

Quantifying Uncertainty in Early Lifecycle Cost Estimation (QUELCE)

QUELCE Workshop

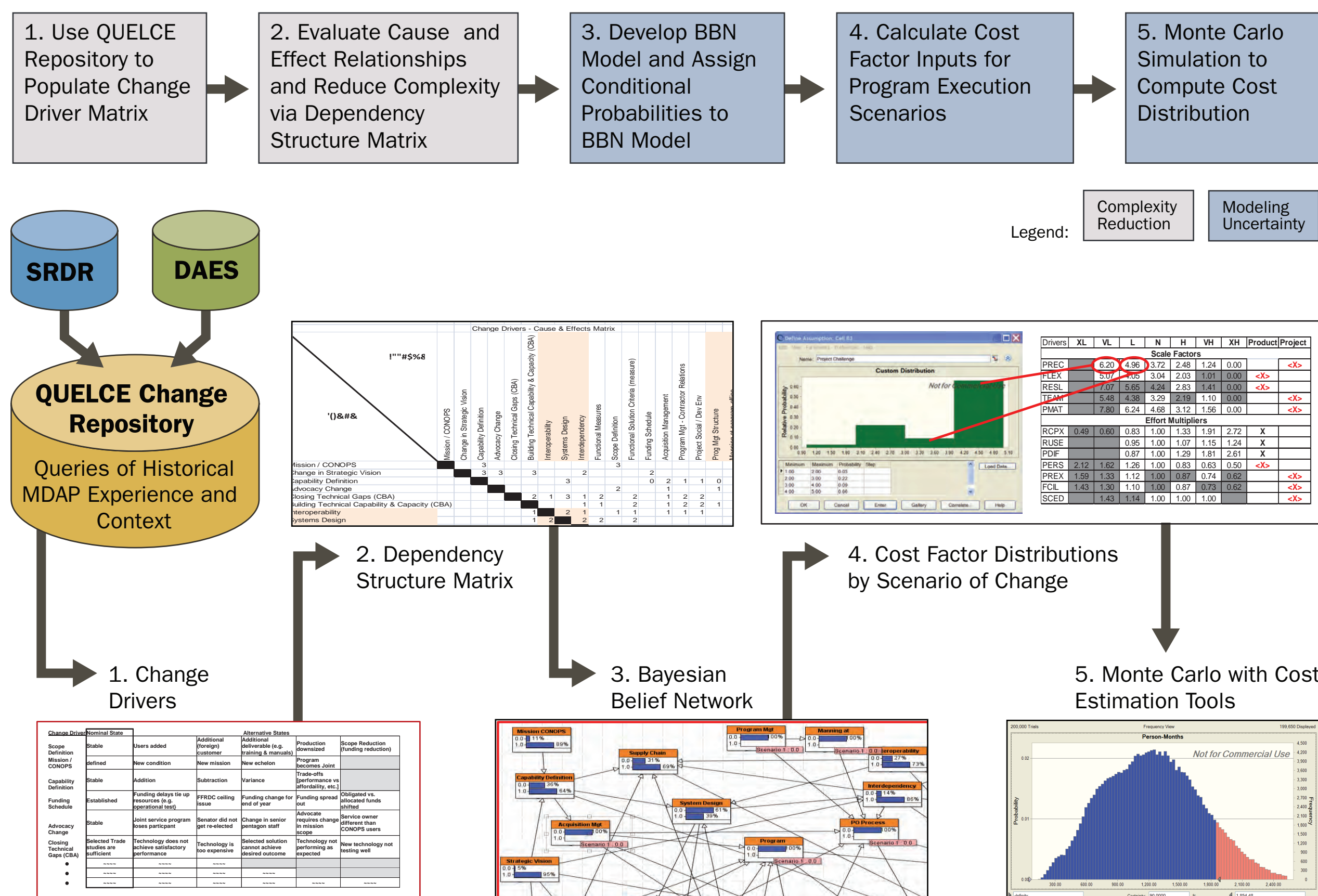
The Quantifying Uncertainty in Early Lifecycle Cost Estimation (QUELCE) workshop enables a client to convene a set of domain experts to formulate early lifecycle cost estimates expressed as cost distributions rather than single points. The QUELCE method involves a five-step process that begins with identifying potential future changes to nominal program execution that will influence program cost. This is followed by probabilistic modeling of the interrelationships of the program change drivers and Monte Carlo simulation of cost model inputs to create program cost estimate distributions. Because many of the inputs are based on subject-matter expert judgment, this workshop also involves a novel approach to calibrating expert judgment through a series of training exercises.

Data Requirements

- Pre-workshop access to existing planning artifacts, such as AoA and ICD/CDD
- Access to domain experts who can anticipate different reasons for cost changes during program execution

Time Frame

- SEI preparation of 1–2 weeks to review available documentation with two SEI staff members
- Two SEI staff members on site for 5–7 days to facilitate five 3-hour workshops with both technical and financial program office staff
- 5–7 days to prepare baseline estimate and suggested scenario-based estimates
- Typically, 3–5 days to assist program office staff with explaining estimates as needed



Expected Results

QUELCE produces a cost estimate that is represented as a distribution from which a decision maker can understand the level of risk associated with a particular cost value. It also produces an executable model that can be used to run alternative scenarios and that can be updated in the future for reestimation purposes. The model and information developed also provide good documentation of the basis of the estimate.

Publications

- Quantifying Uncertainty in Early Lifecycle Cost Estimation (QUELCE)*
www.sei.cmu.edu/library/abstracts/reports/11tr026.cfm
- Quantifying Uncertainty in Expert Judgment: Initial Results*
www.sei.cmu.edu/library/abstracts/reports/13tr001.cfm
- Improving the Reliability of Expert Opinion within Early Lifecycle Cost Estimation*
blog.sei.cmu.edu/post.cfm/improving-the-reliability-of-expert-opinion-within-early-lifecycle-cost-estimation

QUELCE Research

Objective

Quantify expert judgment of anticipated program execution uncertainties and enable more accurate inputs to existing cost models.

Description

Continuing research into the QUELCE method includes

1. Calibrating group judgments of the probabilities of change driver occurrence and co-occurrence
2. Expanding the QUELCE change-driver taxonomy to include detailed sustainment change drivers
3. Prototyping of supervised machine learning to enable the automatic processing of a future stream of DoD program artifacts. This will help create a “living” domain reference point repository benefiting ongoing DoD cost estimation.

Collaboration Opportunities

- Calibrating expert judgment in a group setting – Hubbard-style calibration to create more stability in elicited parameters
- Designing and mapping QUELCE BBN output nodes to cost model inputs
- Defining and classifying program change drivers
- Expanding the use of QUELCE in MDAP and PMO risk management programs to enhance the identification of future risks

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