## PM in construction industry

Construction management 2.
Lepel – BME Department of Construction Technology and Management
19-03-2014

### PM in general

<table>
<thead>
<tr>
<th>Project integration management</th>
<th>Project scope management</th>
<th>Project time management</th>
</tr>
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<tbody>
<tr>
<td>• Project plan development</td>
<td>• Initiation</td>
<td>• Activity definition</td>
</tr>
<tr>
<td>• Project plan execution</td>
<td>• Scope planning</td>
<td>• Activity resourcing</td>
</tr>
<tr>
<td>• Integrated change control</td>
<td>• Scope definition</td>
<td>• Activity duration estimating</td>
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<td>• Scope verification</td>
<td>• Schedule development</td>
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<thead>
<tr>
<th>Project cost management</th>
<th>Project quality management</th>
<th>Project human resource management</th>
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<td>• Resource planning</td>
<td>• Quality planning</td>
<td>• Organizational planning</td>
</tr>
<tr>
<td>• Cost estimating</td>
<td>• Quality assurance</td>
<td>• Staff acquisition</td>
</tr>
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<td>• Cost budgeting</td>
<td>• Quality control</td>
<td>• Team development</td>
</tr>
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<tr>
<th>Project communications management</th>
<th>Project risk management</th>
<th>Project procurement management</th>
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<tr>
<td>• Communications planning</td>
<td>• Risk management planning</td>
<td>• Procurement planning</td>
</tr>
<tr>
<td>• Information distribution</td>
<td>• Risk identification</td>
<td>• Solicitation planning</td>
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<tr>
<td>• Performance reporting</td>
<td>• Qualitative risk analysis</td>
<td>• Solicitation</td>
</tr>
<tr>
<td>• Administrative closure</td>
<td>• Quantitative risk analysis</td>
<td>• Assurance selection</td>
</tr>
<tr>
<td></td>
<td>• Risk response planning</td>
<td>• Contract administration</td>
</tr>
<tr>
<td></td>
<td>• Risk monitoring and control</td>
<td>• Contract closeout</td>
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### Project Integration Management
- Project plan development
- Project plan execution
- Integrated change control

### Project Scope Management
- Initiation
- Scope planning
- Scope definition
- Scope verification
- Scope change control

### Project Time Management
- Activity definition
- Activity resourcing
- Activity duration estimating
- Schedule development
- Schedule control

### Project Cost Management
- Resource planning
- Cost estimating
- Cost budgeting
- Cost control

### Project Quality Management
- Quality planning
- Quality assurance
- Quality control

### Project Human Resource Management
- Organizational planning
- Staff acquisition
- Team development

### Project Communications Management
- Communications planning
- Information distribution
- Performance reporting
- Administrative closure

### Project Risk Management
- Risk management planning
- Risk identification
- Qualitative risk analysis
- Quantitative risk analysis
- Risk response planning
- Risk monitoring and control

### Project Procurement Management
- Procurement planning
- Solicitation planning
- Solicitation
- Assurance selection
- Contract administration
- Contract closeout
PM in construction industry

Because of the properties of construction projects, there are special fields in building PM

- safety management;
- environmental management;
- financial management;
- claim management;
- regulation management (legal environment);
- subcontractors management.

• Construction Extension to PMBOK® Guide
Communications management

Communications planning: determining the information and communication needs of the stakeholders:
  • Who needs what information;
  • When will they need it;
  • How it will be given to them.

Information distribution: making needed information available to project stakeholders.

Performance reporting: collecting and distributing performance information:
  • Status reporting;
  • Progress measurement;
  • Forecasting.

Administrative closure.
Communications management

Communicating

- The exchange of information – it has many dimensions:
  - Written and oral;
  - Internal (within the project) and external (to the customer, the media, the public, etc.);
  - Formal (reports, etc.) and informal (memos, ad hoc conversations, etc.);
  - Vertical (up and down the organisation) and horizontal (with peers).
- Project communication management means to decide how to communicate – including choosing media (written/oral) and style at different points of the project.

Communications management plan contains information on:

- Methods to gather and store various types of information – collecting and disseminating updates and corrections;
- Distribution structure: who gets what information and in what form (according to project organisation chart);
- Description of the information to be distributed:
  - Format,
  - Content,
  - Level of detail,
  - Conventions/definitions to be used.
- Etc.
Performance reporting

Performance reporting – a part of communications management

- Status reporting – “where the project now stands”;
- Progress reporting – “what the project team has accomplished”;
- Forecasting – predicting future project status and progress.

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Tools and techniques</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project plan</td>
<td>Performance reviews</td>
<td>Performance reports</td>
</tr>
<tr>
<td>Work results</td>
<td>Variance analysis</td>
<td>Change requests</td>
</tr>
<tr>
<td>Other project records</td>
<td>Trend analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Earned value analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>distribution tools and techniques</td>
<td></td>
</tr>
</tbody>
</table>

How to measure progress?

- Based on milestones;
- Based on costs: how much has been spent;
- Based on work needed (in workers-day);
- Based on material consumption – in case of using materials of great volumes, e.g. earth, concrete, etc.
- Based on other units, e.g.:
  - Levels finished (in case of multi-storey buildings);
  - Flats finished (in case of residential buildings);
  - Length of road finished;
  - Etc.
Performance reporting

**Milestone based measuring**

- Costs and deadlines can be assigned to each milestone
- It is accurate at well-defined milestones, but cannot be used between them
- Hard to use if a company has more constructions in progress at the same time

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Planned date (week)</th>
<th>Planned cost (HUF)</th>
<th>Actual date (week)</th>
<th>Actual cost (HUF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting the construction</td>
<td>4</td>
<td>5 000</td>
<td>5</td>
<td>6 000</td>
</tr>
<tr>
<td>Finishing the foundation</td>
<td>15</td>
<td>12 000</td>
<td>16</td>
<td>14 000</td>
</tr>
<tr>
<td>Finishing the loadbearing</td>
<td>30</td>
<td>40 000</td>
<td>33</td>
<td>42 000</td>
</tr>
<tr>
<td>structures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End of finishing works</td>
<td>40</td>
<td>50 000</td>
<td>42</td>
<td>56 000</td>
</tr>
</tbody>
</table>

Performance reporting

**How to report performance?**

- Comparing actual project results to planned or expected results (variance analysis):
  - Cost variances;
  - Schedule variances;
  - Variances from plan in the areas of scope, quality and risk, etc.
- Examining project results over time (trend analysis).
- **Earned value analysis** – the most commonly used method, it integrates scope, cost and schedule measures.
Performance reporting

Earned value analysis

• Key values:
  • The budget = budgeted cost of work scheduled (BCWS) – it is the plan;
  • The actual cost = actual cost of work performed (ACWP) – the total of direct and indirect costs – it is the reality;
  • The earned value = budgeted cost of work performed – it is an imaginary number;

• Most commonly used measures:
  • Cost variance: CV = BCWP – ACWP
  • Cost performance index: CPI = BCWP / ACWP
  • Schedule variance: CV = BCWP – BCWS
  • Schedule performance index: SPI = BCWP / BCWS

Performance reporting

Figure 10-2. Illustrative Graphic Performance Report
Performance reporting

Project risk management

- Risk: the effect of uncertainty on objectives, whether positive or negative.
- Project Risk Management:
  - identifying
  - analysing
  - responding to
  - maximising the results of positive events and minimising the consequences of adverse events.

- Risk Identification
- Risk Quantification
- Risk Response Development
- Risk Response Control
Project risk management

Risk assessment
• identification, probability estimate and impact analysis – make clear definition of risks, including chance of their occurrence together with assessing their impact on the project’s outputs.

Risk management
• deals with identifying counteractions necessary to avoid or lessen chance of occurrence or to decrease impact of adverse consequences identified during risk assessment.

Project risk management

Risk Assessment:
• Exploring and identifing risks.
• Analysing risk factors in terms of their impact on performance (cost, schedule and quality).
• Estimating probability of the risk occurring during execution of the project.
• Assigning priorities to risks according to their probability, effects and range of damages associated, together with analysing chance of their simultaneous occurrence.
• Risk identification should address both internal and external risks.
Project risk management

Inputs:
- Product description.
- Other planning outputs. For example:
  - Work breakdown structure;
  - Cost estimates and duration estimates;
  - Etc.
- Historical information — about what actually happened on previous projects. Sources can be:
  - Project files — records of previous project results that are detailed enough to aid in risk identification.
  - Commercial databases — historical information available to buy
  - Project team knowledge — the individual members of the project team may remember previous occurrences or assumptions.

Risk Management Priorities:
- High-impact, high-probability risks;
- High-impact, lower-probability risks;
- Lower-impact, high-probability risks.

What can be done?
- Avoiding the risk (eliminating);
- Reducing the risk (likelihood or impact);
- Transferring the risk to others (insurance);
- Contingency plans (to be implemented if the risk occurs);
- Accepting the risk (just monitoring).

Cost-effective countermeasures — compared with the likely damage if the risk occurred.
### Project risk management

#### Reducing the risk

<table>
<thead>
<tr>
<th>Risk factor identified</th>
<th>Reducing probability</th>
<th>Reducing impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of experienced staff</td>
<td>Employ skilled professionals, and/or consultant-experts</td>
<td>Experienced staff informally supervise the work of less experienced colleagues</td>
</tr>
<tr>
<td>Lack of technical infrastructure in the form of tools or access to tools</td>
<td>Hire or purchase necessary tools and resources</td>
<td>Increase time-span of project planned</td>
</tr>
<tr>
<td>Lack of necessary knowledge or of technical experience</td>
<td>Invite professional subcontractors with high reputation</td>
<td>Organize trainings and study courses for the staff</td>
</tr>
<tr>
<td>Multiple vendors or contractors included</td>
<td>Nominate “Main Contractor”</td>
<td>Increase project contingency times</td>
</tr>
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#### Reducing the risk

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<tbody>
<tr>
<td>Late deliveries, and tardy performance of subcontractors</td>
<td>Stipulate penalties in the contract</td>
<td>Schedule increased durations for activities</td>
</tr>
<tr>
<td>Deficient deliveries, and imperfect performance of sub-contractors</td>
<td>Screen sub-contractors, specify technical priorities and expectations</td>
<td>Stipulate warranty conditions in the contract</td>
</tr>
<tr>
<td>Unforeseen weather extremities</td>
<td>Use less weather-sensitive technologies</td>
<td>Contract Insurance Co., financial reserves, special contract closures</td>
</tr>
</tbody>
</table>