Assessing the Economic value of 3D Geo-information

Cost-Benefit Analysis
Engaging Decision Makers

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Agenda

• Cost-benefit analysis
  - What is cost-benefit analysis?
  - How do we use it?

• Engaging Decision Makers
Cost-Benefit Analysis (CBA)

- A formal discipline used to help assess the *business case for investment* in a project or proposal
- Means of *objective comparison between projects* with different costs, benefits and duration
Assessing the costs

The relatively easy bit
Costs

• Important to include all elements, some often forgotten costs are:
  - Preparing the business case
  - Procurement
  - Project management
  - Business process re-engineering
  - Transitional costs (i.e. parallel running of old and new systems)
  - On-going cost implications (i.e. staff costs and consumables)
  - Data integration
  - Training and re-skilling
  - Marketing
Costs in our Use Cases

• Costs presented today are illustrative
  - We should not be too concerned about the details for the purposes of the workshop
  - The values can be changed in the Financial Model

• In the area of 3D geo-information there are many competing methods:
  - Photogrammetry v LiDAR
  - StreetView v Drones v Obliques

• Costs should be re-assessed for any business case
Benefits categorisation

Types of benefit

- Financial
  - Raise Revenues
  - Lower Costs
- Production
  - Increase Productivity
  - Increase Capacity
- Process improvement
  - Decrease Risk
- Regulation
  - Meet Legislation
  - Standards conformance
- Customer
  - Increase satisfaction
  - Improve Quality
  - Increase efficiency
- Increase capacity
  - Decrease risk
  - Increase efficiency
  - Improve quality
  - Increase satisfaction
  - Meet legislation
  - Standards conformance
  - Lower costs
  - Raise revenues
- Financial
  - Raise Revenues
  - Lower Costs
- Production
  - Increase Productivity
  - Increase Capacity
- Process improvement
  - Decrease Risk
Benefits - examples

• Conform with legislation
  - Avoiding fines for non-compliance (noise regulation)

• Standards conformance
  - Reduced data duplication from sharing standard 3D datasets

• Increased customer satisfaction
  - Reduced citizen time interacting with officials

• Improved decision making
  - Less time compiling information to support decision makers
  - Reduced senior management time
Benefits - more examples

- Improved quality
  - Increase in crime conviction rates by police officers having information on “dark spaces” available on mobile devices

- Increased efficiency
  - Reduction in number of processes from shared services
  - Optimised routes for de-icing roads in winter

- Risk reduction
  - Re-insurance of assets to reduce hazard clustering
Financial Model
CBA and DCF

- A hallmark of Cost-Benefit Analysis (CBA) is that:
  - flows of benefits and flows of costs over time (which tend to occur at different points in time) are expressed on a common basis in terms of their “present value”

- Main tool used for CBA is the Discounted Cash Flow (DCF)
  - Discounting - technique used to compare benefits and costs that occur in different time periods
  - Cash Flow - net inflow and outflow of money
  - Discounted Cash Flow - technique of valuing money to be received or spent in the future in terms of what it is worth today
Time Value of Money

\[ PV = \sum_{t=1}^{T} \frac{X_t}{(1 + r)^t} \]

Where:
- \( PV \) = the present value of the benefit or cost occurring in a future year;
- \( r \) = the discount rate;
- \( t \) = the number of years into the future the benefit or cost occurs after the base date of analysis;
- \( X_t \) = the benefit or cost in year \( t \);
- \( T \) = the life of the scheme.
Net Present Value and Internal Rate of Return

- **Net Present Value (NPV)** - the difference between the present value of benefits and the present value of costs
- **Benefit-Cost Ratio** - the ratio of discounted benefits to discounted costs
- **Payback Period** - time after the project start when cumulative discounted benefits equal cumulative discounted costs

- NPV is expressed in monetary units
## Simple DCF

<table>
<thead>
<tr>
<th></th>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Cost (£000)</td>
<td>-900</td>
<td>-700</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-1,600</td>
</tr>
<tr>
<td>Contingency(10%)</td>
<td>-90</td>
<td>-70</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-160</td>
</tr>
<tr>
<td>Support Costs (£000)</td>
<td>0</td>
<td>-110</td>
<td>-110</td>
<td>-110</td>
<td>-110</td>
<td>-440</td>
</tr>
<tr>
<td>Total Benefits (£000)</td>
<td>0</td>
<td>400</td>
<td>800</td>
<td>800</td>
<td>800</td>
<td>2,800</td>
</tr>
<tr>
<td>Net Cost (£000)</td>
<td>-990</td>
<td>-480</td>
<td>690</td>
<td>690</td>
<td>690</td>
<td>600</td>
</tr>
</tbody>
</table>

| Discount Rate (5%)      | 1.000  | 0.952  | 0.907  | 0.864  | 0.823  |
| NPV (£000)              | -990   | -457   | 626    | 596    | 568    | 343    |
| Cumulative NPV (£000)   | -990   | -1,447 | -821   | -225   | 343    |

Cumulative Net Present Value (NPV) = £343,000  
Internal Rate of Return = 14% (increase discount rate until NPV = £0)
Simple DCF - Payback point

Payback point

Cumulative NPV (£000)

Year 0 Year 1 Year 2 Year 3 Year 4
Sensitivity Analysis

- Tests the range of possible values for the cost-benefit by taking a “pessimistic” and optimistic view of the largest variables
  - Largest variable likely to be data acquisition costs
  - Estimates of benefits maybe too high or low
    - Vary these by suggested 10% up and down
  - Costs currently assume open data policy
    - Financial model includes option to add revenues
Engagement with Decision Makers
Framework for a Successful Communication Strategy

1) Articulating key priorities and imperatives
2) Defining and understanding key audiences
   - customer value propositions
3) Selecting and building distinctive messages (Storytelling)
4) Delivering messages through the right channels and at the right time
5) Assessing the impact of the message
6) Continuously Refining the Approach

Source: Matt Hirschland Ph.D (Director of Communications, University Corporation for Atmospheric Research, UCAR)
Elevator Pitch

Two key elements:
1. Pain statement - what problem are you trying to solve
2. Value proposition - how will your venture solve the problem

Four tests:
1. Succinct
2. Easy to understand
3. Greed inducing (efficiency producing)
4. Irrefutable

http://www.youtube.com/watch?v=Tq0tan49rmc
Preparation

• Time spent of reconnaissance is seldom wasted
  - Spend time with key users, make sure they are “on-board”
  - Often leaders with little time will follow the lead of trusted advisors

• Understand your audience
  - They will focus on the financial analysis
  - What are the other “hot buttons and red flags”

• Keep it short
  - Remember the elevator pitch

• Focus on no more than three compelling arguments
  - Test your arguments by thinking of potential objections

• Solid evidence
  - Make sure the numbers are defensible
Interpreting the Signals

• During a presentation
  - Listen carefully to any feedback, do not “push back” defensively or aggressively
  - Watch the body language, particularly the Chief Financial Officer
  - Interventions are usually good - they exhibit engagement
  - come prepared with backup material to answer objections
  - Never overstay your welcome

• After the presentation
  - Immediately debrief with colleagues present
    • What went well, what didn’t
  - Negative feedback is better than no feedback at all
  - Respond to questions that have been asked ASAP
“Rome was not built in a day”

• Your first attempt will not always be successful in securing the commitment to investment

• Consider: does your message fit with the audiences view of the world
  - If so, you maybe “preaching to the converted”
  - If not, you need to repeat the message many times gradually nudging their “frame of reference” towards what you propose

• If your message comes back to you from another then:
  - Don’t say “that was my idea”
  - Celebrate (quietly)
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