Costing of Infrastructure Projects

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Historically large infrastructure projects had significant cost overruns

<table>
<thead>
<tr>
<th>Project</th>
<th>Approximate final cost US million</th>
<th>Percentage cost overrun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suez Channel (1859-1869)</td>
<td>8.500</td>
<td>1900 %</td>
</tr>
<tr>
<td>Sydney Opera House (1959-1973)</td>
<td>102</td>
<td>1400 %</td>
</tr>
<tr>
<td>Panamá Channel (1881-1914)</td>
<td>375 (only to USA)</td>
<td>200 %</td>
</tr>
<tr>
<td>Brooklyn Bridge (1870-1883)</td>
<td>15.5</td>
<td>100 %</td>
</tr>
</tbody>
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Source: Staff based on internet data
Cost overruns in transportation projects are frequent

- In 9 out of 10 transport projects, costs were underestimated (sample of 258).
- This phenomenon was observed in 20 countries on 5 continents.
- The difference is greater in developing countries (in railways).
- Estimation errors have not reduced over the years.
- There is no technical justification.
- It seems to be due to a strategy.

Source: Megaprojects and Risk (2003), Bent Flyvbjerg, Werner Rothengatter based on “Economic Appraisal of Large-Scale Transport Infrastructure Investments” by Mette K. Skamris.
Causes of cost overruns in infrastructure projects

- Frequent design change due to lack of clearly defined project objectives and scope.
- Contractors financial difficulties that affect project progression.
- Payment delay for completed work (more often in government funded projects)
- Lack of contractor experience causing rework and delays.
- Poor cost estimates due to unreliable data, lack of a national database for prices, lack of experience of estimators and optimistic bias.
- Poor tendering documentation
- Poor material management resulting in late delivery or higher prices

Based on a critical review of 17 studies concerning cost overrun in construction projects. Results of studies based on analysis of 489 projects and 1674 questionnaires/interviews in 16 countries and one worldwide.

Causes of cost overruns in infrastructure projects

- Poor initial studies
- Optimistic bias
- Strategy
- **Proper planning of infrastructure projects is key!!!**

<table>
<thead>
<tr>
<th>Level of detail of pre-investment studies</th>
<th>Actual vs. forecasted cost of project</th>
<th>Actual completion time vs. planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>- 4 %</td>
<td>- 13 %</td>
</tr>
<tr>
<td>Medium</td>
<td>- 2 %</td>
<td>+ 8 %</td>
</tr>
<tr>
<td>Low</td>
<td>+ 16 %</td>
<td>+ 26 %</td>
</tr>
</tbody>
</table>

Source: Construction Industry Institute
Usual costing method by project stage

- **Project concept**
  - Quantities based on previous experience (similar projects)
  - Costing based on secondary sources

- **Pre-feasibility studies**
  - Quantities based on preliminary architectural or engineering design
  - Cost estimates based on market prices

- **Feasibility**
  - Quantities based on architectural and engineering designs
  - Cost estimates based on quotes and market prices
Main challenge for precise estimation: Uncertainty

Factors that contribute to uncertainty include:

- **Experience with similar projects**: The less experience, the greater the uncertainty.
- **Length of planning horizon**: The longer the planning horizon, the greater the uncertainty.
- **Project duration**: Like planning horizon, if a project has a shorter duration it is more likely to account more precisely for all costs.
- **Required personnel**: A higher quantity of personnel and higher skill levels will increase the uncertainty of cost estimates.
- **Infrastructure governance**: weak PIM processes and institutions increases uncertainty.
Recommendations to reduce cost overruns

- Don’t take shortcuts on front end planning (pre-investment studies). Complete all necessary studies/designs before tendering for construction.
- Develop and maintain an updated national costs database and provide training to cost estimators.
- Implement independent reviews to avoid optimistic bias.
- If rights of way are necessary, acquire all before tendering.
- Prepare complete and detailed tendering documentation to avoid disputes and judicialization.
- Select contractor with adequate experience and financial backing.
- Streamline payment procedures to avoid construction stoppages.
- Have an effective system for project monitoring and management to detect deviations and adopt timely corrective measures.
- Do ex-post evaluations to learn from actual cost overruns and avoid them in future projects.