Abstract

Defining and illustrating architectures. Architectures go beyond system structure (parts, interfaces, functions, allocation). Architectures connect design to the context, by capturing customer value proposition, and the business proposition.
One Architecture Facilitates many Solutions

- single cardio vascular X-ray architecture
- many designs
- many variants
## Architecture Description

<table>
<thead>
<tr>
<th>Value Proposition</th>
<th>Business Proposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why does customer want to buy?</td>
<td>How do we earn money?</td>
</tr>
<tr>
<td>Why do users like to use the system?</td>
<td>How do we run a healthy business?</td>
</tr>
<tr>
<td>customer key drivers</td>
<td>life cycle key drivers</td>
</tr>
<tr>
<td>cost of ownership</td>
<td>business model</td>
</tr>
<tr>
<td>customer business analysis</td>
<td>cash flow analysis</td>
</tr>
<tr>
<td>customer stakeholders and concerns</td>
<td>life cycle stakeholders and concerns</td>
</tr>
<tr>
<td>work flow or ConOps</td>
<td>life cycle model</td>
</tr>
<tr>
<td>et cetera</td>
<td>supply chain</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System Specification</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>What does customer get?</td>
<td>How will we realize this specification?</td>
</tr>
<tr>
<td>What is the system-of-interest that we deliver?</td>
<td>How do we ensure performance, safety, robustness, etc.?</td>
</tr>
<tr>
<td>functions</td>
<td>partitioning and interfaces</td>
</tr>
<tr>
<td>qualities (e.g. quantified performance)</td>
<td>dynamic behavior, e.g. functional model</td>
</tr>
<tr>
<td>interfaces</td>
<td>performance models and budgets</td>
</tr>
<tr>
<td>constraints, standards, regulations</td>
<td>concept and technology selection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Engineering</th>
<th>Getting all details right for all business functions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>technical product documentation</td>
<td></td>
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</tbody>
</table>
Functional Model for System Creation

- **stakeholder needs**
- **business objectives**
  - **architecting**
  - **design**
    - architecture guidelines
    - top-level design rationale
  - **engineering**
    - partitioning
    - interfaces
    - functions
    - allocation
  - **documentation**
    - system and parts data
    - procedures
  - **procurement**
  - **production**
  - **installation**
  - **quality assurance**
  - **lifecycle support**
**Structure = Parts + Interfaces + Configuration**

<table>
<thead>
<tr>
<th>ultimate goal:</th>
<th>to facilitate:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• modular component catalogue</td>
<td>• fast creation of solutions</td>
</tr>
<tr>
<td>• well-defined interfaces</td>
<td>• concurrent engineering</td>
</tr>
<tr>
<td>• independent testable</td>
<td>• logistics and production</td>
</tr>
<tr>
<td></td>
<td>• variations and changes</td>
</tr>
</tbody>
</table>

A2 A3
B1
A1 A4
B1 B2
B2
A2 A3 A4 A1 A4

Architecture and Design Fundamentals

5 Gerrit Muller

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ARCVpartitioning
Designing Desired Qualities and Behavior

- How do parts interact to create desired dynamic behavior?
  - allocate functions

- How do desired qualities and performance emerge from the interaction?
  - dimension and configure parts and functions
Design = Structure + Dynamics + Quantification
Our Primary Interest

- Developing organization
- Architect
- System of interest
Context, Zoom-out and Zoom-in

customer organization

developing organization

architect

supplier organization

super system

system of interest

subsystems
Adding the Time Dimension

past  current  future

customer organization

past super system  super system  future super system

developing organization

past system of interest  system of interest  future system of interest

architect

knowledge  innovation

supplier organization

past subsystems  subsystems  future subsystems

based on TRIZ
Architect, Architecture, Architecting

- past
  - past super system
  - past system
  - past subsystems
- current
  - super system
- future
  - future super system
  - future subsystems

- customer organization
- developing organization

- architecting
- architect
- supplier organization

architecture

based on TRIZ