Abstract
The purpose of the functional view is described. A number of methods or models is given to use in this view: (use) case descriptions, commercial decomposition function and feature specifications performance models and specifications, information models. The role of standards is discussed.
## 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>interaction flow (functional aspects)</td>
<td>functional</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</td>
</tr>
<tr>
<td>be able to skip forward or backward</td>
<td>extreme many short movies</td>
</tr>
<tr>
<td>set recording quality</td>
<td></td>
</tr>
<tr>
<td>performance and other qualities</td>
<td>non-functional</td>
</tr>
<tr>
<td>(non-functional aspects)</td>
<td>response time with multiple inputs</td>
</tr>
<tr>
<td>response times for start / stop</td>
<td>image quality with multiple inputs</td>
</tr>
<tr>
<td>response times for directory browsing</td>
<td>insufficient free space</td>
</tr>
<tr>
<td>end-of-movie behaviour</td>
<td>response time with many directory entries</td>
</tr>
<tr>
<td>relation recording quality and storage</td>
<td>replay quality while HQ recording</td>
</tr>
</tbody>
</table>
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
Commercial Decomposition

- basic product
  - excluding options
    - optional option
      - option dependency
Logistic decompositions for a product

- **commercial decomposition**
  - saleable features

- **service decomposition**
  - replaceable items (such as consumables)

- **goods flow decomposition**
  - stockable items
  - purchasable items
Mapping technical functions on products

**technical functions**

<table>
<thead>
<tr>
<th>Product</th>
<th>Home Cinema System</th>
<th>Flat Screen Cinema TV</th>
<th>Bedroom TV</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD display</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>SD-&gt;HD up conversion</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>HD-&gt;SD down conversion</td>
<td>+</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>HD storage</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SD storage</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>HD IQ improvement</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>SD IQ improvement</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>HD digital input</td>
<td>+</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>SD digital input</td>
<td>+</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>SD analog input</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6 HQ channel audio</td>
<td>+</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>2 channel audio</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**Legend**

- present
- optional
- absent
The functional view
Gerrit Muller

version: 1.0
March 6, 2013
FVUserInterface

Relation between user interface and functional specification

user interface
look & feel

user

artificial separation
from user point of view!

user

functional behaviour

style guide
UI spec

prototype
as complement
to spec

stubs
simulators

functional spec
Layering of information definitions

Human understanding and interpretation of the information data model or data dictionary

Information model, semantic defined in terms of:
- entities
- relations
- operations

Data model or data dictionary
- identifiers
- types
- ranges
12 bit Image:
- \( nx: 16 \) bit unsigned integer
- \( ny: 16 \) bit unsigned integer
- \( \text{pixels}[nx][ny]: 16 \) bit unsigned integers \([0..4095]\)

16 bit Image:
- \( nx: 16 \) bit unsigned integer
- \( ny: 16 \) bit unsigned integer
- \( \text{pixels}[nx][ny]: 16 \) bit unsigned integers
Example of performance modelling

The functional view

required dose → throughput model

field size →

field map →

alignment procedure →

internal parameters from realisation:
  max v,a
  laser power
  laser frequency
  transmission factor
  alignment time

user level throughput → throughput model

version: 1.0
March 6, 2013
FVthroughputModel
The role of standards

well defined standards and legislation

- HL7
- DICOM
- HIPAA
- EMC
- FDA
- VDE
- ISO 9001

but many thousands of pages

business objectives

realization consequences

application intention?

conceptual assumptions
The functional view

version: 1.0
March 6, 2013
FVoverview

The functional view = What: externally observable