Quantifying the Benefits of Phasing as a Corporate Real Estate Strategy

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This presentation

• Phasing as a real estate construction strategy – the problem setup
• Some examples from the real world - background
• Numerical case and comparison of strategies – proposed solution
• Discussion & Conclusions
Phasing as a construction strategy

- **Basic notion**: it is possible to build buildings in stages
- Building in a way that allows the construction to be continued later usually has an EXTRA cost – compared to building without the possibility to continue construction.
- The idea is that at first a building is built only to reflect the present need for space and IF the need increases more space is built later => flexibility to expand is not built immediately (no "empty" spaces are built)
- **Basic notion**: Creating the possibility to continue construction is creating a real option
- The creation of the real option to continue construction to the first phase costs EXTRA, the EXTRA cost is the price of the real option
Phasing as a construction strategy

• “The million dollar questions”:
  – What is the value of the real option to construct in phases?
  – Should we construct in phases or not? Is the cost of the real option more than the value?

• To answer these questions we need to be able to value the different strategies and to be able to compare them

• This means valuing a ”normal” construction project and a construction project with a real option to continue building (staging)
Staged construction examples

Example from Turku, Finland – Kupittaa Intelligate complex

Intelligate has been planned to include three buildings.

Construction was already stopped once before the first building, and for the second time after the completion of the first building.

Construction will continue IF the demand for spaces Increases.
Staged construction examples

It is also possible to build high-rise buildings in stages.

Plate 1: Health Care Service Corporation building in Chicago in center of image

Note: Phase 1 (left) and Phase 2 (right)
Sources: Goettsch Partners (2008); Pearson and Wintels (2008)
Staged construction examples

Vertical phasing

Plate 2.
Court Square Two
in New York City

NEW YORK CITY, USA
Staged construction examples

All work was carried out without any interruption to the current building tenants that occupy the existing 22 floors. As Bentall 5 is situated in downtown Vancouver, the protection of the neighboring buildings and the safety of the general public were of utmost importance to the EllisDon construction team.

From: http://ascribehq.com/ellisdon/portfolio/4730
Staged construction examples

- In city centers: the more central you are the more you pay for the land and the right to build.
- When cities grow, and when or if you can build on the same spot it is highly likely that the land price is much higher and you make money just by "already being there."
- Additionally there are savings connected to not having to move the operations (if it is your own organizations’ premises that are built).

BEIJING, PRC

Beijing subway map 2006
Beijing subway map 2008
Beijing subway map 2011
The logic of real option valuation

The single value representing the future value distribution is calculated by using the likelihood of occurrence of (each of) the values as a weight for the value, such that all negative values are assigned value zero.

Discounting the expected value to present value

During the option maturity the value of the option may vary. A process is used to “create” the distribution of outcomes.
Real Options as a Modeling problem

The three major components of modeling the value of a real option are:

a) the modeling of the future value distribution

b) the calculation of the expected value of the future value distribution while mapping negative values of the distribution zero, and

c) modeling the calculation of the present value of the expected value.
Numerical Case

• The problem resembles the (well known) decision problems often found in R&D projects
• As with R&D projects, there is a lot of uncertainty also in construction project outcomes: these projects are well known for cost overruns (cost side uncertainty) and the revenues are also uncertain (market dependency)
• We use cash-flow scenarios to frame the uncertainty in the projects: best guess, minimum possible, and maximum possible scenarios are built for costs and for revenues (3 scenarios)
**Building Strategy 1: Build in one phase**

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<tr>
<th>Time (t)</th>
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<tr>
<td>Optimistic</td>
<td>962,2</td>
<td>966,3</td>
<td>970,4</td>
<td>974,5</td>
<td>978,6</td>
<td>982,7</td>
<td>986,8</td>
<td>990,9</td>
<td>995,0</td>
<td>999,1</td>
<td>1,003,2</td>
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<td>Best guess</td>
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<td>996</td>
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<tr>
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<td>1,000</td>
<td>350</td>
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**Revenue source 1: long term leases (in 100,000s)**

- Optimistic: 962,20
- Best guess: 957,69
- Pessimistic: 961,54

**Revenue source 2: short term leases (in 100,000s)**

- Optimistic: 0,00
- Best guess: 0,00
- Pessimistic: 0,00

**Net present value of Strategy 1: building in one phase**

- Real option value for strategy 1: 302
- Single # NPV: 130

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**Building Strategy 2: Build in two phases**

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<tr>
<td>Best guess</td>
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<td>POSITIVE</td>
<td>SINGLE # NPV</td>
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<td>Pessimistic</td>
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**Benefits of Phasing**

- **Cost cash flows in one and in two stages**
- **"excel compatible"**
- **Scenario NPV’s**
- **Separate discount rates for costs and for revenues**
With the numbers used an unexpected result occurred: the present value of real option cost is negative!

**Explanation:** As the time value of money-effect “kicks-in” the postponing of the second phase alone is enough to justify staging!

Cumulative PV of the construction project with one / two stages

**Observe two things:**

1) How close the scenarios are to each other (inaccuracy of estimation)
2) How low the min scenario goes (most negative perceived outcome)
This table shows single number descriptive numbers about the two strategies. Numbers on the light background are "better" - Usefull for comparison of strategies

This kind of "numbers" are very good for e.g. MCDM => We know, but we sometimes don’t use what we know!

Creation of a pay-off distribution from the scenario values allows The decision-maker to visually compare the strategies. The wider the pay-off distribution, the more risky the project seems to be. Also if the distributions are very asymmetric then the upside and the downside become visible as They are perceived, not as symmetric (as sometimes happens, when e.g.sensitivity analysis is used)
Background & context of this research (where did 10 years of work go?)

- **Research on fuzzy mathematics and possibility theory**
  - Fuller & Carlsson, 2001
  - Zadeh, 1965

- **Possibilistic mean value and variance**

- **Simpler real option valuation methods and application design**
  - Pay-Off Method for Real Option Valuation, 2009

- **Research on real options**
  - Datar & Mathews, 2004

- **Real world problem of real estate investment decision-making**
  - New construction Methods have made it possible to consider & realize also vertical phasing.
Final thoughts / Takeaway message

- Phasing is a relevant alternative for large scale construction
- Staging can be understood as a real option
- Quantifying the value / benefit of staging is relevant from a decision-making point of view – only the quantification reveals if the staging really makes sense
- Graphical presentation increases understanding of the project and the involved risks
Thank You!

Questions? Comments?