautern, 2005, pp. 67-71
- Nick, M.; Denger, C.; Willrich, T.:**
Experience-based Support for Code
Inspections.
In: **Althoff, K.-D.;** Dengel, A.; Berg-
mann, R.; **Nick, M.;** Roth-Berg-
hofer, T. (eds.):
3rd Biennial Conference on Professional
Knowledge Management, WM 2005,
Revised Selected Papers.
Berlin, Springer-Verlag, 2005,
pp. 121-126
(Lecture Notes in Artificial Intelligence –
Subseries of Lecture Notes in Computer
Science 3782)
- Olsson, T.; Dörr, J.; Koenig, T.;**
Ehresmann, M.:
A Flexible and Pragmatic Requirements
Engineering Framework for SME.
In: Ralyté, J.; Ågerfalk, P. J.;
Kraiem, N. (eds.):
1st International Workshop on
Situational Requirements Engineering
Processes, SREP 2005, Proceedings:
Methods, Techniques and Tools to
Support Situation-Specific Require-
ments Engineering Processes.
Limerick, 2005, pp. 1-12
- Peine, H.:**
Rules of Thumb for Secure Software
Engineering.
In: Association for Computing Machin-
ery (ACM); IEEE Computer Society:
27th International Conference on
Software Engineering, ICSE 2005.
New York, ACM Press, 2005,
pp. 702-703

Ras, E.:

Just-in-Time Learning with Situational Content Objects.

In: Richards, G. (ed.):

World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education 2005, Proceedings. Norfolk, Association for the Advancement of Computing in Education (AACE), 2005, pp. 2332-2340

Ras, E.; Memmel, M.; Weibelzahl, S.:

First Workshop on Learner-Oriented Knowledge Management & KM-oriented E-Learning, LOKMOL 2005.

In: **Althoff, K.-D.**; Dengel, A.; Bergmann, R.; **Nick, M.**; Roth-Berghofer, T. (eds.); Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI): 3rd Conference Professional Knowledge Management – Experiences and Visions, WM 2005, Proceedings. Kaiserslautern, 2005, pp. 124-128

Ras, E.; Memmel, M.; Weibelzahl, S.:

Integration of E-Learning and Knowledge Management – Barriers, Solutions and Future Issues.

In: **Althoff, K.-D.**; Dengel, A.; Bergmann, R.; **Nick, M.**; Roth-Berghofer, T. (eds.):

3rd Biennial Conference on Professional Knowledge Management, WM 2005, Revised Selected Papers. Berlin, Springer-Verlag, 2005, pp. 155-164

(Lecture Notes in Artificial Intelligence – Subseries of Lecture Notes in Computer Science 3782)

Rech, J.:

Preprocessing of Object-Oriented Source Code for Code Retrieval.

In: Bauer, M.; Kröner, A.;

Brandherm, B. (eds.); Gesellschaft für Informatik (GI):

Lernen – Wissensentdeckung – Adaptivität (LWA) 2005. Workshop-woche der GI-Fachgruppen/Arbeitskreise: Adaptivität und Benutzermodellierung in Interaktiven Softwaresystemen (ABIS), Knowledge Discovery (AKKD), Maschinelles Lernen (FGML). Saarbrücken, 2005, pp. 220-227

Robinson-Mallett, C.; Ligges-

meyer, P.; Mücke, T.; Goltz, U.: Generating Optimal Distinguishing Sequences with a Model Checker.

1st International Workshop on Advances in Model-Based Testing, A-MOST 2005, Proceedings. New York, ACM Press, 2005, 7 p.

Rombach, D.:

Integrated Software Process and Product Lines.

In: Li, M.; Boehm, B.;

Osterweil, J. (eds.):

Unifying the Software Process Spectrum, Int. Software Process Workshop, SPW 2005, Revised Selected Papers. Berlin, Springer-Verlag, 2005, pp. 83-90

Schmettow, M.:

Towards a Pattern Based Usability Inspection Method for Industrial Practitioners.

In: Harning, M. B.; Kazman, R.;

Kerkow, D.; **Kohler, K.**;

Gulliksen, J. (eds.):

Workshop on Integrating Software Engineering and Usability Engineering 2005, Proceedings. Rome, 2005, 6 p.

Schmid, K.; John, I.; Kolb, R.;

Meier, G.:

Introducing the PuLSE Approach to an Embedded System Population at Testo AG.

In: Association for Computing Machinery (ACM); IEEE Computer Society: 27th International Conference on Software Engineering, ICSE 2005. New York, ACM Press, 2005, pp. 544-552

Thomas, L.; Ras, E.:

Courseware Development Using a Single Source Approach.

In: Kommers, P.; Richards, G. (eds.): World Conference on Educational Multimedia, Hypermedia & Telecommunications, ED-MEDIA 2005, Proceedings.

Norfolk, Association for the Advancement of Computing in Education (AACE), 2005, pp. 4502-4509

Verlage, M.; **Girard, J.-F.;**

Ganesan, D.; Kiesgen, T.:

Überwachung der Qualität der Architektur einer Software-Produktlinie am Beispiel eines web-basierten Wertpapierinformationssystems.

In: **Liggesmeyer, P.**; Pohl, K.; Goedicke, M. (eds.); Gesellschaft für Informatik (GI):

Software Engineering 2005, Fachtagung des GI-Fachbereichs Softwaretechnik, Proceedings.

Bonn, GI – Gesellschaft für Informatik, 2005, pp. 243-254

(GI-Edition – Lecture Notes in Informatics (LNI) – Proceedings Volume P-64)

Standards

Tailoring of ECCS Software Engineering Standards for Ground Segments in ESA. Part A: Software Engineering, Issue 1, Revision 0.

Produced by **O. Armbrust, A. Ocampo, and J. Münch** for the European Space Agency (ESA) on behalf of ESA's Board for Software Standardization and Control (BSSC). June 2005.

Tailoring of ECCS Software Engineering Standards for Ground Segments in ESA. Part B: Product Assurance and Management, Issue 1, Revision 0.

Produced by **O. Armbrust, A. Ocampo, and J. Münch** for the European Space Agency (ESA) on behalf of ESA's Board for Software Standardization and Control (BSSC). June 2005.

Tailoring of ECCS Software Engineering Standards for Ground Segments in ESA. Part C: Document Templates, Issue 1, Revision 0.

Produced by **O. Armbrust, A. Ocampo, and J. Münch** for the European Space Agency (ESA) on behalf of ESA's Board for Software Standardization and Control (BSSC). June 2005.

Tailoring of ECCS Software Engineering Standards for Ground Segments in ESA. Part D: Traceability against ECSS Standards, Issue 1, Revision 0.

Produced by **O. Armbrust, A. Ocampo, and J. Münch** for the European Space Agency (ESA) on behalf of ESA's Board for Software Standardization and Control (BSSC). June 2005.

JAVA Coding Standards.

Development assisted by **M. Soto** for the European Space Agency (ESA) on behalf of ESA's Board for Software Standardization and Control (BSSC).

June 2005.
ISBN 3-00-016020-5

Available at:

<http://www.estec.esa.nl/wmwww/EME/Bssc/BSSCdocuments.htm>

Fraunhofer IESE Reports

Adam, S.; Bunse, C.; Kolling, P.: Modellbasierte Entwicklung generischer Benutzerschnittstellen. Kaiserslautern, 2005 (IESE-Report 093.05/D)

Allmann, C.; **Denger, C.; Olsson, T.:** Analysis of Requirements-based Test Case Creation Techniques. Kaiserslautern, 2005 (IESE-Report 046.05/E)

Anastasopoulos, M.; Patzke, T.; Becker, M.: Software Product Line Technology for Ambient Intelligence Applications. Kaiserslautern, 2005 (IESE-Report 088.05/E)

Angkasaputra, N.; Bella, F.; Riddle, W. E.: Perspective-based Evaluation of Software Process Management Tool Suites. Kaiserslautern, 2005 (IESE-Report 007.05/E)

Angkasaputra, N.; Pfahl, D.: Towards an Agile Development Method of Software Process Simulation. Kaiserslautern, 2005 (IESE-Report 021.05/E)

Apel, S.: Software Reliability Growth Prediction – State of the Art. Kaiserslautern, 2005 (IESE-Report 034.05/E)

Bayer, J.; Forster, T.; Kolb, R.; Knodel, J.: Business Goal-Oriented Architecture Development. Kaiserslautern, 2005 (IESE-Report 057.05/E)

Becker, M.; Decker, B.; Patzke, T.; Syeda, H. A.:
Runtime Adaptivity for Aml Systems – The Concept of Adaptivity.
Kaiserslautern, 2005
(IESE-Report 091.05/E)

Bella, F.; Ocampo, A.:
Adaptable Process Engineering Survey: Adaptive Services Grid Deliverable D6.I-3.
Kaiserslautern, 2005
(IESE-Report 135.05/E)

Burkhard, B.; Int-Veen, M.; Hagedorn, P. A.; Munz, F.; Weber, S.; **Rombach, H. D. (Supervisor); Ciolkowski, M. (Supervisor); Hartkopf, S. (Supervisor); Schwarz, R. (Supervisor):**
Seminar: Risikomanagement für sicherheitskritische Software-Systeme: Wintersemester 2004/05.
Kaiserslautern, 2005
(IESE-Report 031.05/D)

Carbon, R.; Ciolkowski, M.; Denger, C.; Lindvall, M.; Shull, F.; Costa, P.; Rombach, H. D.; Basili, V. R.:
Inspections and Pair Programming – competing or complementary?: Experiences from an Expert eWorkshop.
Kaiserslautern, 2005
(IESE-Report 029.05/E)

Choi, Y.:
A Literature Survey: On the Integrated Use of Formal and Informal Verification Techniques for High Quality Requirements.
Kaiserslautern, 2005
(IESE-Report 048.05/E)

Choi, Y.:
Early Safety Analysis: from Use Cases to Component-based Software Development.
Kaiserslautern, 2005
(IESE-Report 049.05/E)

Choo, Y.; **Amiry, S.; Schmid, K.; Becker, M.:**
Operating System Characteristics for Ambient Intelligent Systems.
Kaiserslautern, 2005
(IESE-Report 103.05/E)

Decker, B.:
Management von Anforderungsdokumenten mittels semantischer Wikis.
Kaiserslautern, 2005
(IESE-Report 080.05/D)

Decker, B.; Nick, M.; John, M.:
Erfahrungsmanagement: Status Quo und Herausforderungen an die Unterstützung durch Erfahrungsdatenbanken.
Kaiserslautern, 2005
(IESE-Report 081.05/D)

Decker, B.; Ras, E.; Rech, J.; Klein, B.; Höcht, C.:
Using Wikis to Manage Use Cases: Experience and Outlook.
Kaiserslautern, 2005
(IESE-Report 132.05/E)

Decker, B.; Ras, E.; Rech, J.; Klein, B.; Höcht, C.:
Self-organized Reuse of Software Engineering Knowledge Supported by Semantic Wikis.
Kaiserslautern, 2005
(IESE-Report 115.05/E)

Denger, C.; Olsson, T.; Kerkow, D.; Koenig, T.:
The ForPics Process.
Kaiserslautern, 2005
(IESE-Report 042.05/E)

Dörr, J.; Kerkow, D.; Koenig, T.; Olsson, T.; Suzuki, T.:
Non-Functional Requirements in Industry - Three Case Studies Adopting the ASPIRE NFR Method.
Kaiserslautern, 2005
(IESE-Report 025.05/E)

Eisenbarth, M.; Grund, M.; **Schmid, K.:**
From Requirements Engineering to Knowledge Engineering: Challenges in Adaptive Systems.
Kaiserslautern, 2005
(IESE-Report 118.05/E)

Eisenbarth, M.; Koenig, T.; Olsson, T.:
Requirements Specification Survey: Adaptive Services Grid Deliverable D6.I-1.
Kaiserslautern, 2005
(IESE-Report 133.05/E)

Eisenbarth, M.; Bayer, J.; Koenig, T.; Grund, M.; **Schmid, K.:**
Reuse-oriented Requirements Technique: Adaptive Services Grid Deliverable D6.I-2.
Kaiserslautern, 2005
(IESE-Report 134.05/E)

Forster, T.; Ganesan, D.; Girard, J.-F.; Grund, M.; **John, I.; Knodel, J.:**
Combination of Requirements Recovery and Architecture Recovery for Existing Systems.
Kaiserslautern, 2005
(IESE-Report 058.05/E)

Freimut, B.; Denger, C.; Ketterer, M.:
An Industrial Case Study of Implementing and Validating Defect Classification for Process Improvement and Quality Management.
Kaiserslautern, 2005
(IESE-Report 018.05/E)

Freimut, B.; Briand, L. C.; Vollei, F.:
Determining Inspection Cost-Effectiveness by Combining Project Data and Expert Opinion.
Kaiserslautern, 2005
(IESE-Report 026.05/E)

Geppert, B.; **John, I.**; Lami, G. (eds.):
 Proceedings of the Second International
 Software Product Lines Young Re-
 searchers Workshop, SPLYR 2005.
 Kaiserslautern, 2005
 (IESE-Report 076.05/E)

Grützner, I.; Waterson, P.;
Vollmers, C.; Trapp, S.; Olsson, T.:
 Requirements Engineering für Com-
 munities of Practice: Aufbau der
 ReqMan Community.
 Kaiserslautern, 2005
 (IESE-Report 067.05/D)

Grützner, I.; Waterson, P.;
Vollmers, C.; Olsson, T.:
 Requirements Engineering for Com-
 munities of Practice: Building the
 ReqMan Community.
 Kaiserslautern, 2005
 (IESE-Report 012.05/E)

Grützner, I.; Thomas, L.:
 Systematische Entwicklung von Medien
 zur Benutzerunterstützung und
 -schulung mit einem XML basierten
 Single-Source-Ansatz.
 Kaiserslautern, 2005
 (IESE-Report 084.05/D)

Hamdan, A.; **Heidrich, J.;** Stauner, T.;

Wickenkamp, A.:
 Erfahrungen mit der Messung der
 Wartbarkeit von Steuergeräte-Software.
 Kaiserslautern, 2005
 (IESE-Report 027.05/D)

Jedlitschka, A.; Hamann, D.;
 Göhlert, T.; Schröder, A.:
 Adapting PROFES for Use in an Agile
 Process: An Industry Experience Report.
 Kaiserslautern, 2005
 (IESE-Report 004.05/E)

Jedlitschka, A.; Pfahl, D.:
 Reporting Guidelines for Controlled
 Experiments in Software Engineering.
 Kaiserslautern, 2005
 (IESE-Report 035.05/E)

Jedlitschka, A.:
 Minutes from Third International Work-
 shop on Empirical Software Engineer-
 ing "Guidelines for Empirical Work in
 Software Engineering".
 Kaiserslautern, 2005
 (IESE-Report 052.05/E)

Jedlitschka, A.; Ciolkowski, M. (eds.):
 Guidelines for Empirical Work in Soft-
 ware Engineering., 3rd International
 Workshop on Empirical Studies in
 Software Engineering, WSESE 2005,
 Proceedings.
 Kaiserslautern, 2005
 (IESE-Report 053.05/E)

John, M.; Schmidt, S.; **Decker, B.:**
 Community-Management in Unter-
 nehmen mit Wiki- und Weblog-
 technologien.
 Kaiserslautern, 2005
 (IESE-Report 030.05/D)

Keuler, T.; Lehner, T.; Decker, B.;
Muthig, D.:
 Efficient Implementation of Intelligent
 Office Appliances with Software
 Product Lines.
 Kaiserslautern, 2005
 (IESE-Report 047.05/E)

Knodel, J.; John, I.; Ganesan, D.;
 Pinzger, M.; Usero, F.; Arciniegas, J. L.;
 Riva, C.:
 Asset Recovery and Their Incorporation
 into Product Lines.
 Kaiserslautern, 2005
 (IESE-Report 037.05/E)

Knodel, J.; Lindvall, M.; Muthig, D.;
Naab, M.:
 Static Evaluation of Software
 Architectures.
 Kaiserslautern, 2005
 (IESE-Report 036.05/E)

Kohler, K.; Kerkow, D.; Hess, S.;

Schmid, K.:
 Best Practices und Usability Pattern für
 Geschäftsprozess-Modellierungswerk-
 zeuge.
 Kaiserslautern, 2005
 (IESE-Report 060.05/D)

Kolb, R.; Muthig, D.:
 First eWorkshop on Quality Assurance
 for Software Product Lines: Strategic
 Issues.
 Kaiserslautern, 2005
 (IESE-Report 013.05/E)

Kolb, R.:
 Cost-Benefit Optimized Quality
 Assurance Strategies for Software
 Product Lines.
 Kaiserslautern, 2005
 (IESE-Report 059.05/E)

Mommel, M.; **Ras, E.;** Jantke, K. P.;

Yacci, M.:
 Approaches to Learning Object
 Oriented Instructional Design.
 Kaiserslautern, 2005
 (IESE-Report 101.05/E)

Münch, J.; Pfahl, D.; Rus, I.:
 Virtual Software Engineering Labora-
 tories in Support of Trade-off Analyses.
 Kaiserslautern, 2005
 (IESE-Report 006.05/E)

Naab, M.; Forster, T.; Knodel, J.;
Muthig, D.:
 Evaluation of Graphical Elements and
 their Adequacy for the Visualization of
 Software Architectures.
 Kaiserslautern, 2005
 (IESE-Report 078.05/E)

Nick, M.:
 Feedback-based Experience Base
 Maintenance.
 Kaiserslautern, 2005
 (IESE-Report 022.05/E)

Olsson, T.; Denger, C.; Koenig, T.; Eisenbarth, M.; Schmid, K.:
A Reference model for requirements.
Kaiserslautern, 2005
(IESE-Report 043.05/E)

Olsson, T.; Denger, C.; Koenig, T.; Eisenbarth, M.; Schmid, K.:
Applying the IESE Requirements Reference model.
Kaiserslautern, 2005
(IESE-Report 045.05/E)

Peine, H.:
Standard zur Entwicklung sicherer Software für Web-Applikationen: Erstellt im Auftrag des Ministeriums für Wirtschaft, Verkehr, Landwirtschaft und Weinbau des Landes Rheinland-Pfalz.
Kaiserslautern, 2005
(IESE-Report 055.05/D)

Ras, E.; Avram, G.; Waterson, P.; Weibelzahl, S.:
Using Weblogs for Knowledge Sharing and Learning in Information Spaces.
Kaiserslautern, 2005
(IESE-Report 011.05/E)

Ras, E.:
Just-in-Time Learning with Situational Content Objects.
Kaiserslautern, 2005
(IESE-Report 028.05/E)

Ras, E.; Memmel, M.; Weibelzahl, S.:
First Workshop on Learner-Oriented Knowledge Management & KM-oriented E-Learning, LOKMOL 2005.
Kaiserslautern, 2005
(IESE-Report 099.05/E)

Ras, E.; Memmel, M.; Weibelzahl, S.:
Integration of E-Learning and Knowledge Management – Barriers, Solutions and Future Issues.
Kaiserslautern, 2005
(IESE-Report 100.05/E)

Rech, J.; Ras, E.; Decker, B.; Höcht, C.; Kilian, L.:
RISE – Reuse im Software Engineering. Evaluationsmethodik der Kontextermittlung.
Kaiserslautern, 2005
(IESE-Report 032.05/D)

Rech, J.; Weber, S.:
Werkzeuge zur Ermittlung von Software-Produktmetriken und Qualitätsdefekten: Studie zu Software-Messwerkzeugen 2005.
Kaiserslautern, 2005
(IESE-Report 108.05/D)

Rech, J.; Emrich, A.:
Report: Open Source Lizenzen 2005: Eine szenario-basierte Untersuchung der gebräuchlichsten Lizenzen im OSS Bereich.
Kaiserslautern, 2005
(IESE-Report 109.05/D)

Schmid, K.; Krennrich, K.; Eisenbarth, M.:
Requirements Management for Product Lines: A Prototype.
Kaiserslautern, 2005
(IESE-Report 061.05/E)

Schwarz, R.:
Systematic Elicitation of Security Requirements in the Context of Aml Systems.
Kaiserslautern, 2005
(IESE-Report 098.05/E)

Thomas, L.; Ras, E.:
Courseware Development Using a Single Source Approach.
Kaiserslautern, 2005
(IESE-Report 001.05/E)

Thomas, L.; Nett, B.; Müller, C.:
Informal Network Learning in Regional Networks of Software Engineering Professionals.
Kaiserslautern, 2005
(IESE-Report 089.05/E)

Thomas, L.:
TL 9000 Quality Management System.
Kaiserslautern, 2005
(IESE-Report 090.05/D)

Thomas, L.; Waterson, P.; Trapp, S.:
Eight Years of Delivering Professional Education and Training for Software Engineering at Fraunhofer IESE: An Experience Report.
Kaiserslautern, 2005
(IESE-Report 092.05/E)

Trapp, S.:
Offshore-Outsourcing von IT-Dienstleistungen - aktuelle Tendenzen.
Kaiserslautern, 2005
(IESE-Report 094.05/D)

Doctoral Theses

Nick, M.:
Experience Maintenance through Closed-Loop Feedback,
Computer Science Department,
University of Kaiserslautern.
Advisors: M. Richter, **D. Rombach**

Trapp, M.:
Modeling the Adaptation Behavior of Adaptive Embedded Systems,
Computer Science Department,
University of Kaiserslautern.
Advisors: B. Schürmann,
P. Liggesmeyer

Diploma and Master Theses

Adam, S.:

Entwicklung eines Ansatzes zur integrierten Modellierung wiederverwendbarer Benutzerschnittstellen.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;**
Bunse, C.

Angelova, L.:

Developing a Conceptual Model and Simulator for Dependable Software Engineering.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;** **Rus, I.;**
Lindvall, M.; **Muthig, D.;** **Lehner, T.**

Dauenhauer, U. H. J.:

Analyzing Software Design Inspections in the Context of UML 2.0.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;**
Denger, C.

Elberzhager, E.:

Analysis of Empirical Findings on Quality Assurance Techniques.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;**
Denger, C.

Huber, A.:

Evaluierung von Software Engineering Prinzipien und ihrer Bedeutung für den Ressourcenverbrauch von eingebetteter Systemsoftware.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;** **Knodel, J.**

Kläs, M.:

A Comparative Study on the Application of Various Simulation Techniques for the Purpose of Cost Estimation, Benchmarking, and Risk Analysis.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;**
Trendowicz, A.; **Wickenkamp, A.**

Merkel, D.:

COWA-Extractor: Ein Plugin basierter Versionierungssystem-Browser.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;** **Rech, J.**

Naab, M.:

Evaluation of Graphical Elements and their Adequacy for the Visualization of Software Architectures.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;** **Muthig, D.;** **Knodel, J.;** **Forster, T.**

Rathanavelu, P.:

Handling Variants in C++ with M-System NT.

University of Kaiserslautern.

Supervisors: **Frey, G.;** **Trendowicz, A.;**
Wickenkamp, A.

Schäfer, W.:

CodeSonar: Ein Plugin-basierter Regelinferierender Code-Browser.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;** **Rech, J.**

Schweikhard, T.:

Identification of Inspection-Variation-Factors for a Decision-Support-Tool.

University of Kaiserslautern.

Supervisors: **Rombach, H. D.;**
Denger, C.

Zeng, X.:

Entwurf und Implementierung eines Syslog-Modules für NeMoS.

Kaiserslautern University of Applied Sciences.

Supervisors: **Diehl, N.;** **Simon, K.**

Project Theses

Angelova, L.:

Anbindung eines Editors an ein flexibles Prozessmodellformat.

Supervisors: **Rombach, D.;** **Heidrich, J.;** **Soto, M.**

Boffo, F.:

Design und Implementierung eines Schulungsbeispiels für Java 2 Enterprise Edition (J2EE 1.4).

Supervisors: **Rombach, D.;** **Luttenberger, K.**

Kläs, M.:

Entwurf und Implementierung eines generischen CoBRA-Werkzeugs.

Supervisors: **Rombach, D.;** **Münch, J.;**
Trendowicz, A.; **Wickenkamp, A.**

Konle, F.:

Risk Factors in Australian Government IT Projects.

Supervisors: **Rombach, D.;** **Heidrich, J.;**
Jeffrey, R.; **Verner, J.**

Walter, C.:

Analysis of the Defect Detection Potential of Automatic Code Checkers.

Supervisors: **Rombach, D.;** **Denger, C.**

Awards

Internal

Armbrust, O.:

The Fraunhofer IESE 2005 Award for Project Excellence

Ocampo, A.:

The Fraunhofer IESE 2005 Award for Project Excellence

Soto, M.:

The Fraunhofer IESE 2005 Award for Project Excellence

Kolb, R.:

The Fraunhofer IESE 2005 Award for Research Excellence

Adam, S.:

The Fraunhofer IESE 2005 Award for Thesis Excellence

Kläs, M.:

The Fraunhofer IESE 2005 Award for Thesis Excellence

Naab, M.:

The Fraunhofer IESE 2005 Award for Thesis Excellence

Buck, B.:

The Fraunhofer IESE 2005 Award for Infrastructure Excellence

Vollmer, N.:

The Fraunhofer IESE 2005 Award for Infrastructure Excellence

External

Muthig, D.; Knodel, J.:

Automated Process SAVE, Innovation Award of Rhineland-Palatinate, December

Appointments and Honors

Pfahl, D.:

Assistant Professorship, University of Calgary, Canada, July

Events

Learntec 2005

February 15-18, Karlsruhe, Germany

International Conference on Software Engineering,

February 15-17, Innsbruck, Austria

Software Engineering Tagung, SE 2005,

March 8-11, Essen, Germany

CeBIT 2005

March 10-16, Hanover, Germany

Konferenz Professionelles Wissensmanagement, WM 2005,

April 10-13, Kaiserslautern, Germany

International Workshop on Learning Software Organizations, LSO 2005,

April 11-12, Kaiserslautern, Germany

Software and Systems Quality Conferences, SQM 2005

April 6-8, Cologne, Germany

Girls' Day 2005

April 28, Kaiserslautern, Germany

MediaMit 2005

October 19, Kaiserslautern, Germany

MetriKon 2005, Kaiserslautern, Germany

Software Technologie Initiative e.V. (STI)

Annual Meeting, November 24-25, Kaiserslautern, Germany