CSIC Asset Management projects

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Agenda

- Asset Management Projects – a recap
- CSIC Asset Management tools
- Case studies
- Outputs
- Discussion and Next steps
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To develop a methodology to determine the level of expenditure on infrastructure assets to maximise lifecycle value.

To develop a methodology to determine the appropriate level of availability of information to support infrastructure asset management.

To develop strategies for future-proofing information associated with large-scale infrastructure.

To review challenges in preparing key infrastructure for future needs and practices used to address them.

Guidelines for whole-life “value”ing of infrastructure assets.

Guidelines for identifying information requirements.

Guidelines for information futureproofing.

Process for capturing future needs and opportunities.
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Process for WLV-based decision-making

A. Establish the Context

A1 Set the scope, objectives and context
A2 Define the problem/decision
A3 Determine the time period for evaluation
A4 Identify and define the asset system
A5 Identify the level of service and performance requirements

B. Value Mapping

B1 Identify all stakeholders
B2 Identify each stakeholders requirements and objectives
B3 Identify the value elements that constitute stakeholders requirements
B4 Identify measurable value metrics for each value element
B5 Determine the influencing factors that impacts the value metrics
B6 Determine the asset related factors that influences value
B7 Determine the external factors that influences asset and value metrics
B8 Determine the various intervention and control options

C. Value Optimisation

C1 Model the dynamic nature of value influencing factors
C2 Model the impact of intervention options on the value influencing factors
C3 Model the relationship b/w value-influencing factors and the value metrics
C4 Quantify the importance of each value metric
C5 Calculate the total value each intervention option
C6 Perform sensitivity analysis and choose the best option

Asset Management is the coordinated activity of an organization to realise value from assets (ISO 55000)
Information requirements process:

1. **Identify life cycle stages**
2. **Identify decisions made and their criticality**
3. **Identify information required for those decisions and its availability**
4. **Calculate information risk to highlight areas of concern**

Information Risk Analysis:
- **Probability that information is used**
- **Probability that unavailability leads to a direct consequence**
- **Probability that a consequence leads to other consequences**
- **Impact on business objectives**

Asset Information Model:

<table>
<thead>
<tr>
<th>Asset</th>
<th>Plan/Design/Build Asset</th>
<th>Operate/Maintain</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>Technical/statutory/mandatory information to plan and develop the delivery of the infrastructure</td>
<td>Technical info to run infrastructure service</td>
<td>Operational information on performance of infrastructure and operations</td>
</tr>
<tr>
<td>Design</td>
<td>Technical/statutory/mandatory information about design offering (asset and service)</td>
<td>Asset level functional information to fully utilise the infrastructure</td>
<td>Info relating to the effectiveness of infrastructure/asset management and its SLA metrics</td>
</tr>
<tr>
<td>Specification</td>
<td>Information to formalise asset design</td>
<td>Information with respect to asset/infrastructure use</td>
<td>Information to illustrate the perception/expectation vs SLA</td>
</tr>
<tr>
<td>Need</td>
<td>Conceptual information about customer asset/service requirement</td>
<td>Information from provider enabling user to exploit infrastructure</td>
<td>Information to determine fulfilment of asset need</td>
</tr>
</tbody>
</table>

Impact on business objectives:
Process for developing information futureproofing strategy

A1. Infrastructure futureproofing
   - Define asset management strategy for infrastructure
   - Define futureproofing strategy for infrastructure
   - Identify temporal distribution of decisions made through the life of the asset
   - Identify the information required to make those decisions

A2. Information requirements
   - Define asset information strategy
   - Identify information that will support futureproofing strategy

A3. Information futureproofing
   - Identify temporal retention requirements for each information
   - Identify technical and organisational challenges that prevent meeting the retention requirements
   - Evaluate and prioritise risks involved in the challenges
   - Select the option that provides the best value

A4. Information futureproofing strategies
   - Evaluation
   - Cost benefit analysis

To A12

Organisation vision and strategies
Asset type

Information futureproofing strategy

Infrastructure futureproofing strategy

Type of infra
Life of infra
Condition of infra

Possible unplanned, uncontrolled disruptions
Long-term capacity and service needs

Technical information strategy
IT strategy
Organisational vision and strategy

Organisational vision and strategy

Infrastructure requirements

Technical challenges
Organisational challenges

Prioritised information futureproofing risks

Prioritised information futureproofing criteria
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Case Study 1: London Underground Lambeth North Station Tunnel

• Problem: Seepages have occurred in several areas on the London Underground Bakerloo Line. Significant maintenance effort is required to prevent these issues affecting the reliability of the service.

• Approach: Use a value-based approach for choosing the best possible repair solutions (type and timing) for providing the best value to stakeholders over 25 years

• Benefits:
  – improve the ability to make good investment decisions and achieve maximum value benefits from a given level of investment.
  – provides a standardised approach for making decisions throughout LU
Next steps

1. Develop crack propagation model
2. Model accumulation of seepage over time
3. Model the probability of value influencing factors over time
4. Model the impact on value metrics
5. Model the impact of interventions
6. Compute value metrics over time with different interventions
7. Conduct sensitivity analysis
8. Choose the best intervention option
9. Choose the best intervention option
Next steps - example

Option 1 Values

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>2.3</td>
<td>13.5</td>
<td>4.7</td>
<td>15.9</td>
<td>37.0</td>
<td>8.2</td>
<td>19.3</td>
<td>10.5</td>
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<tr>
<td>Safety</td>
<td>1.4</td>
<td>1.4</td>
<td>4.6</td>
<td>4.6</td>
<td>0</td>
<td>1.4</td>
<td>1.4</td>
<td>4.6</td>
<td>...</td>
</tr>
<tr>
<td>Service</td>
<td>12.3</td>
<td>13.7</td>
<td>13.7</td>
<td>15</td>
<td>15</td>
<td>12.3</td>
<td>13.7</td>
<td>13.7</td>
<td>...</td>
</tr>
</tbody>
</table>

Whole Life Value

<table>
<thead>
<tr>
<th>Value</th>
<th>Option 0</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
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</thead>
<tbody>
<tr>
<td>Cost</td>
<td>199.5</td>
<td>1015.0</td>
<td>950.5</td>
<td>1616</td>
</tr>
<tr>
<td>Safety</td>
<td>1461.0</td>
<td>86.25</td>
<td>100.66</td>
<td>143.0</td>
</tr>
<tr>
<td>Service</td>
<td>1924.0</td>
<td>1000.5</td>
<td>1382.8</td>
<td>1450.0</td>
</tr>
<tr>
<td>Value for Money</td>
<td>2.818</td>
<td>2.532</td>
<td>1.265</td>
<td></td>
</tr>
</tbody>
</table>
Case Study 2: Surrey County Council

- **Problem:** A large number of highway safety barriers have been in use beyond their intended life. Justifying investment in replacing them is challenging due to their perceived low-value.

- **Approach:** Use the value-map to demonstrate the value of safety barriers and prioritise investment for their replacement over the next 25 years.

- **Benefits:**
  - Enables a clear business case to be made to the Council for safety barrier replacement.
  - Provides a standardised value-based approach for making decisions throughout the Council.
Case Study 3/4: Crossrail/London Underground

- Problem: Crossrail has to deliver information to RfL/TfL/LUL at the end of the project to enable them to operate and maintain the tunnels/pumps. However, there might be a mismatch in understanding the information requirements.

- Approach: Use the process and model to obtain Crossrail and LU perspectives on information required for tunnel/pump maintenance.

- Benefits:
  - Identify gaps between information provided by CR and required by LU.
  - Ensure effective handover of the digital infrastructure along with the physical infrastructure.
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## CSIC Best-practice Guides

### Whole-Life-Value based Decision-Making for Infrastructure Asset Management

** Provides guidelines for:**
- Systematic identification of value drivers for infrastructure assets
- Calculating whole-life value (WLV) provided by the infrastructure asset resulting from different asset management decisions
- Selecting appropriate value-modeling techniques
- Making asset management decisions based on whole-life value

### Managing Infrastructure Asset Information

** Provides guidelines for:**
- Systematic identification of information required for through-life asset management
- Classifying information based on its criticality
- Identifying futureproofing requirements for asset information
- Selecting an appropriate information futureproofing strategy
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Participation

- Additional case studies would be helpful to validate the tools more rigorously

- Contact us for more information on how to participate in case studies and reap early benefits