QAWARE
SOFTWARE ENGINEERING

USAGE OF CONCEPTUAL MODELS IN INDUSTRY

This briefing reports scientific evidence on the usage of conceptual models for software development purposes in industry. In particular,

FINDINGS

Contrary to popular opinions, the usage of conceptual models in the context of industrial software development is neither a self-evident fact of life, nor an academic myth without any support in reality.

It turns out, that there are several distinct modes of modeling occurring in different relative frequencies, and with specific application conditions. We find three such modes, corresponding to three types of models:

- **Informal models** are used very widely to support communication and cognition. Typical tools are whiteboards, pen-and-paper, and ad-hoc media. Models of this kind tend to be very sketchy, though some have a surprisingly long lifespan. Informal models are strongly tied to the context in which they arise.
- **Partially formal models** support design and documentation activities. In order to stand for itself outside a given situational context, such models demand more contextual information and notational precision,
- **Fully formal models** are intended to be taken literal and binding, to allow the analysis of system properties, simulation, and generation of code and test cases. Fully formal models can also be used like legal documents such as contracts, or other formalized agreements.

While informal models are used most by far, partially formal models are still fairly frequently used, and even fully formal models are used in significant amounts among respondents.

Model Type	Never Or rarely	Some times	Often or Always
Sketchy/ Informal	4-8%	15-22%	70-79%
Semi-formal	16-33%	20-28%	43-57%
Fully formal	54-66%	16-32%	18-28%

There is widespread agreement that software architects benefit most from modeling, but Developers, Testers, Domain Experts and Requirements Analysts are also frequently mentioned as benefiting (by more than 60% of study participants).

Modelers agree that modeling is beneficial for delivering software with higher quality, using less development effort, and reduced delivery time (93%, 72%, and 66% of study participants, respectively).

Any findings of this survey critically depend on the population participating in it, so we describe the population characteristics in some detail.

- **Education level** Participants of our survey have an above-average level of formal education: 45% of them have a MSc, another 24% have a PhD as their highest degree. Among the senior participants from industry, we also see 32% and 55% MSc and PhD degrees, respectively.
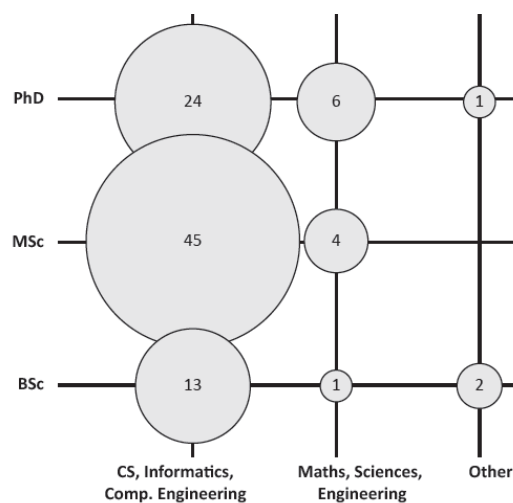
- **Regional Origin** Most of the study participants are from Europe, in particular, Germany and Scandinavia. India, the Americas, UK, and China are under-represented.
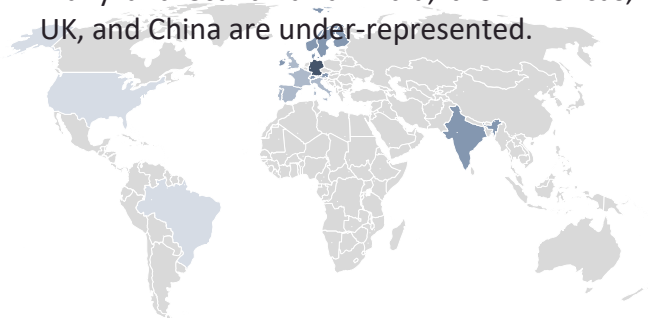
- **General Opinion** Half the study participants share the MDE vision of generating complete applications from models, while 37% disagree with this opinion.
- **Affiliation Type** While this survey was targeted at senior industry practitioners there was a large number of junior practitioners and academics that also participated. There were little differences among the populations, including endorsement of the MDE vision. There may be differences by industry.

We hypothesize, that cultural differences may account or the variation of findings between this and previous studies, at least in part.

Who is this briefing for?

Software engineering practitioners who want to make decisions about why, when, how to use conceptual models based on scientific evidence.

Where do the findings come from?

All findings of this briefing were extracted from the descriptive survey conducted by *H. Störrle*. The survey may be accessed online through the following link.

What is included in this briefing?

The main findings of the original survey. Evidence characteristics through a brief description about the original survey and the population it covered.

What is not included in this briefing?

Additional information not presented in the original survey. Detailed descriptions about the studies analised in the original survey.

For additional information about QAware:

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For additional information about the author:

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