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

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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

Method	Tool development activities supported	Key benefits	Challenges and limitations
Contextual inquiry	Requirements and problem analysis	» Experimenters gain insight into day-to-day activities and challenges. » Experimenters gain high-quality data on the developer's intent.	» Contextual inquiry is time consuming. » Recruiting professionals might be a challenge.
Exploratory lab studies	Requirements and problem analysis	» Focusing on the activity of interest is easier. » Experimenters can compare participants doing the same tasks. » Experimenters gain data on the developer's intent.	The experimental setting might differ from the real-world context.
Surveys	» Requirements and problem analysis » Evaluation and testing	» Surveys provide quantitative data. » There are many participants. » Surveys are (relatively) fast.	The data is self-reported and is subject to bias and lack of participant awareness.
Data mining (including corpus studies and log analysis)	» Requirements and problem analysis » Evaluation and testing	» Data mining provides large quantities of data. » Experimenters can see patterns that emerge only with large corpuses.	» Inferring or reconstructing the developer's intent is difficult. » Data mining requires careful filtering.
Natural-programming elicitation	» Requirements and problem analysis » Design	Experimenters gain insight into developer expectations.	The experimental setting might differ from the real-world context.

Rapid prototyping	Design	Experimenters can gather feedback at low cost before committing to high-cost development.	Rapid prototyping has lower fidelity than the final tool, limiting what problems might be revealed.
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

- 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?