



Exactly How Are Requirements Written?

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THIS ISSUE OF *IEEE Software* focuses on the study of professional software design with five articles that take a suitably broad view, covering important early design and collaboration activities.^{1,2} I was particularly fascinated by how the articles report what software folks actually do rather than what the published methods and processes advise them to do. What folks actually do is far more insightful.

The articles inspired me to take stock of what we know about requirements practices. The answer, I believe, is relatively little. Some well-known studies exist—for example, Daniela Damian and her colleagues discussed patterns of collaboration and aware-

few studies of actual requirements practices compared to studies of how people program.

Pots and Kettles

Is this lack of studies a problem? I think it is. It means that we know relatively little about how people actually do requirements work. For those of us who seek to change requirements practice by introducing new techniques and software tools, this is the pot calling the kettle black. We frequently encourage practitioners in requirements projects to observe stakeholders, understand their work, and explore possible interventions incrementally.

And yet we rarely engage in this practice ourselves to understand our

slowly?), and that the new generations of requirements people will be more willing to use our techniques (we teach them the old ways). These excuses soon wear thin.

A Simple User Story

To begin to fill this particular gap in my knowledge, I reflected on a simple requirements task—writing a user story—and how much (or little) I knew about how it happens. I decided to keep it simple, focus on what a single analyst does, assume that the story has already been outlined, and ignore other user stories in the backlog.

What I learned is how little I know about the cognitive processes that I undertake to successfully write a good requirement. Although I'm recognized as knowledgeable in the field, I was blind to the wide range of cognitive processes that analysts must undertake.

So what's the story? I went for a simple, everyday tale of bank customers and their accounts. The following user story employs a standard format—a bank customer gets a new capability to achieve a goal.

[role] *As a bank customer,*

[capability] *I want to be able to view all relevant information about my account balance*

There are few studies of actual requirements practices compared to studies of how people program.

ness in requirements management,³ while Lan Cao and Balasubramaniam Ramesh reported on the requirements-related practices of numerous agile projects.⁴ However, there are

own stakeholders. Sure, there are lots of excuses: the diversity of requirements practices out there (but are they that diverse?), the fast-changing pace of these practices (but don't they change

[goal] so that I can make impulse purchases using my bank card.

Analysis Tasks, Cognitive Processes

I sketched the user story, read it back, changed it several times, and then quickly reflected on my own cognitive processes. What I found was insightful.

First, I sought to discover and make assumptions about the different possible contexts in which the bank customer would use the capability to achieve the goal. For example, the customer might decide to make a purchase at home from a desktop computer, at an ATM on the street, or at the counter of a shop using a mobile device. To scope the user story, I needed to discover these locations and document them. Important cognitive processes that I undertook during these tasks included discovering and imagining the different contexts, exploring how the bank customer might behave in each context, and then prioritizing and selecting among the contexts according to criteria such as relevance and importance to the user story.

I next sought to understand more precisely the role of the actor, the new capability, and the goal. For example, is the capability to view the information—that is, to see it optically—or to know the information so that it can be processed? Likewise, is the goal to make impulse purchases, or is it to make informed decisions about the consequences of making purchases? Important cognitive processes during this task included challenging and refining the meaning of specified concepts.

Next, I analyzed the new capability's impact on the behavior associated with the types of people who would fulfill the role. For example, does giving an irresponsible teenager informa-

tion that he has money in his account encourage a pay-today, regret-tomorrow approach to spending? Important cognitive processes included envisioning and walking through different future-use scenarios and inferring the likelihood that the capability could still lead to goal achievement.

I also considered whether the bank customer's role changes in the presence of the new capability. For example, I challenged the assumption that the user primarily fulfills the role of bank customer in all relevant contexts. In some, the user is fulfilling the role of a shopper—in others, a potential shopper. Important cognitive processes included inventing and attributing roles to the actor.

A key decision to complete the specification was to predict if the actor could meet the refined goal with the capability as specified. I constructed an argument in which the capability meets the goal based on assumptions, such as the customer having the cognitive capability to make an informed decision. Cognitive processes I undertook to construct the argument included

- challenging the validity of existing assumptions,
- forming a logical argument,
- positing new assumptions, and
- validating the emerging argument.

Finally, I sought to develop one or more acceptance tests for the user story. To do this, I needed to decide what type(s) of requirements to test. I categorized the story as a usability requirement and applied known success measures for this type to generate concrete tests based on timely purchases without defined types of error. The important cognitive processes include categorizing the user story and defining the concepts to measure.

Okay, this self-report isn't very scientific. But it is insightful. What appeared to be a simple, atomic piece of requirements work turned out to be a complex, cognitive task necessitating a diverse range of interleaved cognitive processes.

How much do we understate the complexity and difficulty of good requirements work? To answer this question, we need more studies of individual and collaborative requirements work. Formal empirical studies are welcome, but I wonder to what extent self-reflection about our requirements practices can inform our understanding. Would we see the reflections of our own practices? 🍷

References

1. J. Rooksby and N. Ikeya, "Collaboration in Formative Design: Working Together at a Whiteboard," *IEEE Software*, vol. 29, no. 1, 2012, pp. 56–60.
2. A. Dilmaghani and J. Dibble, "Strategies for Early-Stage Collaborative Design," *IEEE Software*, vol. 29, no. 1, 2012, pp. 39–45.
3. D. Damian, S. Marczak, and I. Kwan, "Collaboration Patterns and the Impact of Distance on Awareness in Requirements-Centred Social Networks," *Proc. IEEE Requirements Eng. Conf. (RE 07)*, IEEE CS Press, 2007, pp. 59–68.
4. L. Cao and B. Ramesh, "Agile Requirements Engineering Practices: An Empirical Study," *IEEE Software*, vol. 25, no. 1, 2008, pp. 60–67.

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