Costing and Budgeting

From cost to value: methods and techniques to set the right cost to software
Goals of the Unit

• Questions you might face:
  – How much does the development of the software cost?
  – Is the project on budget?

• Goals of the Unit
  – Budgeting
  – Managing Project Costs
Initiate

Assess Feasibility

Plan

Formalize Goals

Define Schedule

Define Costs

Execute & Monitor

Collect Outputs

Develop

Kick Off Activities

Monitor Goals, Cost and Schedule

Close

Close

Change Control & Configuration Management

Quality Management

Risk Management

Human Resource Management

[Obtain Approval]
Some Definitions

• **Costing:** determining the bare costs to deliver a project

• **Budgeting (and cost control):** determining the financial needs of a project and preparing the books to monitor expenditures (and incomes)

• **Pricing:** determining how much you will charge for the project

• **Life Cycle Cost (LCC) (also called Total Cost of Ownership):** costs to be sustained to operate (use) a system throughout its lifecycle
(Software)
Project Costing
(Software) Project Costing

• **Project cost:**
  - The expenses we will incur into to finish a project
  - It does not take into account profit
  - Made of direct and indirect costs (next slide)

• **Cost Element Structure:**
  - Hierarchical structure which defines the cost items which determine the project budget
  - It helps structure the costing and monitoring processes and it reduces the risk of double accounting the same expenses
Direct Costs

- **Direct costs:** costs related to the production of the project outputs

- Direct Costs for software projects
  - **Personnel:**
    - The salaries of people directly involved in the project (gross, not net!)
  - **Materials and Supply**
    - Costs of the material necessary to produce project outputs
    - Usually accounted if the project has specific needs
  - **Hardware and software**
    - Systems required for developing the system
    - Usually accounted if the project has specific needs
  - **Travel, meetings and events**
  - **Other Costs**
    - Books, Training, Renting equipment, …
(Software) Project Costing

• **Indirect Costs:** expenses necessary to run the facility and make work actually doable

• Main cost elements for software development:
  
  – General Overheads
    * Office space costs (rent, heating, ...)
    * Consumables
    * Standard equipment
    * Administrative Staff

  – Project Overheads
    * For larger projects, overheads directly accountable to a project
Indirect Costs Computation

- Identification of the expenses contributing to the indirect costs
- Identification of a strategy to allocate indirect costs to a project
  - According to the effort (more effort = more indirect expenses) - Flat or proportional rate
  - According to the project budget (as a percentage of the project budget)
- On a regular basis
  - Assessment of the expenses incurred into in the previous year(s)
  - Estimation of the indirect expenses for the year(s) to come
  - Estimation of the effort which can produced
  - Determination of the overhead rate
Personnel Costs: Gross vs. Net

Employer

- € 60K ← GROSS!
- Retirement Funds
- Regional/National Tax
- National/Federal Tax

Employee

- € 30K ← NET!
- Salary
- Bonuses
Project Cost is...

\[ \sum_{j=1}^{n} \text{Hours}_j \times (PC_j + O_j) + \sum_{i=1}^{n} C_i \]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
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<tbody>
<tr>
<td>H</td>
<td>Total number of hours for profile j</td>
</tr>
<tr>
<td>PC</td>
<td>Cost of profile j</td>
</tr>
<tr>
<td>O</td>
<td>Overhead of profile j</td>
</tr>
<tr>
<td>C</td>
<td>Cost Element i (e.g. hardware)</td>
</tr>
</tbody>
</table>
Project Cost

- Project costs can be looked at from different “points” of view:
  - Cost Element Structure (how much do I need for hardware?)
  - Project Structure (how much do I need for “Writing Requirements”?)
  - Expenditure over time (how much do I need in 2014?)
Managing Project Costs
Goals and Means

• Goals
  – Ensuring that the money is available when it needs to be spent
  – Monitoring project expenditures so that the project remains within budget, or the appropriate actions can be taken when this is not the case

• Means
  – Definition of a baseline/cash flow (see next slides)
  – Expense Authorization
  – Expense book keeping (double entry accounting is quite fine)
Project Costs and Project Structure

```
WBS

A1
A1.1
A1.2

A2
A2.1
A2.2
A2.3

CES

CES1

CES2
CES2.1
CES2.2

CES3
CES3.1
CES3.2
CES3.3

Cost

Cost

Cost
```
## Project Costs and Time

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Total</th>
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<td>€ 50,000</td>
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<td>€ 110,000</td>
<td>€ 10,000</td>
<td>€ 220,000</td>
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<table>
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<th></th>
<th>Q1</th>
<th>Q2</th>
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<th>Q4</th>
<th>Total</th>
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<tr>
<td><strong>Incomes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payment</td>
<td>€ 50,000</td>
<td></td>
<td></td>
<td>€ 200,000</td>
<td>€ 250,000</td>
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<tr>
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<td>€ 0</td>
<td>€ 0</td>
<td>€ 200,000</td>
<td>€ 250,000</td>
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<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Total</th>
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<tr>
<td>Balance</td>
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<td>-€ 110,000</td>
<td>€ 190,000</td>
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<td>Financial Need</td>
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## Project Costs and Time

<table>
<thead>
<tr>
<th>Name</th>
<th>Planned Cost</th>
<th>Time</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>1000</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>2000</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>400</td>
<td>C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Planned Cost</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1000</td>
<td>500</td>
</tr>
<tr>
<td>B</td>
<td>2000</td>
<td>1000</td>
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<tr>
<td>C</td>
<td>400</td>
<td>100</td>
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<table>
<thead>
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<th>Total Cumulative</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
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<td>3400</td>
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</table>

![Graph showing project costs and time]
Project Costs and Time

Banana Shape
Expenditure/Load Profile

• In general we assume workload distributes uniformly during an activity:
  – A resource working in an activity requiring 40 hours of effort and 1 week of duration is assumed to work 8 hours per day.

• However, this is not necessarily the case, and different profiles can be defined for effort and expenditure:

  ![Diagram showing different expenditure/load profiles: front-end loaded, linear distribution, back-end loaded, 1 month up-front, 1-month credit.]
Expense Authorization

- Project management and financial management are usually allocated to different structures.

- According to the organizational structure, the power to authorize expenditures and payments might be solely on the project manager or require a more complex workflow.

- Rules take into account aspects such as:
  - funds availability
  - whether the required expense is budgeted or not
  - the amount of money (expenditures higher than a threshold might require a special authorization)
Expense Authorization: an Example

- Project Manager: request purchase
- Area Head: approve quote yes/no
- Finance:
  - confirm availability
  - request quote
  - quote
  - yes/no
  - request authorization
  - yes/no
  - decrease availability
  - actual expense
  - fix availability
- Procurement:
  - purchase order
  - quote?
  - yes/no
  - current availability

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End of period Report

• At the end of each reporting period, documentation is produced about a project financial status

• Two information are available:
  – Budgeted expenditure vs. actual expenditure
  – Expenditure accounting

• The information is used in different ways:
  – To analyze deviations (what differences there have been)
  – To confirm/update projections to end
  – To evaluate project health and take appropriate actions
The Workflow

### Expected Expenditures

<table>
<thead>
<tr>
<th>Budget</th>
<th>Y1</th>
<th>Y2</th>
<th>Y3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>4000</td>
<td>5000</td>
<td>3000</td>
</tr>
<tr>
<td>Hardware</td>
<td>1000</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>Subcontracting</td>
<td>1000</td>
<td>6000</td>
<td></td>
</tr>
</tbody>
</table>

### Actual Expenditures

<table>
<thead>
<tr>
<th>Budget</th>
<th>Y1</th>
<th>Y2</th>
<th>Y3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>3000</td>
<td>5000</td>
<td>3000</td>
</tr>
<tr>
<td>Hardware</td>
<td>500</td>
<td>2000</td>
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</tr>
<tr>
<td>Subcontracting</td>
<td>1000</td>
<td>6000</td>
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</table>

### End of Period Report & Revision

<table>
<thead>
<tr>
<th>Budget</th>
<th>Y1</th>
<th>Y2</th>
<th>Y3</th>
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</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>5000</td>
<td>4000</td>
<td>3000</td>
</tr>
<tr>
<td>Hardware</td>
<td>500</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Subcontracting</td>
<td>1000</td>
<td>6000</td>
<td></td>
</tr>
</tbody>
</table>
What information you are interested in

- **Budget**: the amount initially budgeted
- **Transfers**: the variations performed on the budget
- **Actual**: the amount actually spent

<table>
<thead>
<tr>
<th>Budget</th>
<th>Budget</th>
<th>Variations</th>
<th>New</th>
<th>Spent</th>
<th>Available</th>
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<td>+2000</td>
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<td>5000</td>
<td>1000</td>
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<tr>
<td>Hardware</td>
<td>3000</td>
<td>-2000</td>
<td>1000</td>
<td>0</td>
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<tr>
<td>Subcontracting</td>
<td>1000</td>
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<td>400</td>
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