Module Scenarios, Story Telling and Use Cases

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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 bla, rabarber music bla bla composer bla bla qwwwety30 zeps.
nja nja njet njippie est quo vadis? Piotr jayski bla bla bla bme ffg gsg hgr mm bas engel heeft een interessant excuus, lex stelt voor om vanavond door te werken.

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

- Vague problem statement
- Insufficient data
- No satisfying solution
- Invalidated solution
- Conflicting other decision
- Vague problem statement
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
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version: 0
October 20, 2017
TORdecisionFlow

vague problem statement
conflicting other decision
insufficient data
no satisfying solution
invalidated solution
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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 p/m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 k$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**low cost and performance 1**

<table>
<thead>
<tr>
<th>throughput</th>
<th>cost</th>
<th>safety</th>
<th>high-performance sensor</th>
<th>high-speed moves</th>
<th>additional collision detector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 p/m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 k$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**low cost and performance 2**

<table>
<thead>
<tr>
<th>throughput</th>
<th>cost</th>
<th>safety</th>
<th>high-performance sensor</th>
<th>high-speed moves</th>
<th>additional collision detector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25 p/m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7 k$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

system level

subsystem level

component level

atomic level

Scenario How To
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TORrecursion
Graph of Decisions and Alternatives

- **Legend**
  - Past decision
  - Most probable decision
  - Potential alternative
  - Less probable alternative

- **Diagram**
  - Communication
  - Scope
  - Past decision
  - Most probable decision
  - Potential alternative
  - Less probable alternative

- **Scenario How To**
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- **Version**
  - 0

- **Date**
  - October 20, 2017

- **Title**
  - ADMdecisionTree
Different Types of Decisions

Understanding Why
- basic principles

Describing What
- requirements

Guiding How
- architecture rules
  implementation choices
  f.i. technology
Elements of a Scenario

scenario: <clear title>

- story
- case
- design

*key specification and design decisions*

scenario: <clear title>

- story
- case
- design

*key specification and design decisions*

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

talk

phone rings

pause viewing

finish conversation

resume viewing

view

play

view
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

Use Case How To
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version: 0.1
October 20, 2017
Content of a Use Case

- user or system
- specified functionality
- behavior
- interfaces
- qualities (NFR's)
- input data
  - format
  - size
  - content
- (sub)system or component
- context
- interaction
- output data
  - format
  - size
  - content
Example personal video recorder use case contents

Typical use case(s)

interaction flow (functional aspects)
- select movie via directory
- start movie
- be able to pause or stop
- be able to skip forward or backward
- set recording quality

performance and other qualities (non-functional aspects)
- response times for start / stop
- response times for directory browsing
- end-of-movie behaviour
- relation recording quality and storage

Worst case, exceptional, or change use case(s)

functional
- multiple inputs at the same time
- extreme long movie
- directory behaviour in case of extreme many short movies

non-functional
- response time with multiple inputs
- image quality with multiple inputs
- insufficient free space
- response time with many directory entries
- replay quality while HQ recording
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: $20 \times 1024^2$ 8 bit images per examination

film production: 3 films of $4k \times 5k$ pixels each

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

- Room 1: Patient 1 at 9:00, Patient 2 at 9:30, Patient 3 at 10:00
- Room 2: Patient 4 at 9:00, Patient 4 at 9:30, Patient 4 at 10:00
- Room 3: Patient 4 at 9:00, Patient 4 at 9:30, Patient 4 at 10:00

1 hour
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.
+ 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
## 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