Programmers Are Users Too: Human-Centered Methods for Improving Programming Tools

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Summary by Prof. Thomas LaToza
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Software Engineering Environments
Programmers are user too

Key idea:

- Developers are users.
- HCI methods can be applied to developers.
- Methods may be applied to tools, APIs, libraries, documentation, programming language design.

Important for tools to be useful and address an important problem:

- Should be high frequency or have a large impact
- Tools that do not address an important problem may not be adopted
<table>
<thead>
<tr>
<th>Method</th>
<th>Tool development activities supported</th>
<th>Key benefits</th>
<th>Challenges and limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contextual inquiry</td>
<td>Requirements and problem analysis</td>
<td>» Experimenters gain insight into day-to-day activities and challenges.</td>
<td>» Contextual inquiry is time consuming.</td>
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<td></td>
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<td>» Experimenters gain high-quality data on the developer’s intent.</td>
<td>» Recruiting professionals might be a challenge.</td>
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<tr>
<td>Exploratory lab studies</td>
<td>Requirements and problem analysis</td>
<td>» Focusing on the activity of interest is easier.</td>
<td>The experimental setting might differ from the real-world context.</td>
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<td></td>
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<td>» Experimenters can compare participants doing the same tasks.</td>
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<td>» Experimenters gain data on the developer’s intent.</td>
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<tr>
<td>Surveys</td>
<td>» Requirements and problem analysis</td>
<td>» Surveys provide quantitative data.</td>
<td>The data is self-reported and is subject to bias and lack of participant awareness.</td>
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<td></td>
<td>» Evaluation and testing</td>
<td>» There are many participants.</td>
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<td>» Surveys are (relatively) fast.</td>
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<tr>
<td>Data mining (including corpus studies and log analysis)</td>
<td>» Requirements and problem analysis</td>
<td>» Data mining provides large quantities of data.</td>
<td>» Inferring or reconstructing the developer’s intent is difficult.</td>
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<td>» Evaluation and testing</td>
<td>» Experimenters can see patterns that emerge only with large corpuses.</td>
<td>» Data mining requires careful filtering.</td>
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<tr>
<td>Natural-programming elicitation</td>
<td>» Requirements and problem analysis</td>
<td>Experimenter gain insight into developer expectations.</td>
<td>The experimental setting might differ from the real-world context.</td>
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<td>» Design</td>
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<tr>
<td>Rapid prototyping</td>
<td>Design</td>
<td>Experimenters can gather feedback at low cost before committing to high-cost development.</td>
<td>Rapid prototyping has lower fidelity than the final tool, limiting what problems might be revealed.</td>
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</tbody>
</table>
| Heuristic evaluations | » Requirements and problem analysis  
» Design  
» Evaluation and testing | » Evaluations are fast.  
» They do not require participants. | Evaluations reveal only some types of usability issues. |
| Cognitive walkthroughs | » Design  
» Evaluation and testing | » Walkthroughs are fast.  
» They do not require participants. | Walkthroughs reveal only some types of usability issues. |
| Think-aloud usability evaluations | » Requirements and problem analysis  
» Design  
» Evaluation and testing | Evaluations reveal usability problems and the developer’s intent. | » The experimental setting might differ from the real-world context.  
» Evaluations require appropriate participants.  
» Task design is difficult. |
| A/B testing        | Evaluation and testing | » Testing provides direct evidence that a new tool or technique benefits developers.  
» It provides objective numbers. | » The experimental setting might differ from the real-world context.  
» Testing requires appropriate participants.  
» Task design is difficult. |
Design recommendations

• Good aesthetic and interaction design
  • Better interaction design leads to better tools
• Primacy of viewing code
  • Visualizations help as comprehension and navigation aids, but want to see code
• Importance of search
  • Developers must work with vast sets of artifacts, but have specific questions. Search can help directly express.
• Augmenting what developers do
  • Developers have specific strategies. Can integrate directly into these strategies.
Questions for discussion

• Overall reactions

• Where might this method have the most impact?

• Where might this method be hard to use?

• You are trying to understand what causes defects. What method(s) might you use?

• You are trying to understand if developers are more productive writing web apps in PHP or in React. What methods might you use?