The Costing View of Architecture

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• Reviewing Bids & Projects
• Standardising & Improving Architecture Practice in CGI NL

GGI Architecture Community of Practice lead

Researcher
• Improving Architecture Practices
• With Universities (VU Amsterdam, Twente, Eindhoven)
• Member if IFIP WG 2.10 Software Architecture

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Impact of Architecture on Project Control
Quantified by research*

<table>
<thead>
<tr>
<th>Result</th>
<th>Improvement by applying Solution Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budget predictability</td>
<td>2-3 x better</td>
</tr>
<tr>
<td></td>
<td>Std dev 32 $\rightarrow$ 13</td>
</tr>
<tr>
<td>Budget overrun</td>
<td>7 x less</td>
</tr>
<tr>
<td></td>
<td>22% $\rightarrow$ 3%</td>
</tr>
<tr>
<td>Time overrun</td>
<td>6 x less</td>
</tr>
<tr>
<td></td>
<td>48% $\rightarrow$ 8%</td>
</tr>
<tr>
<td>Troubled projects</td>
<td>3 x less</td>
</tr>
<tr>
<td></td>
<td>38% $\rightarrow$ 13%</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>1-2 points better</td>
</tr>
<tr>
<td></td>
<td>10 point scale</td>
</tr>
<tr>
<td>Results delivered</td>
<td>+10%</td>
</tr>
</tbody>
</table>

Specifically correlated with presence of architect and defined solution architecture during budget calculation

*Survey among 49 software development projects between €50,000 and €2,500,000. Reported by Raymond Slot, PhD Thesis, 2010.
The Architecting Microcycle

1. Identify & prioritize architectural concerns
2. Research possible solutions
3. Decide best fitting solution
Identify & prioritize architectural concerns

Research possible solutions

Decide best fitting solution

Architectural decisions

Architectural concerns (backlog)
What is architecture about?

“Fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution”.

[ISO/IEEE]

“Architecture is about the important stuff. Whatever that is.”

[Fowler]

After talking to architects and stakeholders on dozens of projects, we have come to equate the “important stuff” with the stuff that has most impact on risk and costs.

Important $\leftrightarrow$ high risk and cost
Risk and Cost Driven Architecture

Solution architecting principles and practices based on a view of architecture as a risk and cost management discipline

- Applicable in agile and traditional engagements
- Highly scalable and pragmatic
- Architectural decision making based on economic trade-offs
- Architecture communication in economic terms
- Traceability from requirements to cost
RCDA Practices

Core Practices

- Architectural Requirements Prioritization
- Solution Selection
- Applying Architectural Strategies
- Architecture Documentation
- Solution Costing
- Architecture Evaluation
- Architecture Implementation
- Architecture Maintenance

Supporting Practices

- Requirements Analysis
  - Stakeholder Workshop
  - Dealing with NFRs
  - Requirements Convergence Plan
  - Architecture Roadmapping
- Solution Shaping
  - Solution Shaping Workshop
  - Cost-Benefit Analysis
  - Documenting Architectural Decisions
- Architecture Validation
  - Independent Architecture Assessment
  - Architectural Prototyping
  - Supplier Evaluation
- Architecture Fulfillment
  - Technical Debt Control

Lifecycles

- RCDA Core Process
- Waterfall Project
- RUP Software Development
- Agile Development
- Bid
- Blended Delivery
- Enterprise to Solution
Traceability from requirements to cost

- Architectural Requirements Prioritization
- Solution Selection
- Applying Architectural Strategies
- Architecture Documentation
- Solution Costing

- Architectural Requirements & Concerns
- Architectural Decisions
- Solution Structure
- Solution Blueprint
- Costing Model

Key:
- Process flow
- Traceability

RCDA Practice Produces RCDA Deliverable
Solution-based estimating

Collaboration

Solution Architect

- Business Issue
- Targeted Solution
- Functional Requirements
- Non-Functional Requirements
- Architecture
- SBS

Cost Engineer

- Financial Model
- Pricing Model
- Estimating Effort
- Cost Model
- Delivery Strategy
- WBS
- Schedule

Project/Delivery Manager

- Financial Model

Business Owner
Architecture Documentation
Views and Viewpoints

All architecture documentation methods use views
• ISO 42010, TOGAF, Archimate, 4 + 1, ‘Views and Beyond’

• Viewpoints address concerns per stakeholder (group)
• RCDA Solution Definition template has standard viewpoints
• Don’t forget: connect the views!
Solution Definition
Document Template for Planning/Budgeting/Bid stage

1. Introduction
2. Requirements
   2.1 Business drivers
   2.2 Key functionality
   2.3 Key architectural requirements
   2.4 Other architectural drivers
3. Key Design Decisions and Concerns
4. Operational View
   4.1 Solution in its operational environment: Context Diagram
   4.2 Operational decomposition
5. Delivery Breakdown View
   5.1 Solution Breakdown Structure
   5.2 Delivery Strategy
Solution Breakdown Structure (SBS)

The SBS is a deliverable-oriented *hierarchical decomposition* of the solution.

The SBS is a tree showing how the solution decomposes into products:
- Top level of the tree is the Solution itself.
- Lower levels show how each product breaks down into sub-products, etc.

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**Smart Phone**
- **Hardware**: Control system, Camera, User interface, Casing, Hardware
- **Software**: Control sw, Camera sw, User interface sw
- **Prototype**: Control system, Camera, User interface, Hardware
- **Packaging**: Single box for phone, Multi pack for shipping
- **Marketing plan**: Marketing plan, TV Commercial, Trade show exhibit
Solution Breakdown Structure (SBS)

Depth of the tree is determined by level of detail required for a reasonable cost estimate

At lowest level, each product should be responsibility of a single delivery organisation, e.g:
- service line
- single subcontractor
- build team
Development Approach

**Development Approach**: high-level activities required to develop or otherwise obtain the products that make up the solution

Responsibility for selecting delivery approach lies with **Project/Delivery Manager**
- but consult Solution Architect to make sure of proper fit with solution's structure and requirements
Integration Strategy

Integration Strategy: describes how the various products in the SBS are integrated to form the complete solution

Responsibility for determining integration strategy lies with Project/Delivery Manager
• but consult Solution Architect to make sure all architectural concerns regarding the implementation are addressed
Costing View of Architecture – Summary

- Good architecting can significantly improve project control
- Prioritize architectural concerns by risk and cost impact
- Document costing views for delivery and operation
- Create a Delivery Breakdown View:
  - Hierarchical breakdown (SBS)
  - Development approach
  - Integration strategy