Better Business Cases – Cost Modelling
National Meeting Cardiff, 17\textsuperscript{th} April 2015

Presented by Peter Leonard and Stefan Sanchez
1. **Requirements**
   - Fundamentals; financial and economic requirements; and using models on an ongoing basis.

2. **Cost modelling**
   - Getting the breakdown and detail correct; Accounting treatment of costs, assumptions and modelling differing scenarios.

3. **Programme and project cost envelopes**

4. **Programme business case (PBC) modelling**
   - Challenges and consolidated programme views of costs.

5. **Sources to identify costs**
1.1 Requirements - Fundamentals

- Two sets of analysis required.
- Economic – Value for Money
- Financial – affordability. Where’s the money coming from and how much will it actually cost?
1.2 Requirements - Financial appraisal

- **Funding analysis is split by organisation**: show how the total Programme/Project capital and revenue will be funded and how contingency is allocated.

- **Balance sheet, Income and Expense (I&E) and Cash flow per organisation**
  Consolidated B/S, I&E and Cash flow statement makes no sense.

- **Financial modelling requirement** to allow different organisations (Trusts, DH and ALBs) to have **different financial policies**.

- **Identify VAT (20%), Inflation (CPI), Contingency** and **Optimism Bias (OB)** uplift separately by funding organisation.

- **Contingency**: “Expected risk” value plus any provision for “Qualitative” risks.
1.3 Requirements – Economic appraisal

- The “Green Book” economic assessment is based on Value for Money (VFM). DH also use Absolute Value for Money (AVfM) ratio; Cabinet Office Payback Period; Others Return on Investment (ROI)

\[ \text{Risk Adjusted VFM} = \text{Discounted [Benefits – Costs – Risks]} \]

- VFM >0 is a Net Present Value (NPV); VFM <0 is a Net Present Cost (NPC).

- Reasons for a Net present Cost (NPC): Legislation, some infrastructure (e.g. Networks), high risk, benefits work incomplete and incorrect scope.

- No infrastructure should be considered in isolation.
1.3 Requirements - Economic appraisal cont.

**Absolute Value for Money (AVfM) Ratio**

**Discounted [(NCRBs + SBs) / (Cost + Risk - CRBs)]**

- The **AVfM ratio** is the Department of Health’s external comparator to NICE guidance. The comparator derives from the value of Quality Adjusted Life Years (QALYs) and the target ratio is 4 i.e. for every £1 spent generates £4 of benefit.

**Payback Period**

The point at which the **cumulative benefits** equals the **cumulative costs**
1.4 Requirements – Other analysis

- Other cost analysis: e.g. Major Project Authority GMPP, Cabinet Office Digital spend, financial budgets and staff budgets.
1.5 Requirements - living models

- Business case models are used as a vehicle to monitor changes against original authorised case; DH uses a tolerance exception process.

- **Re-baselining price base for new financial years.** Some reports require the price base prices, risks and benefits to be updated each year. The MPA GMPP return requires a quarterly update.

- **Re-baselining activities:** Historic risk, re-profiling risks, updating actual spend and forecasts; benefit projections.
2.1 Cost modelling – Contents of a model

• Getting the **cost breakdown and detail correct**; need to split out Capital/Revenue, VAT/irrecoverable VAT; need to know the pedigree and calculation.

• **Costs maybe included in financial appraisal not in economic** include: Redundancy costs, VAT, depreciation and capital charges, inflation and contingency.

• **Included in the economic appraisal not in financial** include: retained risk. Values are discounted.
# 2.1 Cost modelling – Contents of a model

<table>
<thead>
<tr>
<th>Costs (exc. VAT) £K</th>
<th>(C)ap/ (R)ev</th>
<th>Economic Appraisal</th>
<th>Financial Appraisal</th>
<th>VAT?</th>
<th>If so, is it recoverable?</th>
<th>CO Spend</th>
<th>Budget holder</th>
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<th>Yr 1</th>
<th>Yr 2</th>
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<td>Y</td>
<td>N</td>
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<td>Abc</td>
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<td>Revenue - Mgd Serv</td>
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<td>Y</td>
<td>Xyz</td>
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<td>Abc</td>
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<td>Operational Staff</td>
<td>R</td>
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<td>Abc</td>
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<td>Redundancy Costs</td>
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<td>£2,050</td>
<td>£900</td>
<td>£3,450</td>
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2.2 Cost modelling – Assumptions

- **Irrecoverable VAT** major consideration as VAT can move the cost base by 20%: VAT can be recovered in some circumstances for a tailored service may be classified as reclaimable. De-aggregation of contracts may change liability.

- **Staff costs.** Work on standard costing based on average of a salary band plus NI and SERPS (up to 26%), accommodation, PCs, variable costs and fixed costs.

- **Inflation:** based on CPI or specific inflation in contractual terms. CPI taken from HM Treasury website. Use Feb, May Aug and Nov quarters which contain the full forecasts. Convert from calendar years to financial years.

- **Financial modelling assumptions:** Discount rate is 3.5%; Rate of Return (ROR) is 0. Trusts for example may use different rates ROR.
2.3 Cost modelling – Scenarios

• **Modelling differing commercial scenarios.** Can use switches to allow costs to be switched in and out based on scenarios e.g. 3 year contract or a 5 year contract.

• **Sunk costs** not part of business case but help show the total picture. “Discovery work” and costs for preparing business cases are often sunk.

• **Year end changes** sometimes change the nature of some costs items from forecast to sunk while business case is in production.
3.1 Cost modelling – Cost envelopes at PBC/SOC

PBC/SOC (£12K to 35K)

“Do Min” Walk

£1K

“Preferred Way Forward” Travel by Car

£12K

Optimism Bias (40% to 200% before mitigation)

£35K

“Do Max” Travel by Train then Taxi

£40K

Rough order of magnitude (ROM) costs
3.2 Cost modelling – Cost envelopes at OBC

OBC (£10K to 15K)

“Do Min”
2 seater town car

“Preferred Option”
4 door saloon car

“Do Max”
6 seater off road

<table>
<thead>
<tr>
<th>Cost Range</th>
<th>“Do Min”</th>
<th>“Preferred Option”</th>
<th>“Do Max”</th>
</tr>
</thead>
<tbody>
<tr>
<td>£8K</td>
<td>£10K</td>
<td>£15K</td>
<td>£30K</td>
</tr>
</tbody>
</table>

Market sounding and benchmarking costs

Optimism Bias (being mitigated) and Contingency
3.3 Cost modelling – Cost envelopes at FBC

**FBC (£10K plus £1K)**

Best and final offer (BAFO) costs

Any residual Optimism Bias and Contingency

£10K

£11K
3.4 Cost modelling – Cost envelopes

PBC/SOC (£12K to 35K)

- "Do Min" Walk
  - £1K

- "Preferred Way Forward" Travel by Car
  - £12K

- "Do Max" Travel by Train then Taxi
  - £35K

OBC (£10K to 15K)

- "Do Min" 2 seater town car
  - £8K

- "Preferred Option" 4 door saloon car
  - £10K

- "Do Max" 6 seater off road
  - £30K

FBC (£10K to 11K)

- "Do Min" Car
  - £10K

- "Preferred Option" Car
  - £11K

- "Do Max" Car
  - £15K

"Preferred Option" Travel by Car

4 door saloon car

"Do Min"
2 seater town car

"Do Max"
6 seater off road
4.1 PBC modelling - Challenges

- **A consolidated programme view of costs;** individual business cases to feed into the iterative programme business case (PBC) model.

- **Some elements of a programme may be more mature than others.** At PBC stage costs will not be fully identified so we would be looking at cost envelopes; require estimates for each business cases within the overall programme.

- Programme business case **modelling needs to be flexible** to produce project information or be fed from individual project models.
4.2 PBC modelling - Economic analysis

- Economic viability of individual projects within a programme as well as the overall economic viability of the overall programme – Economy of the part is not the same as the economy of the whole

- “Free goods” for infrastructure projects distort the NPV of services that use that infrastructure. However, a single government organisation does not necessarily want the overhead of internal charging and associated accounting.
5.1 Sources to identify costs

- **Sources**: Forecasting, Benchmarking, Market engagement, Estimating models, comparisons and Research (e.g. PSSRU in Health).

- **Exercising pricing mechanisms in contracts** provides information e.g. Benchmarking and open book.

- **Be mindful of commercial confidentiality** when comparing.

  **Stefan’s Exercise**
Cost modelling

…great in theory, but how do you actually do it?
The ‘challenge’

We need:

• A consolidated view of costs at programme level – individual business cases feeding into the iterative programme business case (PBC) model

• Flexible programme business case modelling fed from individual project models
Stakeholder needs

• Sponsor authorities and approval authorities demand clarity and brevity from business cases, including:
  • A clear understanding of how short listed options compare to each other (considering NPC/V in the round with qualitative benefits)
  • Financial clarity:
    • What are the capital and revenue requirements for my organisation?
    • Where is the capital and revenue coming from?
    • When is it needed?
    • How long is it needed for?
Cost model

• Should collect the right data!!

• Essential features:
  • **Economic**: modelled over 60 years with discounted costs, optimism bias, risks, benefits
  • **Financial**: modelled over shorter period, include inflation, contingency, cash releasing benefits

• Desirable features:
  • Ability to split costs appropriately between funding organisations (not always 50:50!)
  • Split out capital and revenue
  • Identify key spend categories
  • Flexible and easily updatable as information changes
Project and Programme dashboards

Example:

• Schools programme – 5 new build schools
• ‘combined OBC (cOBC) with economic and financial analysis in one place
• Allows a view of each individual project
• Allows a ‘whole programme’ view
Projects Dashboard
This shows the key economic metrics for each of the projects in the programme, demonstrating the choice of the preferred option for each project.
# Programme Dashboard

This is an updated summary of the programme. It shows the key economic and financial metrics for the programme.

## Economic metrics

### Net Present Cost - Programme (£000)

<table>
<thead>
<tr>
<th>School 1</th>
<th>NPC £000</th>
<th>EAC £000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status quo</td>
<td>19,157</td>
<td>730</td>
</tr>
<tr>
<td>PWF</td>
<td>20,944</td>
<td>799</td>
</tr>
<tr>
<td>Less ambitious</td>
<td>20,178</td>
<td>769</td>
</tr>
</tbody>
</table>

### Net Present Cost - Projects

<table>
<thead>
<tr>
<th>School 1</th>
<th>NPC £000</th>
<th>EAC £000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status quo</td>
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</tr>
<tr>
<td>Less ambitious</td>
<td>20,178</td>
<td>769</td>
</tr>
</tbody>
</table>

## Financial metrics - preferred option

### Programme capital cost breakdown by cost category (£000)

- **Site preparation works, £1,760,800, 11%**
- **New School costs & CYPP-Youth Services, £4,449,084, 33%**
- **Fixtures and fittings, £1,269,766, 8%**
- **Community facilities, £636,760, 5%**
- **2+ and 3+ Early Years, £897,883, 6%**
- **Additional items, £459,645, 6%**

### Capital cost breakdown by project

- **School 1, £5,386,305, 26%**
- **School 2, £5,444,368, 26%**
- **School 3, £3,440,208, 17%**
- **School 4, £2,933,391, 14%**
- **School 5, £3,440,208, 17%**

### Affordability (£000)

- **Total project costs (£000)**
  - **School 1, £5,386,305, 26%**
  - **School 2, £5,444,368, 26%**
  - **School 3, £3,456,626, 17%**
  - **School 4, £2,933,391, 14%**
  - **School 5, £3,440,208, 17%**

### Spend profile per year - capital

- **2015/16**
  - **£4,494,084**
  - **£1,259,423**
  - **£1,423**
- **2016/17**
  - **£2,492**
  - **£1,259,423**
  - **£1,423**
- **2017/18**
  - **£2,492**
  - **£1,259,423**
  - **£1,423**
- **2018/19**
  - **£2,492**
  - **£1,259,423**
  - **£1,423**
- **2019/20**
  - **£2,492**
  - **£1,259,423**
  - **£1,423**
- **2020/21**
  - **£2,492**
  - **£1,259,423**
  - **£1,423**

### Spend profile per year - revenue

- **2015/16**
  - **£4,494,084**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
- **2016/17**
  - **£2,492**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
- **2017/18**
  - **£2,492**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
- **2018/19**
  - **£2,492**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
- **2019/20**
  - **£2,492**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
- **2020/21**
  - **£2,492**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**
  - **£1,259,423**

### Total project costs (£000)

- **School 1, £5,386,305, 26%**
- **School 2, £5,444,368, 26%**
- **School 3, £3,440,208, 17%**
- **School 4, £2,933,391, 14%**
- **School 5, £3,440,208, 17%**
Collecting the ‘right data’

Requires:

• Clearly identified project ‘ingredients’ – what are you going to actually have to do to build a school? What are the cost lines?

• We have developed a standard list BUT the quality of the output is entirely reliant on the quality of the input
Cost refining

Early modelled build costs (PBC/SOC)

<table>
<thead>
<tr>
<th>Scope of work</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Cost per item</th>
<th>Year 1 profile</th>
<th>Year 2 profile</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>New 240 place School &amp; CYPP/ Youth Services</td>
<td>1,500</td>
<td>m2</td>
<td>£1,800</td>
<td>£2,700,000</td>
<td>£2,160,000</td>
<td>£540,000</td>
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<td>2+ and 3+ Early Years</td>
<td>200</td>
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<td>£1,800</td>
<td>£360,000</td>
<td>£288,000</td>
<td>£72,000</td>
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<tr>
<td>Library</td>
<td>180</td>
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<td>£324,000</td>
<td>£259,200</td>
<td>£64,800</td>
<td>£324,000</td>
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<td>youth/community room</td>
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<td>£28,800</td>
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<td>£36,000</td>
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<td>Total gross internal area</td>
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<td>m2</td>
<td>£1,800</td>
<td>£360,000</td>
<td>£288,000</td>
<td>£72,000</td>
<td>£360,000</td>
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<tr>
<td><strong>Total works</strong></td>
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<td></td>
<td></td>
<td></td>
<td><strong>£2,894,400</strong></td>
<td><strong>£723,600</strong></td>
<td><strong>£3,618,000</strong></td>
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Refined build costs (OBC)

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<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Cost per item</th>
<th>Year 1 profile</th>
<th>Year 2 profile</th>
<th>TOTAL COST</th>
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<tr>
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<td><strong>£2,894,400</strong></td>
<td><strong>£723,600</strong></td>
<td><strong>£3,618,000</strong></td>
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</table>

- Space requirements based on previous experience
- Costs of standardised build – anecdotal evidence

Soft market testing exercise with potential suppliers enabled:
- refinement of space requirements
- Refined cost per m2
- User requirements also refined (e.g. inc community space)
Exercise 1 – cost modelling

• Standard list of items for school build provided
• Education colleagues – please indicate for each cost category:
  (a) Where you would source data from
  (b) How you would model the costs at early stages (PBC/SOC)?
  (c) How you would refine these costs at OBC stage

Health colleagues – please identify any additional cost categories that would apply for a new hospital build and then answer the same questions

30 mins depending on time…
## Exercise 2 – Options Framework – choose a workshop

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<tbody>
<tr>
<td></td>
<td>Peter Kellam</td>
<td>Tracey Hill</td>
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<tr>
<td></td>
<td>Accelerating the delivery of WG’s National Strategy for Flooding and Coastal Erosion Management to reduce risks to people, properties and the economy</td>
<td>Development of a new Hybrid theatre facility, the first in Wales, to support UHW’s role as the designated “hub” of the vascular network for SE Wales</td>
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<table>
<thead>
<tr>
<th></th>
<th>3. Gabalfa Primary</th>
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<td></td>
<td>Laura Sampford</td>
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<td>Consolidation of educational and Early Years provision</td>
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<th>4. Drefach 3-11 Area School</th>
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<td></td>
<td>Eirian Williams</td>
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<td></td>
<td>Proposal to build a new Welsh-medium 3-11 Voluntary Controlled area school on a new site, bringing together 3 Primary schools in addition to creating a new nursery facility for 3 year olds</td>
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