On the UML use in the Brazilian industry: A state of the practice survey

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Outline

• Context
• Objective
• Research Questions
• Experimental Process
• Evaluation Scenarios
• Results
• Conclusion
• Future Works
• References
Context
Context

• Unified Model Language (UML)
  • Graphical representations to denote diverse aspects of software
    • States, activities, components, objects, and classes

• UML is widely adopted on Industry
  • Is considered by many the *de facto* standard for software modeling

• The Use of UML in practice is a topic of interest of researchers on software engineering

• Several studies investigate the practice of UML in industry
How do we use UML?  
Is it cost-effective?  
What is the cost/benefit?  
Pros and cons?

Questions researchers have asked:

How can we improve?  
Or we should not care?
Recent research findings:

High cost of keeping models synchronized and consistent.

“No shit” or “Oh, shit!”: responses to observations on the use of UML in professional practice

Authors
Marian Petre

Authors and affiliations
1. Centre for Research in Computing, The Open University, Milton Keynes, UK

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Recent research findings:

Great part of developers make a selective use of UML i.e. they use UML in a informal and personal way for as long it is considered useful; Models are usually discarded after their conception

“No shit” or “Oh, shit!”: responses to observations on the use of UML in professional practice
Recent research findings:

Design models are not used very extensively in industry. UML is used with minimal tool support. The notation is not necessarily UML.

Journal of Systems and Software
Volume 95, September 2014, Pages 176-193

On the use of software design models in software development practice: An empirical investigation

Tony Gorschek a, Ewan Tempero b, Lefteris Angelis c

a Blekinge Institute of Technology, Karlskrona, Sweden
b University of Auckland, Auckland, New Zealand
c Aristotle University of Thessaloniki, Thessaloniki, Greece
Recent research findings:

UML benefits collaboration and communication (especially within teams geographically distributed).

Empirical Software Engineering

An industrial case study on the use of UML in software maintenance and its perceived benefits and hurdles

Authors
Ana M. Fernández-Sáez, Michel R. V. Chaudron, Marcela Genero
Recent research findings:

There is a possible association between cultural differences and modeling usage, which was considered worth exploring in the future.
Gaps in Related Work:

• Most of them did not target UML practice specifically on industrial closed source projects.
  • Or they were restricted to participants from a single company.

• They did not focus on:
  • Analyzing whether or not the type of participants’ organization affects UML use.
  • A particular geographic region.
Our focus:

Software engineers who work in industrial closed source projects.

Assess the UML practice in a particular geographic region.

• Do previous findings hold?
• Or do they vary?
Goals

• **G1**: understand the diffusion and relevance of UML use in the Brazilian companies;

• **G2**: identify improvement points to increase the UML adoption in real-world projects.
Research Questions

• **RQ1:** How frequent do software engineers use UML in practice?

• **RQ2:** Is UML the “lingua franca” for software modeling?

• **RQ3:** What improvement points may increase the UML use?
Participant Demographics

- A total of 222 participants from 140 different companies in Brazil;
Participant Demographics: Experience

Developers

- Less than 2 years: 30%
- From 3 to 4 years: 17.1%
- From 5 to 6 years: 6.9%
- From 7 to 8 years: 6.9%
- More than 8 years: 39.2%

Engineers with modeling roles

- Less than 2 years: 24%
- From 3 to 4 years: 17.1%
- From 5 to 6 years: 12.4%
- From 7 to 8 years: 10.6%
- More than 8 years: 35.9%

Other roles

- Less than 2 years: 54.3%
- From 3 to 4 years: 26.9%
- From 5 to 6 years: 9.1%
- From 7 to 8 years: 4.1%
- More than 8 years: 5.5%
RQ1: How frequent do software engineers use UML in practice?

Survey question:
“Do you use UML in the projects you’ve been involved with?”

- Yes: 60 (28.2%)
- No: 156 (73.2%)
RQ1: How frequent do software engineers use UML in practice?

A sample of 113 participants from 222 was extracted to evaluate statistically if the UML usage could be influenced by the type of the company (software factory or not).

<table>
<thead>
<tr>
<th></th>
<th>Software Factory</th>
<th>Not a Software Factory</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use UML</td>
<td>19</td>
<td>17</td>
<td>36</td>
</tr>
<tr>
<td>Do not use UML</td>
<td>38</td>
<td>39</td>
<td>77</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>56</td>
<td>113</td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>50.4%</td>
<td>49.6%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Statistical tests show that there is no relation between using or not using UML and whether the company is a software factory or not.
RQ1: How frequent do software engineers use UML in practice?

Conclusion #1:

• **UML is not used very often in the work life of participants.**

• **No relationship was identified between the use of UML and whether or not participants’ company is a software factory.**
RQ2: UML as “Lingua franca”?

![Bar chart comparing responses to UML as "Lingua franca" in modeling and MDD, with percentages for Totally Agree, Partially Agree, Neutral, Partially Disagree, and Totally Disagree.]
RQ2: UML as “Lingua franca”?

**Conclusion #2:** Participants are relatively divided in this regard. There is no agreement or consensus.
RQ3: Improvement points to support UML use

Suggested Improvements

<table>
<thead>
<tr>
<th>Area</th>
<th>Totally Agree</th>
<th>Partially Agree</th>
<th>Neutral</th>
<th>Partially Disagree</th>
<th>Totally Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Picture</td>
<td>0%</td>
<td>3%</td>
<td>24%</td>
<td>37%</td>
<td>33%</td>
</tr>
<tr>
<td>Feature-oriented diagrams</td>
<td>0%</td>
<td>5%</td>
<td>25%</td>
<td>46%</td>
<td>21%</td>
</tr>
<tr>
<td>Round-trip engineering</td>
<td>0%</td>
<td>4%</td>
<td>12%</td>
<td>33%</td>
<td>12%</td>
</tr>
<tr>
<td>Collaborative modeling tool</td>
<td>0%</td>
<td>4%</td>
<td>11%</td>
<td>34%</td>
<td>11%</td>
</tr>
</tbody>
</table>
RQ3: Improvement points to support UML use

![Suggested Improvements Chart]

- **Totally Agree**
- **Partially Agree**
- **Neutral**
- **Partially Disagree**
- **Totally Disagree**

**Percentage of the respondents**

- **Big Picture**
  - Totally Agree: 37%
  - Partially Agree: 33%
  - Neutral: 24%
  - Partially Disagree: 3%
  - Totally Disagree: 0%

- **Feature-oriented diagrams**
  - Totally Agree: 46%
  - Partially Agree: 25%
  - Neutral: 21%
  - Partially Disagree: 5%
  - Totally Disagree: 0%

- **Round-trip engineering**
  - Totally Agree: 48%
  - Partially Agree: 33%
  - Neutral: 12%
  - Partially Disagree: 4%
  - Totally Disagree: 0%

- **Collaborative modeling tool**
  - Totally Agree: 49%
  - Partially Agree: 34%
  - Neutral: 11%
  - Partially Disagree: 4%
  - Totally Disagree: 0%
RQ3: Improvement points to support UML use

![Bar chart showing suggested improvements]

Percentage of respondents' agreement with the following improvements:
- Big Picture: 24% Totally Agree, 37% Partially Agree, 33% Neutral, 0% Partially Disagree, 3% Totally Disagree
- Feature-oriented diagrams: 25% Totally Agree, 25% Partially Agree, 21% Neutral, 0% Partially Disagree, 3% Totally Disagree
- Round-trip engineering: 48% Totally Agree, 12% Partially Agree, 4% Neutral, 4% Partially Disagree, 0% Totally Disagree
- Collaborative modeling tool: 49% Totally Agree, 11% Partially Agree, 4% Neutral, 4% Partially Disagree, 0% Totally Disagree
RQ3: Improvement points to support UML use
Conclusion #3:

- The ability to automatically create a “Big Picture” view of the system under development;
- Provide diagrams/views filtered by system features;
- Support more effectively:
  - round-trip engineering; and
  - modeling collaboration.
Final Remarks

• This work sought to find evidence of how UML is used in practice focused on:
  • Particular geographic region (Brazil);
  • Practitioners who work on closed source projects.

• In total, 222 participants from 140 IT companies.
Final Remarks

• Overall, our results show that UML use has not varied much by region.

• In our context:
  • The majority have not used UML in their work life.
  • Everyone knows UML but they don’t necessarily agree it is a “Lingua Franca” for software modeling.
  • The majority pointed out tool related improvements to boost UML use. Perhaps this requires changes in the language.
Future Work

• Further investigation on:
  • Motivating factors for UML adoption;
  • Perceived cost/benefit of UML from the perspective of academics and practitioners.

• Analyze more data we already collected from the same set of participants.

• Assess to what extent UML modeling tools:
  • Support round-trip engineering; and
  • Collaborative modeling.
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