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## The model and software factory for the development of complex software systems

In software development, several million lines of code are often written by hand. This development process is time-consuming and error-prone. Model-based software development methods provide an alternative by facilitating the automatic generation and testing of software components from models. As a result, the software becomes more robust, secure, and stable and substantial amounts of time can be saved in the development process. This can be seen especially when changes are made to the code or when drafts are reused, because the modeling allows for a simple and clear documentation of the development process, so that the individual steps can be traced. For this reason, a model and software factory is developed in the BIZWARE project, in which model concepts and model transformations for the use of domain-specific languages (DSLs) in the generation of software tools are developed.

## Technologies for developers and users

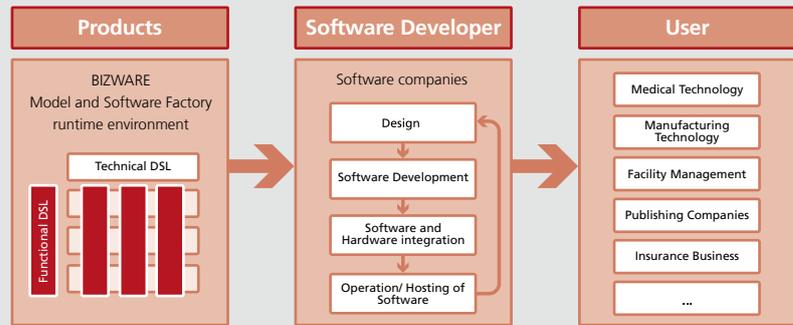
Within the scope of the BIZWARE project, custom-made modeling tools make for a significantly higher quality of software development. It is the goal of the BIZWARE project to implement tool generators that allow software developers to develop specific modeling techniques and offer them to their customers. Not only UML is to be used, but also technical tools such as Visio and Excel. These tools can be employed by users to generate sector-specific models and solutions, or to combine specific modeling techniques. This will enable them in the future to collaborate in software development, contribute domain-specific requirements to the development process, and participate in the description of test cases.



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## Domain-specific languages (DSLs)

The tools that are being developed in the project are based on so-called domain-specific languages. These DSLs are specifically adapted to the demands of a particular sector and are geared to the application's needs. They are text or graphic based and serve to generate application software for the user. Software requirements are first described using models. Based on these models, developers can easily detect whether important components are missing. The models are also well-suited for the documentation of development steps and can be used for the software's certification, should this become necessary.

## An example: safety standardization in the automation industry

In automation technology, if programmable logic control (PLC) programming is employed, all users utilize the function blocks of the PLCopen Safety group. The specification of these blocks and of corresponding finite automata is done in Visio and Excel. From this, a domain-specific model devised by Fraunhofer FOKUS can generate simulation and test models, or even corresponding machine code for the firmware. For manufacturers of Safety PLCs, this results in a faster development and higher quality. The benefit, however, can already be seen in the standard itself, which can automatically be inspected for its consistency. Customer-specific extensions can be tested immediately and can subsequently be used for the manufacturing of Safety PLCs.

## The DSM workbench

For the generation of domain-specific models from the BIZWARE model and software factory, Fraunhofer FOKUS provides a multi-modeling workbench to its customers. It supports software developers in providing a DSL, editors and interpreters to their end users. With the help of the workbench, developers can determine the structure and relevance of a model's elements.

## Funding

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## Sectors

- Manufacturing Technology
- Facility Management
- Health Care
- Medical Technology
- Insurance Business
- Publishing Companies

## Technologies and services

- Concepts, methods, and tools for model-based software development
- Design and development of domain-specific languages (DSLs)
- Consulting on DSL generation and processing of domain models
- Model-based test case generation

