Integrating Value Assessment into the Computational Engineering Design Cycle

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Value Driven Design Methodology

1. A preparatory phase
   - Stakeholder expectations
   - Stakeholder needs
   - Value Dimensions
   - Value Drivers
   - Definition of the Value Dimensions and Value Drivers relationships

2. Conducting Studies
   - Candidate designs and architectures are explored according to the Value Dimensions

3. Value Evaluation
   - Understanding the design space through visualisation ("Screening")

Illustrative Case Study and Methodology

Fig. 3: Re-engine Scenario: Turbine Exit Structure (Illustration from Flight Magazine)

Generation of Architectural Options

The Configurable Components Model (CCM) has been used by Chalmers University, Sweden. Seven alternative architectural options have been identified and then evaluated and assessed according to the Value Dimensions. The Change Prediction Model (CPM) within the Cambridge Advanced Modeller (CAM) tool has been deployed. These simulations receive the DSM (Design Structure Matrix) description of the different design solutions and produce the Combined Risk Matrices, as well as the In/Out Risk plots.

Quantification of Value Dimensions

![Image of DSM, Combined Risk Matrix, and In/Out Risk Plot to quantify the Value Dimensions]

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\text{ability to integrate} = \frac{1}{\text{INT}_1}
\]

\[
\text{DesPrEff} = \frac{1}{\text{DPE}_1} + \frac{1}{\text{DPE}_2}
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\[
\text{DevPrEff} = \frac{1}{\text{DevPE}_1} + \frac{1}{\text{DevPE}_2}
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Value Assessment – Screening

Benefits

- Ability to minimise rework through early identification of behaviour in selected Value Dimensions
- Ability to identify architectural options that align with Value Creation Strategy
- Enable evaluation of design options in advance of physical trade studies
- Link Top Level Requirements with technical measures of 'performance'

References
