Relevance, Benefits, and Problems of Software Modelling and Model Driven Techniques
A Survey in the Italian Industry

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A joint research conducted with F.Tomassetti (PolITo), F.Ricca, A.Tiso, and G.Reggio (UniGe)

Agenda

- Motivation
- Survey design
- Results
- Conclusions
Motivation

- Claimed benefits of software Modelling and Model Driven techniques (MD*) are improvements in:
  - productivity,
  - portability,
  - maintainability, and
  - interoperability.
- Though, few efforts at collecting evidence

Goals

**G1** Assess the actual relevance of software modelling and MD* in the Italian industry.

**G2** Find out the way modelling and MD* are applied (i.e., which processes, languages and tools are used), and

**G3** Understand the motivations either leading to the adoption (expected benefits) or preventing it (experienced or perceived problems).
Survey design

- Population
  - Italian software professionals
- Probabilistic Sampling
  - Commerce Chamber DB
- Convenience sampling
  - Industrial contact networks
  - Invitations on mailing lists
  - Advertisement in on-line magazine
  - Advertisement on page of large developers’ conference

Questionnaire

- Web-based questionnaire with Lime Survey
  - **Sub**: subject’s demographics
  - **Dev**: development process
  - **Mod**: modelling details
  - **Lan**: languages and notations
Questionnaire paths

Legal kind of the firm?
(Individual or firm)

Sub02

Sub03

Sub05

Sub04

Sub06, Dev06, Dev07

Dev09

Dev08

Dev07

Dev10, Dev11, Mod12a, Mod12b, Mod13

Mod14

(>0)

Mod15

Mod16, Mod17, Mod18

Mod19a

Mod19b

Mod20... Mod24

Lan28

Lan25

Lan26

Lan27

Lan29a

Lan29b

Lan29c

Research questions

RQ1: What is the diffusion and relevance of Modelling and MD* in the Italian industry?

RQ2: What are the benefits of using Modelling and MD*?

RQ3: What issues hinder/prevent the adoption of modelling and MD*?
Relevance

- A software development technology is relevant to software engineering if it increases the likelihood of improving software development practices.
  - Technical aspects
  - Process aspects ~ % of developers adopting it

Relevance thresholds

- Irrelevance
- Limited Relevance
- Normal Relevance
- High Relevance

10% 25% 50%
RQ1: Metrics

- Are models used for software development in your organization?
  - For model we mean both diagrams, e.g., UML, and text according to any DSL
  - Valid answers: Always; Sometimes; Never
  - Percentage of Modellers (i.e. Always + Sometimes)

Relevance

RQ1: Results

- All companies: 13% Always, 55% Sometimes, 32% Never

Highly Relevant
RQ1: Languages & notations

Modellers

- 76% use UML
  - 38% UML w/ Profiles
  - 51% UML w/o Profiles
  - 11% UML unknown

- 21% use DSLs
  - 50% Graphical
  - 27% Mix
  - 23% Textual

R1: MD* key techniques

Modellers

- 48% Any
- 44% Code Generation
- 16% Model Interpretation
- 10% Model Transformation
RQ2: Metrics

What are the benefits verified as consequences of using modelling?

- Design support
- Improved documentation
- Improved development flexibility
- Improved productivity
- Quality of the software
- Maintenance support
- Platform independence
- Standardization
- Shortened reaction time to changes

Likelihood thresholds

- Unlikely
- Probable
- Likely
- Very Likely

Likelihood thresholds:

- 10%
- 25%
- 50%
RQ2: Results

Very Likely
- Design
- Documentation
- Maintenance

Likely
- Quality
- Standardization

Possible
- Flexibility
- Productivity
- Reactivity

Unlikely
- Plat. Independ.

Achievement Ratio

RQ2: Results

Design
- Documentation
- Maintenance

Quality
- Standardization

Flexibility
- Productivity
- Reactivity

Plat. Independ.

MD*
Basic
## Benefits Achievement

<table>
<thead>
<tr>
<th></th>
<th>Code Gener.</th>
<th>Model Interpr.</th>
<th>Model Transform</th>
<th>Toolsmith</th>
<th>UML Profiles</th>
<th>DSL</th>
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Odds ratios

## RQ3: Metrics

- What are the problems preventing the adoption of modelling and MD*?
  - Too much effort required
  - Not useful enough
  - Lack of competencies
  - Lack of supporting tools
  - Refusal from management
  - Cost of supporting tools
  - Refusal from developers
  - Fear of lock-in
  - Not flexible enough
  - Inadequacy of supporting tools

Problem Relevance


RQ3 - Results

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<th>Relevant</th>
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<td>Refusal from management</td>
<td>Fear of lock-in</td>
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<td>Lack of supporting tools</td>
<td>Cost of supporting tools</td>
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<tr>
<td>Lack of competencies</td>
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<td>Refusal from management</td>
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6 times more likely to occur among MD* adopters

Threats to validity

- Construct
  - Did we capture the essential aspects of MD*?
- Internal
  - Sampling (selection bias)
- External
  - How representative of the Italian (EU) IT industry?
Conclusions

- MD* is a **relevant** technology, modeling is **highly relevant**
- A few (very) likely benefits of modeling
  - MD* techniques make the chances of achieving the less likely benefits four+ times higher
  - Toolsmithing provides several benefits
  - UML apparently plays no significant role

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Conclusions

- Main problems
  - Too much effort estimated
  - Not useful enough
  - Lack of competencies
  - Among MD* fear of lock-in
Thank you

- For further details:
  - Marco Torchiano, Federico Tomassetti, Filippo Ricca, Alessandro Tiso, Gianna Reggio,
  *Relevance, Benefits, and Problems of Software Modelling and Model Driven Techniques - A Survey in the Italian Industry*,
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