Project Cost Management

- Scope
- Time
- Cost
- Quality

Project Integration Management

- HR
- Comm.
- Risk
- Procure.
Life-Cycle Costs
- A Project is an Investment

"To estimate and analyse the costs of the immediate project investment and future earnings and expenses"

A – Project Start
B – Project Finish, The Product is delivered
C – Net Earnings = 0, the Pay-back Time
D – The Product Life-cycle
Life-Cycle Costs
- The Basic Principle

- Investment Analysis – Income/expenses during the life time of the product
- Cash Flow (in- and outflow) at different points in time cannot be compared
- Interest Rate – The cost of moving money over time
Life-Cycle Costs
- The Net Present Value

\[ K = -K_0 + \sum [K_n \times (1 + r)^{-n}] + R \times (1 + r)^{-T} \]

- **K** = Net Present Value (NPV)
- **K_0** = Project Investment (Investment Budget)
- **K_n** = Net Cash Flow (Inflow - Outflow)
- **T** = The Total Time of the Cash-Flow Analysis
- **n** = Time unit of Analysis
- **r** = Discount Rate
- **R** = Rest Value
Life-Cycle Costs
- The Net Present Value

Net Present Value > 0, the investment will add value

About the Discount Rate:
- The discount rate corresponds to the rate of return that could have been earned on another investments under similar conditions.
Life-Cycle Costs

Cash Flow – Inflow and Outflow
The Dilemma of Cost Estimation

- Decisions need to be taken in the early stage of the project
- Limited information available in the early stage of the project
Reference Projects – Experience Data
Project Budget
Cost Estimates – a Building Project Example

Example:
How much does it cost to hammer a nail down?

Building Materials – Nail
Equipment – Hammer
Labour – Carpenter (work)
Example:
How much does it cost to hammer a nail down in the tower of a Church?
Project Budget
Cost Estimates – a Building Project Example

Example:
How much does it cost to hammer TWO nails down in the tower of a Church?

Consider:
- Context/Conditions
- Volume
- Timing
- Etc.
Project Budget
Cost Estimates – Building Projects

The Top-Down Approach

The Bottom-up Approach
Cost Estimates – Cost types

<table>
<thead>
<tr>
<th></th>
<th>Risk and Revenue</th>
<th>Central Administration</th>
<th>Site Management and Site Establishment</th>
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<tbody>
<tr>
<td>Labour</td>
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<td></td>
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<tr>
<td>Building Materials (equipment)</td>
<td></td>
<td></td>
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<tr>
<td>Sub-Contractors</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Cost Estimates – Scope and Structure

Real Estate
- Ground
- Taxes

Service Installations
- Electricity, communication
- Water supply
- Heating, etc.

Building Cost
- Ground
- Construction Works
- MEP-installations
- Painting
- Gardening

Design
- Geological survey
- Architectural design
- Engineering design
- Building permission

Other Client Costs
- Taxes
- Approvals
- Financial costs
- Etc.

Total Cost
(for the Client)
Cost Estimates
– The Successive Principle

Managing the Cost Distribution - Assessing the Uncertainty of Cost Estimates

Calculated Est. = (Opt. + 3*Likely + Pes.)/5
Cost Estimates
– The Successive Principle

Step 1: Identification of Potential Risk Factors

Risk Factors:

• Project Location
• Building Standard
• Project Organisation
• Material Suppliers
• Etc.

• Market Situation (Upturn/downturn, competitors…)
• Interest rates
• Political Situation
• Etc.
## Cost Estimates
– The Successive Principle

### Step 2: Reference Conditions for each Risk Factor

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Reference Conditions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Project Location</td>
<td>- Normal Conditions</td>
</tr>
<tr>
<td>• Building Standard</td>
<td>- High Standard</td>
</tr>
<tr>
<td>• Project Organisation</td>
<td>- Well-known Actors</td>
</tr>
<tr>
<td>• Material Suppliers</td>
<td>- Local</td>
</tr>
<tr>
<td>• Etc.</td>
<td>- …</td>
</tr>
</tbody>
</table>

| • Market Situation            | - Stable              |
| • Interest rates              | - X %                 |
| • Political Situation         | - Stable              |
| • Etc.                        | - …                   |
## Cost Estimates
– The Successive Principle

### Step 3: Specific Project Conditions for each Risk Factor

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<thead>
<tr>
<th>Risk Factors</th>
<th>Reference Conditions:</th>
<th>Exceptions (Project Specific):</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Project Location</td>
<td>- Suburban Area</td>
<td>- Down Town</td>
</tr>
<tr>
<td>• Building Standard</td>
<td>- High Standard</td>
<td>- Normal Standard</td>
</tr>
<tr>
<td>• Project Organisation</td>
<td>- Well-known Actors</td>
<td>- Partly new Players</td>
</tr>
<tr>
<td>• Material Suppliers</td>
<td>- Local</td>
<td>- Local and International</td>
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<td>• Etc.</td>
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<td>- …</td>
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<tr>
<td>• Market Situation</td>
<td>- Stable</td>
<td>- Business Upturn</td>
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<tr>
<td>• Interest rates</td>
<td>- X %</td>
<td>- X %</td>
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<tr>
<td>• Political Situation</td>
<td>- Stable</td>
<td>- New Rules and Regulations</td>
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<td>• Etc.</td>
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## Cost Estimates

– The Successive Principle

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<td>4 000</td>
<td>8 000</td>
<td>4 400</td>
<td>1 200</td>
<td>1 440</td>
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<td>3 000</td>
<td>2 100</td>
<td>300</td>
<td>90</td>
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<td>03.01 Ground</td>
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<td>180</td>
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### Calculated Cost

Calculated Cost = (Opt. + 3*Likely + Pes.) / 5

### Standard Deviation

Standard Deviation, $S = (Pes. – Opt.) / 5$

### Variance

Variance, $V = S * S$
## Cost Estimates
– The Successive Principle

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General Risk Factors:

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<tbody>
<tr>
<td>Project Location</td>
<td>80</td>
<td>100</td>
<td>160</td>
<td>108</td>
<td>16</td>
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<tr>
<td>Building Standard</td>
<td>-360</td>
<td>-200</td>
<td>-120</td>
<td>-216</td>
<td>48</td>
<td>2,3</td>
</tr>
</tbody>
</table>

| Totals              | 17 582| 1 561 | 2 435 |          |           |      |
Cost Estimates
– The Successive Principle

Example:
Cost Estimate = 17 582
S = 1 561

95%
Life-Cycle Costs

Cash Flow – Inflow and Outflow

Investment, Project Budget

Cash Flow
Inflow and Outflow

Rest Value
Time