Module Scenarios, Story Telling and Use Cases

by Gerrit Muller University of South-Eastern Norway-NISE
e-mail: gaudisite@gmail.com
www.gaudisite.nl

Abstract

This module addresses Scenarios, Story Telling and Use Cases. Scenarios are used to cope with multiple alternatives for specification or design. Story telling is a means to explore customer needs and as a means for communication. Use Cases are used to analyze the design for specific circumstances.
### goal of this module

- Be able to apply story telling technique.
- Be able to use scenario analysis.
- Be able to use use-cases for design.

### content of this module

- Format and criteria for stories
- Elements of scenarios
- Role of scenarios in decision making
- Quantified use cases

### exercise

Create a story and translate story via use cases in design
Abstract

A story is an easily accessible story or narrative to make an application live. A good story is highly specific and articulated entirely in the problem domain: the native world of the users. An important function of a story is to enable specific (quantified, relevant, explicit) discussions.
From story to design

What does Customer need in Product and Why?

Customer What
Customer How
Product What
Product How

Customer objectives
Application
Functional
Conceptual
Realization

story
analyze design
case
analyze design
design

market vision

a priori solution knowledge
A day in the life of Bob

Bla blah, rabarber music, bla composer, bla qwwwety, 30 zeps.

Nja nja, njet njippie est quo vadis? Pjotr jaleski, bla bla brase, fj otpg hig hig.

In the middle of the night, he is awake and decides to change the world forever.

The next hour, the great event takes place:

This brilliant invention will change the world forever because it is so unique and valuable that nobody believes the feasibility. It is great and WOW at the same time, highly exciting.

Vtables are seen as the solution for an indirection problem. The invention of Bob will obsolete all of this in one incredible move, which will make him famous forever.

He opens his PDA, logs in and enters his private secure unique non-trivial password, followed by a thorough authentication. The PDA asks for the fingerprint of this little left toe and to pronounced the word shit. After passing this test, Bob can continue.
Points of attention

- **purpose**: What do you need to know for specification and design?
- **scope**: “umbrella” or specific event?
- **viewpoint, stakeholders**: Define your stakeholder and viewpoint (e.g., user, maintainer, installer)
- **visualization**: Sketches or cartoon Helps to share and communicate ideas
- **size (max 1 A4)**: Can be read or told in few minutes
- **recursive decomposition, refinement**
Criteria for a good story

- **accessible, understandable**
  "Do you see it in front of you?"

- **valuable, appealing**
  attractive, important
  "Are customers queuing up for this?"

- **critical, challenging**
  "What is difficult in the realization?"
  "What do you learn w.r.t. the design?"

- **frequent, no exceptional niche**
  "Does it add significantly to the bottom line?"

- **specific**
  names, ages, amounts, durations, titles, ...
Betty is a 70-year-old woman who lives in Eindhoven. Three years ago her husband passed away and since then she lives in a home for the elderly. Her 2 children, Angela and Robert, come and visit her every weekend, often with Betty’s grandchildren Ashley and Christopher. As so many women of her age, Betty is reluctant to touch anything that has a technical appearance. She knows how to operate her television, but a VCR or even a DVD player is way to complex.

When Betty turned 60, she stopped working in a sewing studio. Her work in this noisy environment made her hard-of-hearing with a hearing-loss of 70dB around 2kHz. The rest of the frequency spectrum shows a loss of about 45dB. This is why she had problems understanding her grandchildren and why her children urged her to apply for hearing aids two years ago. Her technophobia (and her first hints or arthritis) inhibit her to change her hearing aids’ batteries. Fortunately her children can do this every weekend.

This Wednesday Betty visits the weekly Bingo afternoon in the meetingplace of the old-folk’s home. It’s summer now and the tables are outside. With all those people there it’s a lot of chatter and babble. Two years ago Betty would never go to the bingo: “I cannot hear a thing when everyone babbles and clatters with the coffee cups. How can I hear the winning numbers?!”. Now that she has her new digital hearing instruments, even in the bingo cacophony, she can understand everyone she looks at. Her social life has improved a lot and she even won the bingo a few times.

That same night, together with her friend Janet, she attends Mozart’s opera The Magic Flute. Two years earlier this would have been one big low rumbly mess, but now she even hears the sparkling high piccolos. Her other friend Carol never joins their visits to the theaters. Carol also has hearing aids, however hers only “work well” in normal conversations. “When I hear music it’s as if a butcher’s knife cuts through my head. It’s way too sharp!” So Carol prefers to take her hearing aids out, missing most of the fun. Betty is so happy that her hearing instruments simply know where they are and adapt to their environment.
Value and Challenges in this story

Value proposition in this story:
quality of life:
   active participation in different social settings
usability for nontechnical elderly people:
   "intelligent" system is simple to use
   loading of batteries

Challenges in this story:
Intelligent hearing instrument
Battery life — at least 1 week
No buttons or other fancy user interface on the hearing instrument, other than a robust On/Off method
The user does not want a technical device but a solution for a problem
Instrument can be adapted to the hearing loss of the user
Directional sensitivity (to prevent the so-called cocktail party effect)
Recognition of sound environments and automatic adaptation (adaptive filtering)

source: Roland Mathijssen, Embedded Systems Institute, Eindhoven
Abstract

Good designers keep multiple alternatives open in parallel. This improves the specification and design quality. Scenarios can be used to cope with these alternatives and as a means for communication with stakeholders.
content of this presentation

Decision making

Multiple propositions

Scenarios
Decision Making Process

1. Problem understanding
2. Analysis
3. Decision
4. Monitor, verify, validate

- insufficient data
- invalid solution
- no satisfying solution
- conflicting other decision
- vague problem statement
Flow from problem to solution

1. Problem understanding by exploration and simple models

2. Analysis by
   + exploring multiple propositions (specification + design proposals)
   + exploring decision criteria (by evaluation of proposition feedback)
   + assessment of propositions against criteria

3. Decision by
   + review and agree on analysis
   + communicate and document

4. Monitor, verify, validate by
   + measurements and testing
   + assessment of other decisions

Scenario How To
13 Gerrit Muller

version: 0
October 11, 2020
TORdecisionFlow
## Example of Multiple Propositions

<table>
<thead>
<tr>
<th>Throughput</th>
<th>Cost</th>
<th>Safety</th>
<th>High-performance sensor</th>
<th>High-speed moves</th>
<th>Additional pipelining</th>
<th>Additional collision detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 p/m</td>
<td>20 p/m</td>
<td>20 p/m</td>
<td>20 p/m</td>
<td>20 p/m</td>
<td>20 p/m</td>
<td>20 p/m</td>
</tr>
<tr>
<td>5 k$</td>
<td>5 k$</td>
<td>5 k$</td>
<td>5 k$</td>
<td>5 k$</td>
<td>5 k$</td>
<td>5 k$</td>
</tr>
<tr>
<td>300 ns</td>
<td>300 ns</td>
<td>300 ns</td>
<td>300 ns</td>
<td>300 ns</td>
<td>300 ns</td>
<td>300 ns</td>
</tr>
<tr>
<td>9 m/s</td>
<td>9 m/s</td>
<td>9 m/s</td>
<td>9 m/s</td>
<td>9 m/s</td>
<td>9 m/s</td>
<td>9 m/s</td>
</tr>
</tbody>
</table>

### low cost and performance 1

### low cost and performance 2

### high cost and performance
Recursive and concurrent application of flow

1. Problem understanding
2. Analysis
3. Decision
4. Monitor, verify, validate

Legend:
- Decision flow
- Analysis flow

Scenario How To
Gerrit Muller
Version: 0
October 11, 2020
TORrecursion
Graph of Decisions and Alternatives

Legend:
- past decision
- most probable decision
- potential alternative
- less probable alternative

Scenario How To
Gerrit Muller

version: 0
October 11, 2020
ADMdecisionTree
Different Types of Decisions

Understanding Why

Describing What

Guiding How

- basic principles
- requirements
- architecture rules implementation choices f.i. technology

Scenario How To

Gerrit Muller

version: 0
October 11, 2020
ADMdecisions
Elements of a Scenario

scenario: <clear title>

story  case  design

key specification and design decisions
Summary of Scenarios

Exploration and analysis require multiple propositions.

Architects continuously work with multiple alternatives.

Scenarios have a clear title, story, use case and design.

Scenarios are differentiated by key specifications and design decisions.
Abstract

Use cases are frequently used in Software Engineering. Use cases support specification and facilitate design, analysis, verification and testing. Many designers, unfortunately, apply use cases in a rather limited way. This presentation provides recommendations for effective use cases.
Why Use Cases?

Supports or is part of specification
by providing specific data in user perspective

Facilitates analysis and design

Facilitates verification and testing
Example Time Shift recording

20:00 21:00 22:00 23:00

start movie

broadcast

end movie

record

view view talk

phone rings
pause viewing

play

finish conversation
resume viewing

view

Use Case How To

version: 0.1
October 11, 2020
EexampleTimeShifting
Construction limits intrude in User Experience

- number of tuners
- number of simultaneous streams (recording and playing)
- amount of available storage
- management strategy of storage space
What if?

1. programmed recording of other station
2. very long phone call
3. Dad zaps

phone rings
pause viewing

start movie
broadcast
end movie

view
talk
record
play

view
play

start movie
end movie

version: 0.1
October 11, 2020
Content of a Use Case

use case

(user or system specified functionality behavior)

(interfaces qualities (NFR's))

(input data format size content)

(output data format size content)

(context interaction)

(sub)system or component
## Example personal video recorder use case contents

<table>
<thead>
<tr>
<th>typical use case(s)</th>
<th>worst case, exceptional, or change use case(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>interaction flow (functional aspects)</strong></td>
<td><strong>functional</strong></td>
</tr>
<tr>
<td>select movie via directory</td>
<td>multiple inputs at the same time</td>
</tr>
<tr>
<td>start movie</td>
<td>extreme long movie</td>
</tr>
<tr>
<td>be able to pause or stop</td>
<td>directory behaviour in case of extreme many short movies</td>
</tr>
<tr>
<td>be able to skip forward or backward</td>
<td></td>
</tr>
<tr>
<td>set recording quality</td>
<td></td>
</tr>
<tr>
<td><strong>performance and other qualities (non-functional aspects)</strong></td>
<td><strong>non-functional</strong></td>
</tr>
<tr>
<td>response times for start / stop</td>
<td>response time with multiple inputs</td>
</tr>
<tr>
<td>response times for directory browsing</td>
<td>image quality with multiple inputs</td>
</tr>
<tr>
<td>end-of-movie behaviour</td>
<td>insufficient free space</td>
</tr>
<tr>
<td>relation recording quality and storage</td>
<td>response time with many directory entries</td>
</tr>
<tr>
<td></td>
<td>replay quality while HQ recording</td>
</tr>
</tbody>
</table>
Example of Quantification of Typical Use Case

3 examination rooms connected to 1 medical imaging workstation + printer

examination room: average 4 interleaved examinations / hour

image production: \(20 \times 1024 \times 2\) 8 bit images per examination

film production: 3 films of 4k*5k pixels each

high quality output (bi-cubic interpolation)
Timing of this Use Case

- Exam room 1
  - Patient 1
  - Patient 2
  - Patient 3
  - Patient 4

- Exam room 2

- Exam room 3

<table>
<thead>
<tr>
<th>Time</th>
<th>Room 1</th>
<th>Room 2</th>
<th>Room 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Patient 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:30</td>
<td>Patient 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td>Patient 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30</td>
<td>Patient 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 hour

Version: 0.1
October 11, 2020
MICAF typical timing
Recommendations for working with use cases

+ combine related functions in one use case
- do not make a separate use case for every function
+ include non-functional requirements in the use cases

+ minimise the amount of required *worst case* and *exceptional use cases*

- excessive amounts of use cases propagate to excessive implementation efforts
+ reduce the amount of these use cases in steps
- a few well chosen *worst case* use cases simplifies the design
1. Create a story
   • use the criteria

2. Transform the story into a case
   • functional, as well as quantitative

3. Perform a short design exploration
   • based on the case.

4. Improve the story
   • first iteration based on feedback from case and design.
   • Use time boxes to ensure that you make all the indicated steps.
Exercise Reflection

+ stories make discussions much more specific
+ implicit assumptions are identified

~ creating relevant stories is far from trivial

- too much fun

starting point for generalization: specification and design
Summary Scenarios, Story Telling, Use Cases

Conclusions

Stories help to focus early design discussions
Scenarios help to cope with multiple alternatives
Use cases address integral use: functional and quantitative

Techniques, Models, Heuristics of this module

Story telling, criterias
Scenarios
Quantified use cases
Worst case, exceptional and change use cases