

COST Action TU1402 – 8th Workshop Summary 20-21 March 2017, Munich

Technische Universität München Engineering Risk Analysis Group 26 May 2017





Summary

- Two day workshop with 16 participants
- Work in break-out groups and in the plenum, with lots of discussion

Aim:

- Clarify the classification and organization of a Vol analysis and develop an common understanding
- Provide the basis for the case studies

Results:

- Different takes on the Vol analysis
- Multiple schemes for representing and summarizing the Vol analysis
- Joint proposal for a Vol flow chart

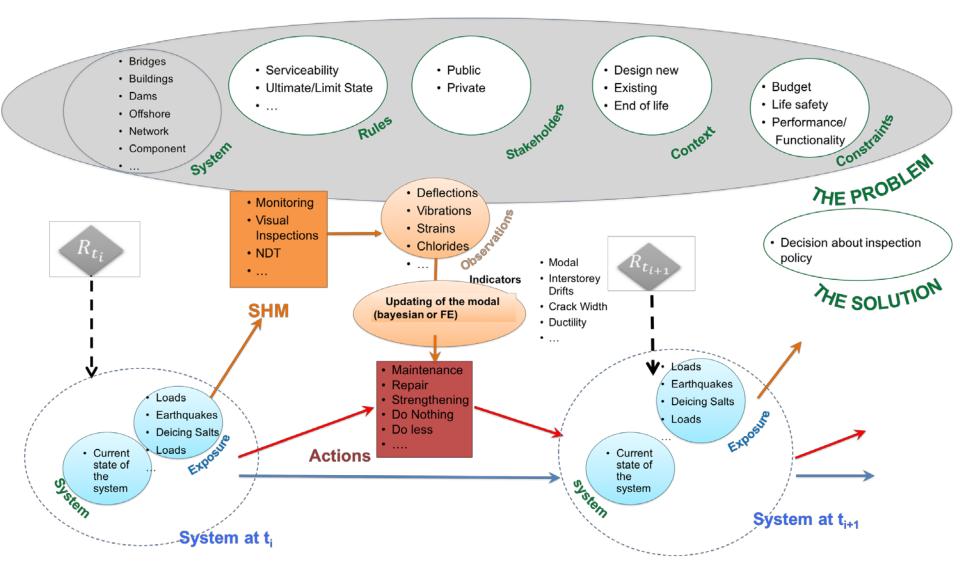
Flow chart group A



LEVEL 0	DECISION MAKER		LIFE CYCLE COST OPTIMIZATION	
Formulate an objective function	Public/Private		 CONSTRAINTS Budget Life Safety Performance/Functi Regulations Stakeholders 	BENEFITS onality
LEVEL -1	CONTEXTDesign newExistingEnd of Life	<u>FUNCTIONALITY</u>		
LEVEL -2	ElementNetwork			
LEVEL -3	Structural Types: Bridges, Offshore, Nuclear, Building	Performance Criteria: Basic Variab ULS Loads SLS Resistar Fatigue	•	ACTIONS Maintenance Inspection Repair Strengthening SHM
LEVEL -4		Materials Degradation mechanisms	Technologies: Visual inspection	

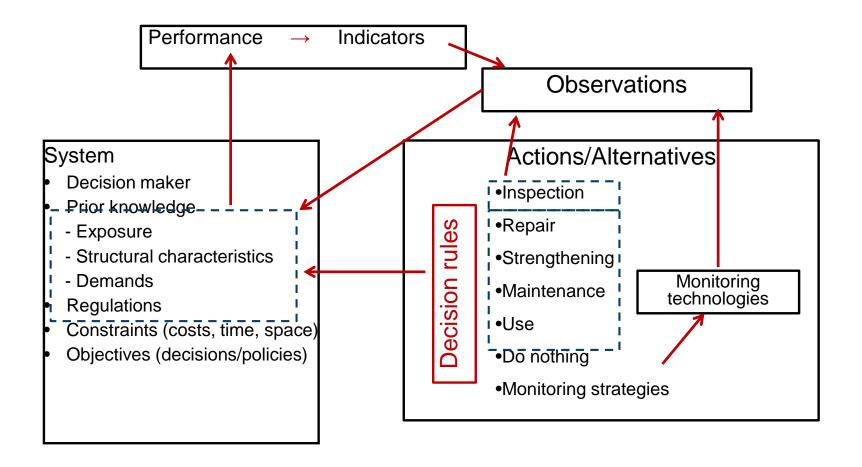
Flow chart group B





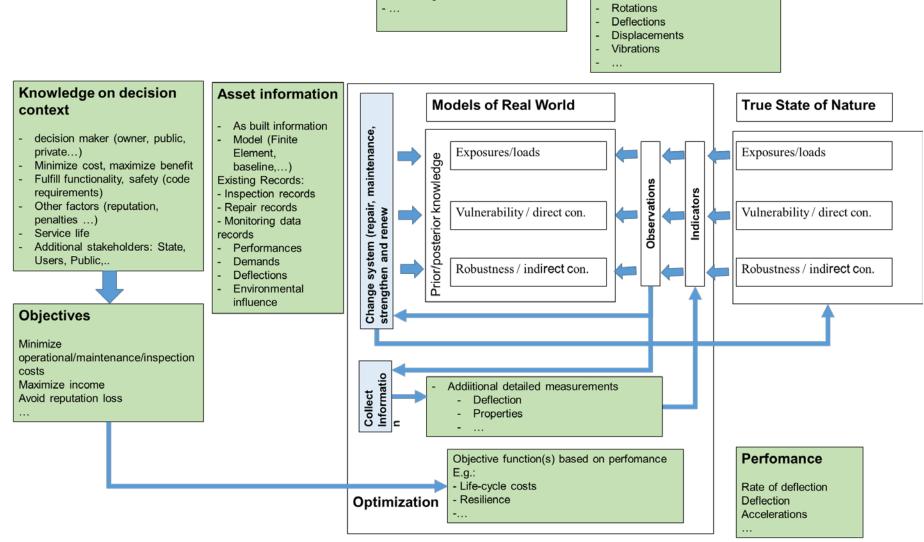
Flow chart group C





Resulting Vol flow chart





Remedial actions

retroffiting

Indicators

Strains

Example implementation - Lezíria Bridge



Remedial actions

- Do nothing
- Strengthening (e.g. additional prestressing)
- Reduce traffic speed

Indicators

- Strain of concrete at piers and deck
- Rotations in the deck near the supports
- Deflections at mid-spans (from the virtual bridge)
- Displacement in bearings

Knowledge on decision context

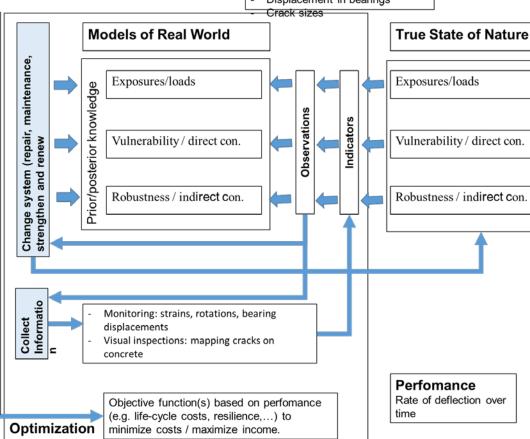
- Decision maker: private company (owner/operator of the bridge)
- Additional stakeholders: State, users, insurance company
- Minimize costs / maximize income
- Constraints: Budget, functionality/ serviceability, SLS (Eurocode threshold requirements) spection times
- Ensure reputa

Objectives

- Minimize operational costs
- Maximize income (toll)
- Avoid reputation loss

Asset information

- Landmark bridge (980 m)
- Service life: 100 years
- Structural type: Prestressed concrete bridge built by the cantilever method with piled foundation
- Demands: environmental exposure (relative humidity, temperature and wind), traffic loads and (possibly) ship impact
- Design information
- As built information:
 Materials properties (i.e. concrete, prestressing steel, loads); Finite
 Element model (virtual bridge baseline refined FE model set up at the end of construction including real geometry, materials and prestressing forces)
- Inspection records
- Repair records
- Monitoring data records (strains, rotations, displacements, accelerations)



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Example implementation – Offshore wind park



Remedial actions

- Do nothing
- Repair weld (grinding or welding)
- Limit turbine operation
- Shut down turbine operation

Indicators

- strains, inclinations, modal properties
- crack sizes

Knowledge on decision context

- Decision maker: private company (owner or operator of the wind park)
- Additional stakeholders: state and insurance company
- Constraints: budget, functionality, life safety (reliability requirements defined by governing codes/standards)

Objectives

- Move from a prescriptive inspection regime to a performance-based inspection reaime
- Minimize service life inspection and repair costs for turbine support structures

Asset information

- Portfolio of structures
- Service life: 20 years
- Structural type: turbine tower supported by jacket structure with piled foundations
- Demands: environmental loads (wave, wind, current), turbine operational loads and (possibly) ship impact
- Design information
- As-built information

