



Business Unit Quality Engineering

System quality right
from the outset

Development and quality assurance of safety-critical software

The increasing interconnection of software-based systems poses new challenges for their development and quality assurance. We offer the appropriate methods and tools.



*Dipl.-Inform.
Andreas Hoffmann
Director Business
Unit Quality
Engineering*

The business unit "[Quality Engineering](#)" of Fraunhofer FOKUS offers methods, processes and tools for the assurance, evaluation and optimization of the quality of software-based systems. Today, such systems are increasingly interconnected. What is now quite commonplace for the user requires a great deal of experience in system development. After all, many such functions are safety-critical and a failure could not only lead to a financial risk but also endanger human lives. The ever-increasing use of artificial intelligence (AI) or the topic of quantum computing (QC) also poses new challenges for the quality assurance of software-based systems.

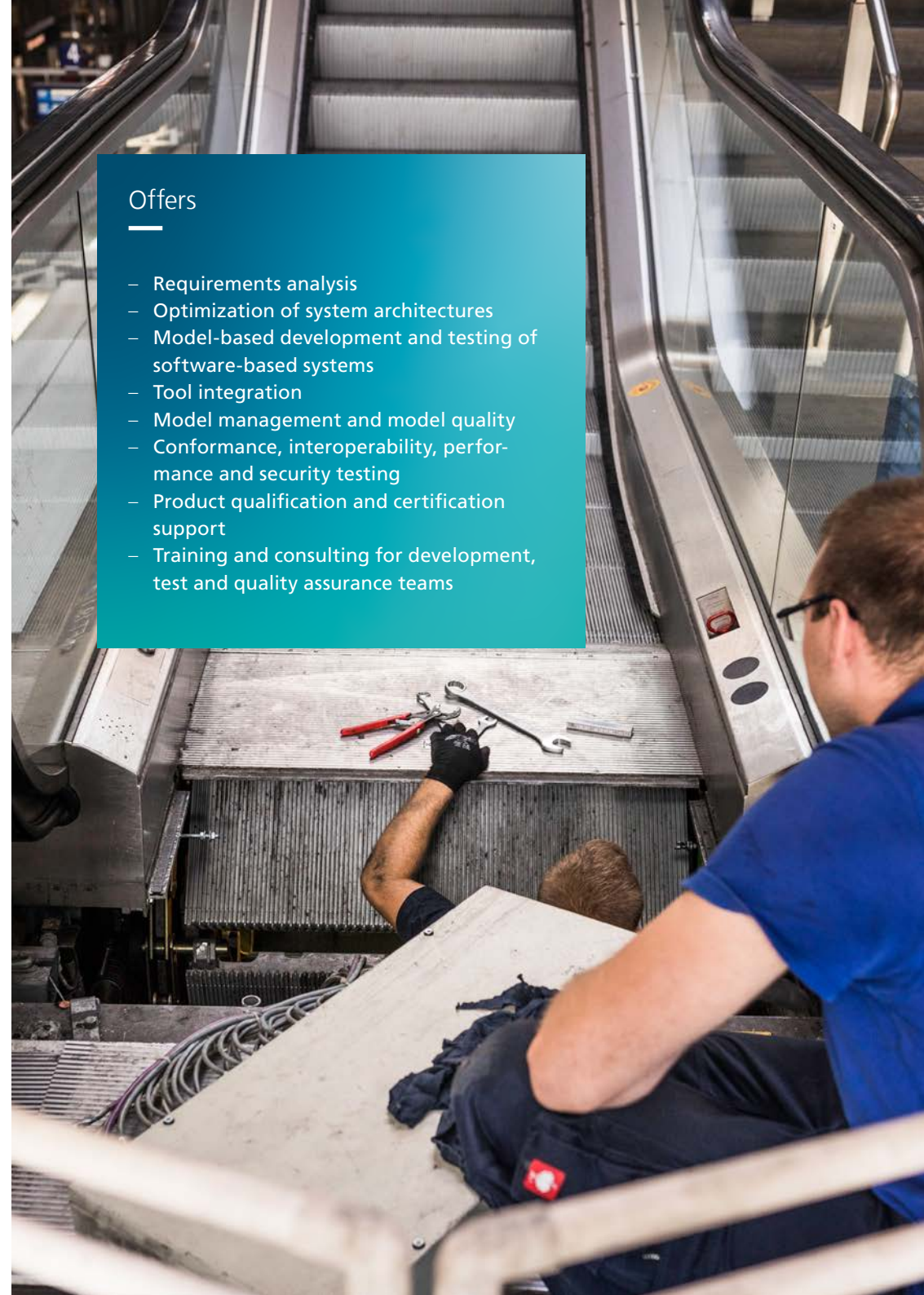


*Dipl.-Inform.
Friedrich Schön
Director Business
Unit Quality
Engineering*

To ensure that safety-critical functions are guaranteed and technical systems are helpful to people, it is a question of their failure protection (safety properties) and protection against attacks (security properties). The goal of the employees in the Quality Engineering business unit is to develop reliable, secure and trustworthy software-based systems to ensure functionality, performance, safety and robustness.

Offers

- Requirements analysis
- Optimization of system architectures
- Model-based development and testing of software-based systems
- Tool integration
- Model management and model quality
- Conformance, interoperability, performance and security testing
- Product qualification and certification support
- Training and consulting for development, test and quality assurance teams





We ensure system quality throughout the entire development process – from requirements analysis to certification.”

Friedrich Schön,
Director Business Unit Quality Engineering

Improving the development processes of software-intensive systems

In the “[Optimization of Development Processes](#)” working area, the scientists support their customers in developing software-intensive systems. Their goal is to improve individual development steps and the entire development process. In doing so, they primarily rely on technologies for model-driven software development, which enable the integration of various tools for efficient software development and the generation of code and test cases directly from a model.

For their customers, this results in increased efficiency and reduced development costs. In addition, they offer methods and tools for requirements management, traceability, model transformation, code and document generation, which can play a decisive role, especially regarding possible certification.

Development and quality assurance for safety-critical software

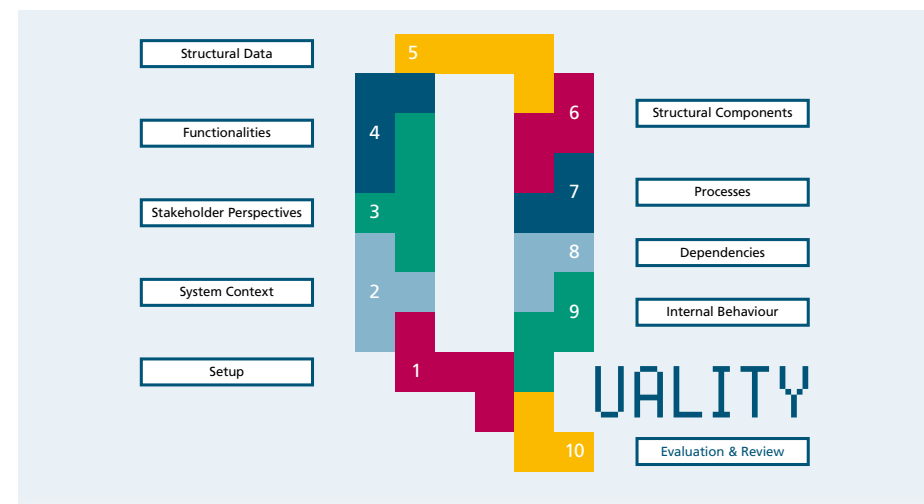
Complex systems, such as those in transportation, cloud services, or critical infrastructures, must run flawlessly to ensure the smooth functioning of essential social processes. Therefore, the scientists in the “[Critical Systems Development](#)” research area work on the design and development as well as testing of software architectures and applications specifically for critical application areas. Their work focuses on the definition of architectures, communication infrastructures, exchange formats and processes for the automotive industry, and defining security architectures, systematically performing risk analyses and

risk-based security tests in and for critical infrastructures.

Urban information and communication technologies and quantum computing

As the urban population grows, urban information and communication technologies become increasingly important. To enable cities to better adapt to the needs of each and every individual while being fast, cost-efficient, sustainable and ecologically correct, the scientists in the “[Quality Engineering for Urban ICT & QC](#)” research area are developing architectures for information and communication technologies in the smart city.

Quality assurance throughout the entire development process



In the future, quantum computers will also be used to solve complex computations, such as optimizing traffic forecasts in the smart city, cashless payment or supply chains between towns and the countryside. The scientists are therefore working on developing special middleware for quantum computers and adapting algorithms to the requirements of such computers. The topic of "[quantum computing as a service](#)" – i. e. the provision of quantum-based services via a cloud – is also a focus of the researchers' work. They pay particular attention to the security, privacy and data protection of such applications.

Quicker identification of errors in the development process and saving development costs

The Quality Engineering business unit has over 20 years of experience in using testing techniques. This is because testing is one of the most important means of assuring the quality of systems. By using test design and test execution techniques early, errors in the development process can be found faster and development costs can be saved. The focus of the scientists in the "[Testing](#)" research area is on automating test design and execution and improving test management through the use of models. The objective is to increase the

quality of products by optimizing development processes. The scientists develop their own tools and testbeds for the testing and further development of the techniques used. The experience gained in this process is contributed to standardization bodies, such as the European Telecommunications Standards Institute (ETSI) or the Object Management Group (OMG).

Verification

In addition to testing, [static software analysis](#) can contribute to software security, functionality, and robustness. Testing alone does not provide a cost-effective solution, especially for very high-security requirements applications. The application areas for the solutions developed by the "Quality Engineering" business unit are both in the area of attack security (security) and operational safety (safety). The scientists recommend formal verification methods for highly safety-critical applications.

This involves using mathematically sound methods to prove that software conforms to its specification or that no runtime errors occur. They advise companies on deriving formal specifications and using tools for a primarily automated verification process.

Sectors

Our customers come from the automotive, automation, railroad, medical and information technology sectors. In addition, we have industry expertise in aerospace, telecommunications, and smart cities.

Software-based systems are increasingly interconnected today





New!
FOKUS-APP

Contact

Dipl.-Inform. Andreas Hoffmann
Director Business Unit Quality
Engineering
Phone +49 30 3463-7392
andreas.hoffmann@fokus.fraunhofer.de

Dipl.-Inform. Friedrich Schön
Director Business Unit Quality
Engineering
Phone +49 30 3463-7453
friedrich.schoen@fokus.fraunhofer.de

Fraunhofer FOKUS
Kaiserin-Augusta-Allee 31
10589 Berlin
Germany

www.fokus.fraunhofer.de/en/sqc

We
connect
everything