Usefulness and usability of heuristic walkthroughs for evaluating domain-specific developer tools in industry: Evidence from four field simulations

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The use of domain-specific languages (DSLs) is an approach to reducing the complexity of software development by expert developers for selected application domains. To support expert developers, a DSL is often combined with a tailored, domain-specific developer tool that provides similar functionality to general-purpose programming environments (IDEs) while integrating with a domain-specific toolchain (e.g., code or documentation generators, simulators). General-purpose development environments have been successfully evaluated for the programmer experience (PX) and for anomalies using heuristic walkthroughs as a mixed review technique. We report on the usefulness and acceptance of heuristic walkthroughs as a PX evaluation technique applied to domain-specific languages and IDEs in an industry context. Heuristic walkthroughs are used in four interventions (field simulations) to assess the programming experience and usability of domain-specific, Eclipse-based IDEs. Data on the usefulness and acceptance (perceived satisfaction) of the walkthroughs themselves are collected and analysed. Our studies show that walkthroughs are useful for revealing practically relevant PX anomalies, while maintaining acceptance by the expert developers participating in the walkthroughs. The documented variant of heuristic walkthroughs can be adopted for future field studies in academic research and for evaluation projects in industry. The steps of a heuristic walkthrough are (see also Fig. 1):

**Preparation** Each reviewer is trained on the review object, e.g. through a tutorial, a training task, or during a live demonstration by the authors.

**Prelude** The expertise and background of each evaluator is collected through a self-assessment questionnaire or by a structured interview. Data on an orthogonal review phenomena, such as the perceived usability of the review object, are collected.

**Walkthrough** In pairs, a moderator and an evaluator conduct a task-based walkthrough. The evaluator interacts with the review object to solve pre-selected and representative

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work tasks in a think-aloud manner. The evaluator works through tasks and attempts to achieve a predefined goal by performing a sequence of actions. Upon completion of a task, the evaluator is prompted by the moderator to answer predefined thought-guiding questions.

**Evaluation** The walkthrough is followed by a heuristic evaluation based on a predefined collection of PX heuristics against the background of the previously performed tasks. In this step, for each heuristic, the moderator invites the evaluator to comment on her experience, her observations on the review object being evaluated (e.g., the visibility of system status when performing the walkthrough tasks). In addition, the evaluator is asked to rate her observations on each heuristic in three categories: critical, non-critical, and undecided.

**Postlude** The evaluators are interviewed by the moderator, e.g., using questionnaires, to elaborate on PX anomalies previously documented (during the walkthrough or the evaluation).

**Follow-up** The collected material is systematically reviewed and transformed into actionable items (e.g., issue tickets, bug reports, RFE). This can include systematic content analysis (including text coding of transcripts). In a subsequent meeting, the moderator reports the recorded PX anomalies to the authors and the stakeholders. The authors decide on the status and the consequences of each PX anomaly. The moderator monitors the status of the rework and communicates a status report to the stakeholders.

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