Module 34, Architectural Reasoning Customer Space Analysis

by Gerrit Muller     HBV-NISE

e-mail: gaudisite@gmail.com
        www.gaudisite.nl

Abstract

This module provides methods and techniques to analyze the customer space.
Methods to Explore the Customer Perspective

by Gerrit Muller  HBV-NISE

e-mail: gaudisite@gmail.com

www.gaudisite.nl

Abstract

This presentation provides a set of techniques to explore the customer perspective. The main purpose is for an organization to understand its customer sufficiently. Architects need this level of understanding to guide specification and design.
<table>
<thead>
<tr>
<th>what</th>
<th>story telling, scenario</th>
<th>financial cost of ownership model money flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>who</td>
<td>stakeholders and concerns</td>
<td>humans organizations autonomous behavior emotions</td>
</tr>
<tr>
<td>how</td>
<td>system context diagram human-made artifacts</td>
<td></td>
</tr>
<tr>
<td>when</td>
<td>timeline from seconds to years</td>
<td></td>
</tr>
<tr>
<td>where</td>
<td>map from nanometers to kilometers</td>
<td></td>
</tr>
<tr>
<td>why</td>
<td>customer key driver graph productivity model</td>
<td></td>
</tr>
</tbody>
</table>

URLs:
- [Story How To](http://www.gaudisite.nl/info/StoryHowTo.info.html)
- [Key Drivers How To](http://www.gaudisite.nl/info/KeyDriversHowTo.info.html)
Scenario: Patient George

• Patient George has continuous headache.

• His family doctor has send him to the Neurologist.

• The Neurologist wants to exclude the possibility of a tumor and requests an MRI examination.

• The Radiologists does not see any indication for a tumor.

• The Radiologist sends his report to the Neurologist.

• The Neurologist discusses his findings with the patient and sends a report to the family doctor.
From Complaint to Diagnosis

- Family Doctor
- Patient
- Referring Physician
- Nurse, operator
- Radiologist
- MRI scanner

Methods to Explore the Customer Perspective

Gerrit Muller
## Stakeholders and concerns MRI scanner

### Methods to Explore the Customer Perspective

<table>
<thead>
<tr>
<th>Government</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cost of care</strong></td>
</tr>
<tr>
<td><strong>general practitioner</strong></td>
</tr>
<tr>
<td><strong>patient comfort</strong></td>
</tr>
<tr>
<td><strong>patient health</strong></td>
</tr>
<tr>
<td><strong>family support</strong></td>
</tr>
<tr>
<td><strong>IT dep. conformance security</strong></td>
</tr>
<tr>
<td><strong>financial dir. cash flow cost of op.</strong></td>
</tr>
<tr>
<td><strong>ref. physician diagnosis treatment</strong></td>
</tr>
<tr>
<td><strong>radiologist diagnosis reimbursement</strong></td>
</tr>
<tr>
<td><strong>operator ease of use</strong></td>
</tr>
<tr>
<td><strong>maintainer accessibility safety</strong></td>
</tr>
<tr>
<td><strong>cleaner accessibility safety</strong></td>
</tr>
<tr>
<td><strong>administration patient id invoice</strong></td>
</tr>
<tr>
<td><strong>nurse patient ease of work</strong></td>
</tr>
<tr>
<td><strong>inspection quality</strong></td>
</tr>
</tbody>
</table>

**Legend**
- **Administrative**
- **Clinical**
- **Patient**
- **Support**
Methods to Explore the Customer Perspective

Gerrit Muller

Context of MRI

- MRI
- CT
- Xray
- PACS (Picture Archiving and Communication)
- RIS (Radiology Information System)
- HIS (Hospital Information System)
- LIS (Laboratory Information System)
- Physician workstation
- Patient portal
- Other IS
- Administrative
- Clinical
- Imaging
- Patient
- Support
- External stakeholders
- IT infrastructure (communication, gateways, servers, storage, ...)

Legend

Methods to Explore the Customer Perspective

February 3, 2015

version: 0

MECPcontextDiagram
Workflow

request
exam

schedule
exam

perform
exam

send
report

receive
patient

prepare
patient

examine
patient

release
patient

patient
undresses

move
patient

position
on table

attach
coils

move
into magnet
Clinical Information Flow

richness

clinical value

acquire images → prepare diagnosis → diagnosis → report authorise → archive

medical imaging workstation

clinical review
education
research
treatment planning
demonstration
George arrives at radiology department

Nurse explains the procedure

George is waiting in the dressing room

Examination of previous patient

15 minute time slot

Prepare George for the examination

(a.o. RF coils)

Position Imaging

View away View away

George leaves exam room

14:00

14:15

14:30
5 minute view: Patient Preparation (1 operator)

**functional procedure**

- walk from dressing room to table
- position patient on table
- move table upwards
- position coils and connect
- move table and patient into magnet
- make plan scan

---

**Timeline:**

- 14:15:
  - walk
  - position on table
  - table up
  - talk
  - coils
  - in magnet

- 14:20:
  - walk
  - talk
  - plan scan
Patient Preparation Work Flow

1. Get patient
2. Patient on table
3. Get RF coil
4. Position RF coil
5. Move patient in magnet
6. Plan scan

preparation work flow
1. Get patient
2. Patient on table
3. Get RF coil
4. Position RF coil
5. Move patient in magnet
6. Plan scan
Productivity and Cost models

Cost Of Ownership model

- radiologist
- nurse
- security
- administration
- operator

- personnel
- consumables
- service
- facilities
- financing

Methods to Explore the Customer Perspective

Methods to Explore the Customer Perspective
15 Gerrit Muller

version: 0
February 3, 2015
AVcostBenefitModels

Embedded Systems Innovation
by TNO
The financial context of the radiology department

Methods to Explore the Customer Perspective
16  Gerrit Muller
Make a **context diagram**, showing the **systems** and their **relations** in the **customer space**

- typically, tens of systems are relevant for customers

Capture one or a few main **workflows** in the customer space
Abstract

The notion of "business key drivers" is introduced and a method is described to link these key drivers to the product specification.
Example Motorway Management Analysis

Key-drivers

Safety
- Reduce accident rates
  - Enforce law
  - Improve emergency response
- Reduce delay due to accident
- Improve average speed
- Improve total network throughput
- Optimize road surface
- Speed up target groups
- Anticipate on future traffic condition

Effective Flow

Smooth Operation
- Ensure traceability
- Ensure proper alarm handling
- Ensure system health and fault indication

Environment
- Reduce emissions

Derived application drivers

Early hazard detection with warning and signaling
- Maintain safe road condition
  - Classify and track dangerous goods vehicles
  - Detect and warn noncompliant vehicles
  - Enforce speed compliance
  - Enforce red light compliance
  - Enforce weight compliance

Requirements

- Automatic upstream accident detection
- Weather condition dependent control
- Traffic speed and density measurement
- Cameras
- Deicing
- Traffic condition dependent speed control

Note: the graph is only partially elaborated for application drivers and requirements
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define the scope specific.</td>
<td>in terms of stakeholder or market segments</td>
</tr>
<tr>
<td>Acquire and analyze facts</td>
<td>extract facts from the product specification and ask why questions about the specification of existing products.</td>
</tr>
<tr>
<td>Build a graph of relations between drivers and requirements</td>
<td>where requirements may have multiple drivers</td>
</tr>
<tr>
<td>by means of brainstorming and discussions</td>
<td></td>
</tr>
<tr>
<td>Obtain feedback</td>
<td>discuss with customers, observe their reactions</td>
</tr>
<tr>
<td>Iterate many times</td>
<td>increased understanding often triggers the move of issues from driver to requirement or vice versa and rephrasing</td>
</tr>
</tbody>
</table>
# Recommendation for the Definition of Key Drivers

- **Limit the number of key-drivers**
  
  minimal 3, maximal 6

- **Don’t leave out the obvious key-drivers**
  
  for instance the well-known **main function** of the product

- **Use short names, recognized by the customer.**

- **Use market-/customer- specific names, no generic names**
  
  for instance replace “ease of use” by “minimal number of actions for experienced users”, or “efficiency” by “integral cost per patient”

- **Do not worry about the exact boundary between Customer Objective and Application**
  
  create clear **goal means** relations
Transformation of Key Drivers into Requirements

Key Drivers

- Customer What
- Derived Application Drivers

Customer Objectives

- Customer How
- Derived Application Drivers

Product What

- Functional

Means
- Goal
- May be skipped or articulated by several intermediate steps

Functions
- Interfaces
- Performance figures

Key Drivers How To

Gerrit Muller

version: 0.2

February 3, 2015

REQfromDriverToRequirement
Make a **customer key driver graph**

Use yellow note stickers

Start at the right hand side

![Customer Key Driver Graph](image-url)
Stakeholders and Concerns (Who)

- Government: cost of care
- Financial director: cost of operation
- Insurance: patient invoice
- General practitioner: patient diagnosis
- Radiologist: diagnosis reimbursement
- Nurse: patient ease of work
- Maintenance: accessibility, safety
- Ref. physician: diagnosis
- Facility manager: space, service support
- IT: conformance, security
- Patient: comfort, health
- Family: support
- IT department: conformance, security

Context Diagram (what systems)

- Hospital ERP: patient info report
- Patient portal: patient info report
- RIS (radiology): MRI, CT, X-ray images
- PACS (Picture Archiving and Communication System): images
- HIS (hospital information system): patient info report
- LIS (laboratory information system): patient info report
- Radiology workstation: MRI, CT, X-ray
- IT infrastructure: communication, gateways, servers, storage, ...

Workflow (what dynamics)

- Request exam
- Schedule exam
- Perform exam
- Send report
- Receive patient
- Prepare patient
- Examine patient
- Release patient
- Patient undresses
- Move patient
- Position on table
- Attach coils
- Move into magnet

Information Flow

- Richness
- Clinical value
- Acquire images
- Prepare diagnosis
- Diagnosis
- Report authorise
- Archive
- Medical imaging workstation
- Clinical review
- Education
- Research
- Treatment planning
- Demonstration
More Analysis Methods and Techniques

Timeline (when, what, who)

1. Call family doctor
2. Visit family doctor
3. Call neurology department
4. Visit neurologist
5. Call radiology department
6. Examination itself
7. Diagnosis by radiologist
8. Report from radiologist to neurologist
9. Visit neurologist

2D or 3D map (where)

Annotated map (where, what)

Preparation work flow:
1. Get patient
2. Patient on table
3. Get RF coil
4. Position RF coil
5. Move patient in magnet
6. Plan scan

Cost Models

Productivity model:
Typical use
Events
Configuration
Working conditions
Production rate

Cost of Ownership model:
Radiologist
Nurse
Security
Administration
Facilities
Operator
Personnel
Consumables
Service
Financing
Customer Key Driver Graph

Focus on Customer World

- Safety
  - Reduce accident rates
  - Enforce law
  - Improve emergency response

- Effective Flow
  - Reduce delay due to accident
  - Improve average speed
  - Optimize road surface
  - Speed up target groups
  - Anticipate on future traffic condition

- Smooth Operation
  - Ensure traceability
  - Ensure proper alarm handling
  - Ensure system health and fault indication

- Environment
  - Reduce emissions

Key drivers
Derived application drivers
Early hazard detection
- Warning and signaling
Maintain safe road condition
- Weather condition dependent control
Traffic speed and density measurement
- Cameras

Requirements
- Automatic upstream accident detection
- Weather condition dependent control
- Traffic speed and density measurement
- Cameras

Decoding
Traffic condition dependent speed control

Note: the graph is only partially elaborated for application drivers and requirements

Specific Scope, Fact Based

- Define the scope specific, in terms of stakeholder or market segments
- Acquire and analyze facts extract facts from the product specification and ask why questions about the specification of existing products
- Build a graph of relations between drivers and requirements where requirements may have multiple drivers by means of brainstorming and discussions
- Obtain feedback discuss with customers, observe their reactions
- Iterate many times increased understanding often triggers the move of issues from driver to requirement or vice versa and rephrasing

3 to 6 Key driver, Capture Tensions

- Limit the number of key-drivers minimal 3, maximal 6
- Don’t leave out the obvious key-drivers for instance the well-known main function of the product
- Use short names, recognized by the customer.
- Use market-/customer- specific names, no generic names for instance replace "ease of use" by "minimal number of actions for experienced users", or "efficiency" by "integral cost per patient"
- Do not worry about the exact boundary between Customer Objective and Application create clear goal means relations

intentionally left blank

Summary Module Architectural Reasoning Customer Space Analysis
version: 0.2
February 3, 2015
Gerrit Muller