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From Programmer to Software Architect

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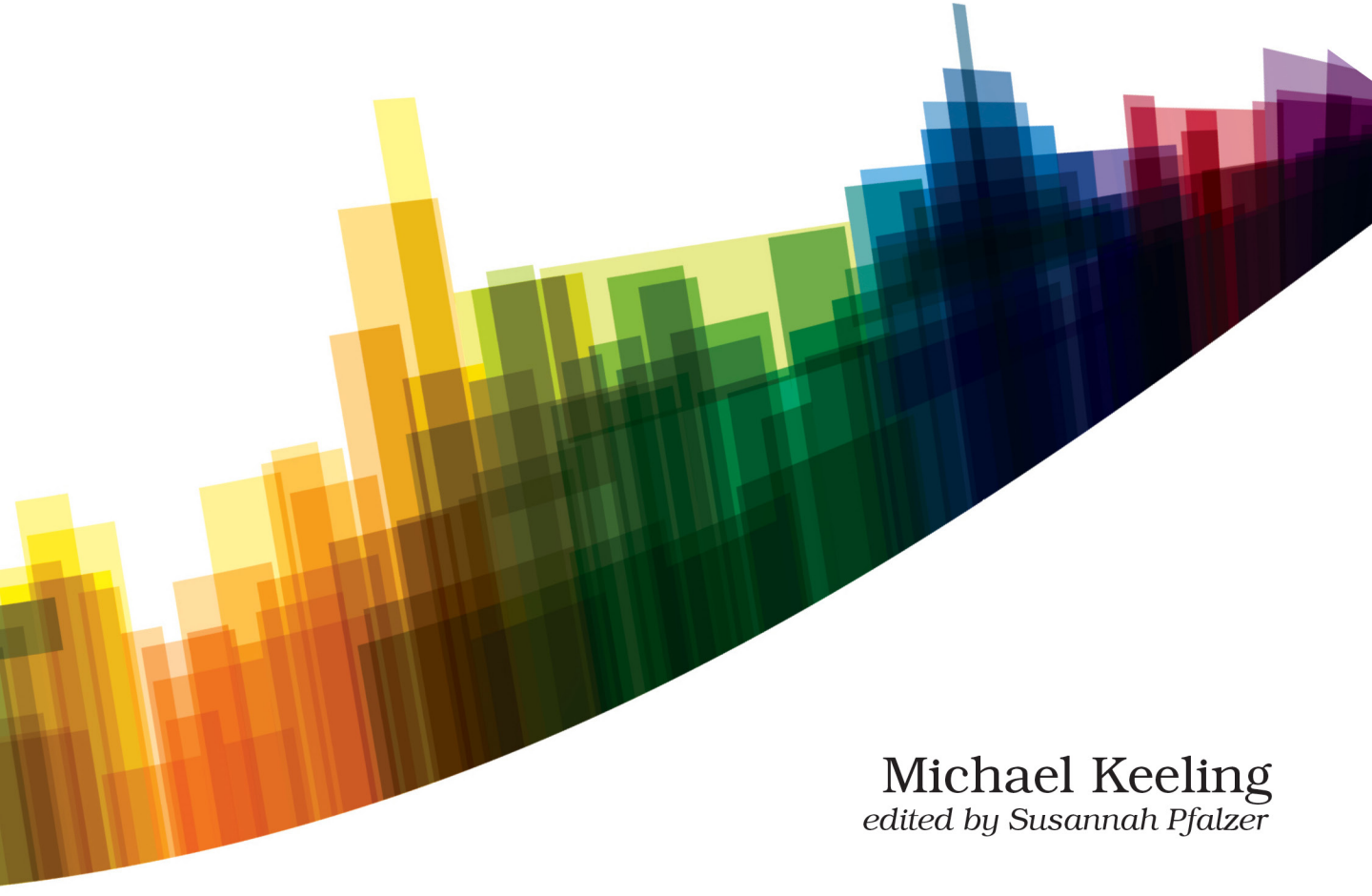

Michael Keeling

edited by Susannah Pfalzer

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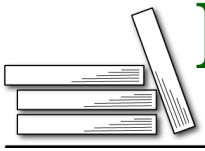

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Layout: Gilson Graphics

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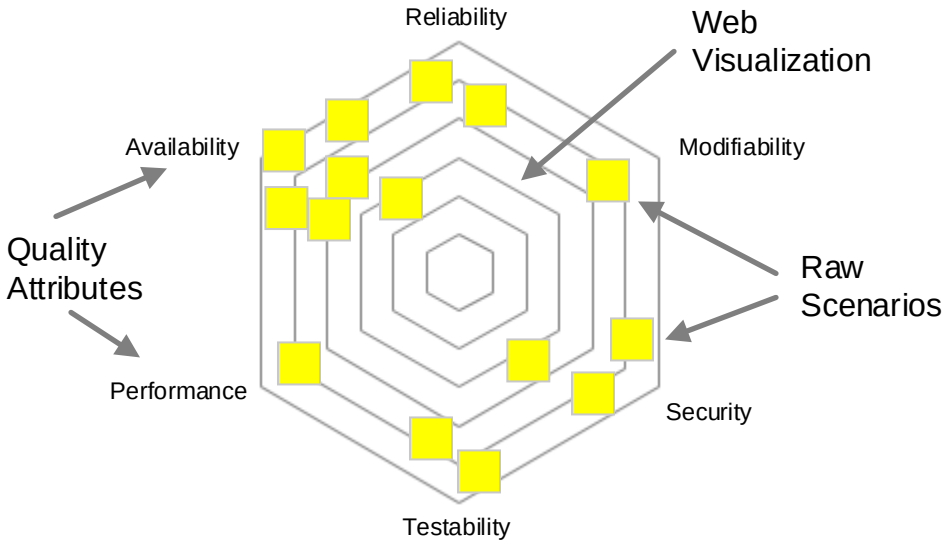
Printed in the United States of America.
ISBN-13: 978-1-68050-209-1
Encoded using the finest acid-free high-entropy binary digits.
Book version: P1.0—October 2017

Activity 6

Quality Attribute Web

The *quality attribute web* is a brainstorming and visualization activity to help elicit, categorize, refine, and prioritize stakeholder concerns and raw quality attribute scenarios. A quality attribute web captures stakeholders' concerns. We write each concern on individual sticky notes. The web is drawn as a simple radar chart with relevant quality attributes written around the edge like this:



Benefits

- Guide stakeholders to think about quality attributes instead of features.
- Provide a visualization that shows how one system is different from another based on highly desirable properties.
- Help stakeholders prioritize quality attribute scenarios before refining them.

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Activity Timing

30–45 minutes

Participants

Any stakeholders, including the team

Preparation and Materials

- If you are using a quality attribute taxonomy, prepare it ahead of time. You may find it helpful to print the web on poster paper instead of drawing it on a whiteboard.
- Sticky notes, markers

Steps

1. Draw or post a blank quality attribute web so everyone can see it. The web can be created ahead of time if you know which quality attributes to include. If you're not using a prepared web, brainstorm as a group to identify 5–7 quality attributes that are important to the stakeholders.
2. Brainstorm concerns and raw quality attribute scenarios as a group. Write each concern down on a sticky note and add it to the web near the quality attribute to which it most closely applies.
3. When time expires, write down the concerns and use the information to create quality attribute scenarios.

Guidelines and Hints

- Some stakeholders will need help getting started. Be prepared to help them phrase their concerns initially.
- Use dot voting to prioritize concerns on the web.
- Don't worry about getting perfect scenarios. A general thought, worry, response measure, or partial scenario is a great start.
- Combine with the mini-quality attributes workshop, described on page 8, for a more comprehensive workshop.

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Example

In this example, quality attributes were brainstormed when the activity began and written on a whiteboard. In this particular workshop, you can see that availability and reliability tended to be on everyone's minds slightly more than other quality attributes. Of the twenty or so raw scenarios created during the hour long activity, only six or seven were prioritized highly by stakeholders. The remainder helped the team gain necessary context about the stakeholders' concerns.

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Activity 7

Mini-Quality Attribute Workshop

The *mini-Quality Attribute Workshop* (mini-QAW) is a lean, facilitated workshop designed to help you talk about quality attributes with stakeholders early in a system's life.[5] During a mini-QAW, you'll collaborate as a group to quickly identify, develop, and clarify quality attributes with the help of a quality attribute taxonomy. By the end of the mini-QAW, you'll have a prioritized list of quality attribute scenarios and a wealth of contextual information about the system to be designed.

Benefits

- Walk through the essential steps of a traditional quality attribute workshop in only a few hours.
- Quickly identify raw quality attributes and prioritize them before refining into full scenarios.
- Provide opportunities for stakeholders to riff on each other's ideas.
- Create a forum for open discussion among stakeholders to discuss quality attribute concerns, risks, and other general concerns about the software system.

Activity Timing

Ninety minutes to 3 hours, depending on the size of the taxonomy and brainstorming method used

Participants

A facilitator, usually the software architect. A small group of stakeholder participants.

This workshop works best in small groups of 3–5, with a maximum size of about 10 participants. Host multiple workshops if necessary to keep the group size down. When hosting multiple workshops, review scenarios with all groups once the workshops have concluded.

5. http://bit.ly/mini-qaw

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Preparation and Materials

- Before the workshop, prepare a *quality attribute taxonomy*. The quality attribute taxonomy is a set of predefined quality attributes highly relevant to the type of system you are building. An example of a quality attribute taxonomy for service-oriented architectures is available from the Software Engineering Institute.[6] The taxonomy will be used to facilitate structured brainstorming.
- Prepare graphical quality attribute scenario templates in the style of the examples on page ?. Use these templates to capture scenarios during the workshop.
- If desired, prepare a quality attribute web, shown on page 5, on poster-sized paper for use during the workshop. If not using a pre-printed taxonomy web, draw a web at the start of the workshop.
- Sticky notes and markers for participants

Steps

1. Present the workshop goals and agenda.
2. Teach participants what they need to know about quality attributes. Describe the quality attribute taxonomy you'll use during the workshop.
3. Display or draw the quality attribute web so everyone can see it.
4. Brainstorm raw quality attribute scenarios using either structured brainstorming or a questionnaire. Instruct participants to write one idea per sticky note and place them directly on the displayed taxonomy web. Read the posted raw scenarios out loud as they are placed on the web. If this prompts participants to think of new scenarios, record and post them on the web too.
5. After the brainstorming phase, prioritize the quality attributes and raw scenarios using dot voting. Participants get 1/3 the number of identified raw scenarios. For example, if there are 25 sticky notes on the web, everyone gets 8 votes to spend however they please. Participants also get 2 votes for overall quality attributes. Everyone votes at the same time.

6. Liam O'Brien, Len Bass, and Paulo Merson. *Quality Attributes and Service-Oriented Architectures*. http://resources.sei.cmu.edu/library/asset-view.cfm?assetid=7405

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6. Refine the top raw scenarios as a group until time runs out using the six-part scenario template shown on page ?. Remaining work must be done as homework.

7. As homework, refine the top raw quality attribute scenarios. Present the top refined quality attribute scenarios in a follow-up meeting to verify the scenarios and relative priority.

Guidelines and Hints

- Keep your taxonomy small, 5–7 quality attributes max.
- Use the web visualization to drive the workshop. Put the sticky notes close to related quality attributes.
- Don't worry about creating formal scenarios during brainstorming.
- Ask probing questions about the stimulus, response, environment.
- Pay attention when stakeholders sound worried about something. Stakeholders' worries are often the source of a possible scenario.
- Watch out for features and functional requirements.
- Do not skip the homework. This is the most important part!
- If workshop participants are not co-located, select screen-sharing software all participants can use or consider using a digital whiteboard application such as Mural. See *Work with Remote Teams*, on page ? for more remote facilitation tips.

Example

Here is an example mini-QAW agenda:

Agenda Item	Timing	Hints
Introduce the Mini-QAW	10 minutes	
Teach participants about Quality Attributes	15 minutes	Set participants up for success
Brainstorm Raw Scenarios	30 minutes–2+ hours	Walk the System Properties Web
Prioritize raw scenarios	5 minutes	Use dot voting
Refine scenarios	Until time runs out	Finish as homework
Review the results	1 hour	Separate, future meeting

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The mini-QAW is a very useful workshop with a few moving parts. Next, we'll look at some additional tips for each of the stages in the standard agenda.

Brainstorm and Prioritize Raw Scenarios

If workshop participants are relatively experienced, guide them through a simple brainstorming exercise. Set a time limit of 7–10 minutes for brainstorming and have participants work alone to come up with as many raw scenarios as they can. With less experienced participants (or facilitators), consider using the quality attribute web activity on page 5 with a prepared taxonomy and *quality attribute taxonomy-based questionnaire*. The taxonomy questionnaire is a list of questions based on a predefined quality attribute taxonomy designed to prompt stakeholders to think about potential scenarios. Questionnaires require more up-front work, but this approach is thorough and produces more consistent results than brainstorming without a questionnaire.

After brainstorming, prioritize the raw scenarios. Stakeholders will raise many concerns during a workshop, but not all concerns are worth the effort to refine further. After participants have finished voting, take a step back and look at the web. Are there areas of the web with a greater number of sticky notes than others? How does that compare with how people voted? Were the high-priority scenarios aligned with the high-priority quality attributes?

The example on page 12, is what the quality attribute web might look like after voting. Dots on sticky notes are a vote for a raw scenario whereas dots on the web are for the overall quality attribute regardless of the specific scenarios identified.

Start Scenario Refinement

After prioritizing raw scenarios, use the time remaining in the workshop to refine scenarios as a group. Show the quality attribute scenario template during the workshop and fill it in with stakeholders. The template can be printed on paper or shown as a presentation. The facilitator is responsible for refining any remaining scenarios as homework before the next meeting.

As you refine scenarios, keep an eye out for functional requirements masquerading as quality attribute scenarios. Everyone loves to talk about features, and it's easy for feature requests to come up during a QAW. When this happens, add the feature request to your notebook and redirect the conversation back toward specific quality attributes.

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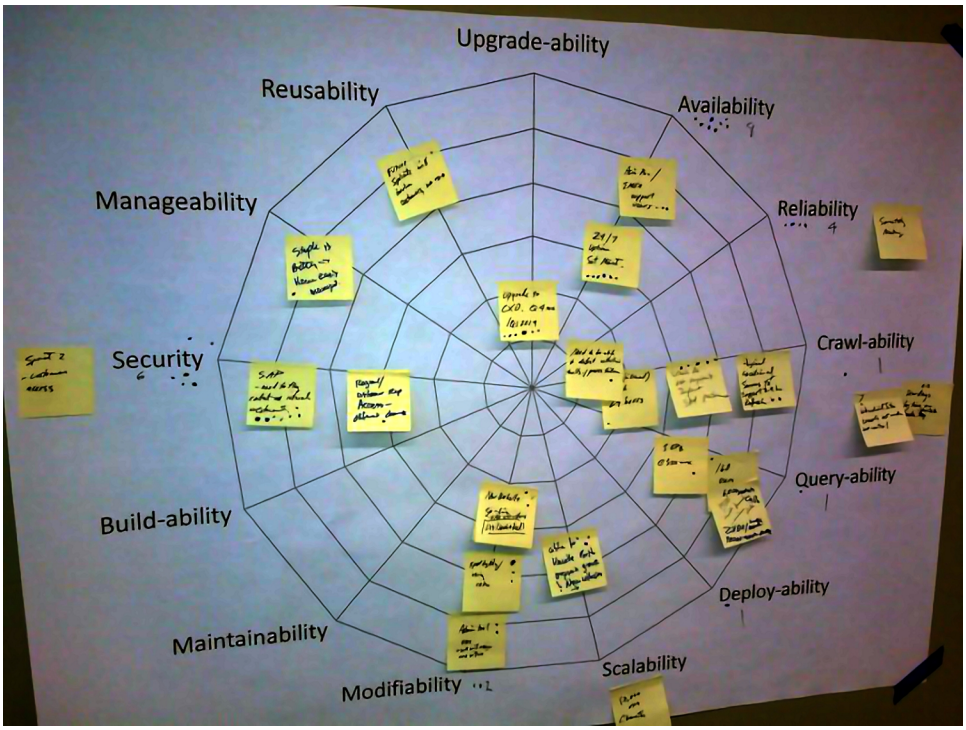

Verify Findings with Stakeholders

Hold a follow-up meeting to review the refined scenarios with stakeholders. Prepare a slide-based presentation of the findings or other appropriate write-up to share during the meeting.

During this follow-up meeting, check the accuracy of any straw man numbers you put into the scenarios (see Activity 9, *Response Measure Straw Man*, on page ?. Discuss information missing from scenarios and fill what you can. Finally, use this opportunity to double-check the priority of the top quality attribute scenarios. A simple *high* or *low* is usually sufficient. Any raw scenarios not refined are considered as *low* priority.

Alternatives

The mini-QAW is based on a more comprehensive workshop. The traditional QAW takes a few days to complete and is more appropriate for high-risk systems with many stakeholders. *Quality Attribute Workshops (QAWs), Third edition [BELS03]* describes the traditional QAW in detail.