1. introduction

2. the system of cost management

3. cost estimation

4. cost calculation
COST MANAGEMENT

4. Project cost management

- ensures the project to be completed within the approved budget

- consists of
  - resource planning
  - cost estimation / calculation
  - cost budgeting
  - cost control
3  COSTS IN GENERAL

time is money
credit
savings
rate of interest

Who has to deal with costs?

client / investor
contractor
PM
consultants
quality/quantity surveyor
3 BASIC TOOLS REQUIRED

Information

Method → Cost estimation ← Schedule

Skill (knowledge / experience)

3 CASH FLOW PLAN

When? – How much?

scheduling of the sources

actual budget

income
costs

Vidovszky – BUTE – Department of Construction Technology and Management
PHASES OF THE CONSTRUCTION PROJECT – COST ESTIMATION

Preliminary analysis → financial source analyses
Feasibility study → preliminary estimations - rate of return, etc.
Conception plan → surface-based calculation
Construction plan → detailed calculation - based on technical specification
Tendering + contract
Construction phase → cash flow plan
Running-in – hand-over → final pay-off
Operation and maintenance → operation and maintenance cost estimations

PHASES OF COST MANAGEMENT

estimation - calculation - monitoring

Feedback
(Change in geometry, in construction, alternatives of building)

Cost estimation
(controlling of plans, design)

Comparison to the actual costs
Regarding to the budget
PHASES OF COST MANAGEMENT

Phase 1
Cost estimation

• intensive connection with the participants of the investment (information transport)
• determine the planned target
• design according to the aim of the project
• tendering for the construction

Cost estimation always must be synchronized with the design.

PHASES OF COST MANAGEMENT

Phase 2
Comparison the actual costs with the budget

• costs as they actually occur are continuously compared with the budget
• cost reports are prepared - at regular time intervals (information for the client on the cost status of the project)
• information in proper time is required - if effective action against cost overruns is to be taken
PHASES OF COST MANAGEMENT

Phase 3
Feedback

• significant differences lead to change of the design
• management consideration is focused on those job areas that need attention
• preferring the alternative biddings at the competition is suggested

Criteria

• use cost estimating method, that fits to the project stages
• data should be transported from one project phase to the other
• systematic Work Breakdown Structure for the costs
• use of project cost code
• documentation of cost data of buildings accomplished
• use of Building Cost Documentation with data of analyzed method
• control of the costs: both direction between each of the project phases
3 METHODS OF COST MANAGEMENT

**Analytic**
- Cost and quantity components are based on the data of the complete building.

**Synthetic**
- Cost and quantity components are based on detailed design.

3 PHASES OF COST MANAGEMENT

**Phases**
- Quantity of information

**Methods**
- Preliminary estimation (on the bases of samples)
- Cost estimation based on surface model (€/m²)
- Cost calculation based on technical specification (€/unit/work activity)
SIMPLE COST ESTIMATION

cost values of similar construction cases

total cost / volume of an existing project (building) (m, m², m³)

currency unit / construction unit e.g. € / m²

industrial databases e.g.:

<table>
<thead>
<tr>
<th>building type function</th>
<th>construction cost data</th>
</tr>
</thead>
<tbody>
<tr>
<td>residential - family houses</td>
<td>x.xxx € / m²</td>
</tr>
<tr>
<td>residential - low intensive</td>
<td>y.y.yy € / m²</td>
</tr>
<tr>
<td>residential - ...</td>
<td></td>
</tr>
<tr>
<td>public - educational - nursery</td>
<td></td>
</tr>
<tr>
<td>public - educational - school</td>
<td></td>
</tr>
<tr>
<td>public - educational - ...</td>
<td></td>
</tr>
<tr>
<td>public - cultural - museum</td>
<td></td>
</tr>
<tr>
<td>public - ...</td>
<td></td>
</tr>
<tr>
<td>office - category 1</td>
<td></td>
</tr>
<tr>
<td>office - ...</td>
<td></td>
</tr>
<tr>
<td>industrial - category 1</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>
2 SIMPLE COST ESTIMATION

estimation

currency / construction unit • volume of the planned building
(€ / m²) • (m²)

estimated cost

for preliminary information / starting decision

---

2 COST ESTIMATION – BASED ON SURFACE MODEL

installation

roof

slab

wall

foundation

Volume of complete multilayered structure + norm
e.g. wall = outer render + insulation + windows + wall structure + inner render
COST ESTIMATION – BASED ON SURFACE MODEL

multilayered structure costs

roof structure
- tiles
- battens
- foil
- insulation
- covering

slab
- flooring
- screed
- insulation
- load bearing structure
- render

wall
- external render
- insulation
- masonry
- internal render

+ doors and windows

currency unit / m²

structure unit costs

building installations

currency unit / netto m²

foundation

currency unit / m³
3 COST CALCULATION

Cost calculation methods

- list of activities
- work breakdown structure (WBS)
- norm collections
- norm systems

- items + volume * specific norms → cost item

- e.g. Concrete screed (below 10cm)
  - 100 m²
  - 11 €/m²
  - 1100 €

2 WORK BREAKDOWN STRUCTURE

Deep structure of the WBS system

- X00 – main groups of cost types e.g. 300 building constructions
- XX0 – subgroups – groups of construction activities e.g. 330 external wall system
- XXX – construction activities – cost items e.g. 333 external pillars
2 WORK BREAKDOWN STRUCTURE

Main groups

100 Building plot
200 Infrastructural facilities
300 Building – constructions
400 Building – installations
500 Outdoor constructions and installations
600 Furniture and artworks
700 Additional expenses

2 WBS – DIN 276-1

group 100

100 Building plot
110 Plot price (value)
120 Incidental costs of ownership
121 alignment
122 cost of legal procedures
123 notary costs
124 estate agent pay
125 duty
126 valuation, and related expertise
127 authorization fees
128 plot alteration, withdrawal from cultivation
129 other incidental expenses
130 Liberation costs of the plot
131 indemnification
132 resolving form restrictions
139 other
2 WBS – DIN 276-1

**group 200**

200 Preparation and infrastructure  
210 Preparation  
220 Infrastructure - public utilities  
230 Infrastructure - Internal  
240 Renting public area  
250 Temporary arrangements

---

2 WBS – DIN 276-1

**group 300**

310 Pit for basement level  
320 Foundation  
330 External walls  
331 external load-bearing walls  
332 external walls, infill walls  
333 outer pillars  
334 external doors and windows  
335 facade  
336 interior finish for pillars, exterior walls  
337 external walls assembled  
338 shading  
339 other  
340 Interior walls  
350 Floors  
360 Roof  
370 Built-in appliances  
390 Other arrangements related to building constructions
WBS – DIN 276-1

group 400

400 Building - building services and technical equipment
   410 Water, sewage, gas
   420 Heating
   430 Ventilation and air conditioning
   440 Electricity
   450 Telecommunications, information technology
   460 Transportation equipment
   470 Technology Equipment
   480 Integrated building management and security management
   490 Other arrangements related to building services and technical equipment

WORK BREAKDOWN STRUCTURE

DIN 276-1

Base for budget: the total investment cost

100 Building plot
200 Infrastructural facilities
300 Building – constructions
400 Building – installations
500 Outdoor constructions and installations
600 Furniture and artworks
700 Additional expenses
2 COST NORMS

- based on statistics or company experiences
- can be found in databases or applied by calculation software
- usually involves more cost types in one norm e.g.:
  - material cost
  - transport cost
  - work fees
  - administrative costs of the construction company

In case of using a norm all these information have to be considered!

Hungarian Cost Estimation Manual for Construction Industry

annual publication

for architectural cost estimation
2 COST NORMS

Building Cost Information Centre of the German Chamber of Architects

BKI

Online cost database in Germany

- based on statistical data of construction industry
- collected every year
- about different fields of the construction industry
- available for a certain fee

BKI Construction costs for buildings 2014
BKI Construction costs for construction elements 2014
BKI Construction costs for positions 2014

2 COST CALCULATION – „MOST ACCURATE” METHOD

- before and during construction
- on the basis of detailed construction data:
  - construction plan
  - specification
  - firm database of the actual contractor
  - actual material prices

<table>
<thead>
<tr>
<th>items</th>
<th>hr</th>
<th>norms</th>
<th>costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>estimated amount of the work</td>
<td>estimated amount of workers</td>
<td>per material types</td>
<td>per work time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>material costs</td>
<td>additional costs</td>
</tr>
</tbody>
</table>

involves work fee + administrative cost + profit usw.
COST OVERRUNS

technical – imperfect calculation method or data

psychological – overestimating the possible positive or underestimating the possible negative events

political-economic – result of strategic misinterpretation of scope or budgets

quite common – risk analyses is required on the basis of

...resource analyses
...technical environment analyses
...legal / political environment analyses

Avoid!!! BUDGET OVERRUN
REFERENCES

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