

Quantitative Methods in Systems Engineering

Project Scoring Rubric

WEEK 3: GENERATING AND EVALUATING ALTERNATIVES

The **highlighted steps** within this week's project are those that are explicitly graded. The other steps will need to be done in order to progress in the project, but do not need to be graded.

Building on your work from Week 2, the project tasks for this week are:

Step 1: Generate design variables using a DVM

- Take a look at the attributes from Week 2 and brainstorm designs/choices that would drive the attributes
- Decompose the designs/choices into design variables and enter into DVM; propose enumeration levels for design variables
- Assess impact of potential design variables on attributes (0-1-3-9 scale)
- Remove weak drivers and summarize "final" set of design variables in a DVM (no more than 5 DV for this project)
- Define final enumeration range, and using simple sampling approach, propose a set of designs to be evaluated

Step 2: Generate evaluation model

- Inspect DVM for key clusters of strong interaction between design variables and attributes
- Identify and briefly describe relationships between design variable and attributes
- Create parametric equations for each attribute (as a function of one or more design variables, and/or intermediate variables/constants)
- Validate evaluation "model" using extreme value and typical value testing for face validity

Step 3: Evaluate the designs

- For each design in the proposed set to be evaluated, execute the evaluation model (or use prior data or expert judgment) to assign attribute scores

Step 4: Value the designs

- For each design, the attribute scores have been entered into your utility value model to generate value scores (i.e. single and multi-attribute utility); please inspect for face validity

Step 5: Summarize

- Write up a short summary of activities performed this week, highlighting assumptions made, difficulties encountered, and how you might do this differently given more time, data, or other resources

Criterion	Peer Assessment Feedback
Prompt	Please provide feedback (300 characters or less) for this project.
Points	
1	Project submitted: An answer has been submitted for this assignment. Feedback is mandatory for this step.

Criterion	Step 1: Generate design variables using a DVM
Prompt	Take a look at the attributes from Week 2 and brainstorm designs/choices that would drive the attributes
Points	
2	Complete: The write up lists more than one design concept and/or choice that makes sense.
1	Incomplete: The write up lists at least one design concept and is unclear why it was chosen.
0	Not Attempted: No answer is provided. Sample project is copied for submission.

Criterion	Step 1: Generate design variables using a DVM
Prompt	Remove weak drivers and summarize "final" set of design variables in a DVM (no more than 5 DV for this project)
Points	
3	Complete: DVM has no more than five design variables (with associated units in parentheses), and has scores of 0,1,3, or 9 in cells mapping relationship between design variable and attributes. The design variables make sense as parameterizing one or more design concepts from the brainstormed list. These are form or operations-related variables that are potentially in the control of a designer. No row or column sum equals 1 or 0.
2	Partially Complete: Same as "complete" but one or more row or column sum equals 1 or 0; some design variables may not seem to be in the control of a designer.

1	Incomplete: Design variables are missing units, or do not make sense as parameterization of listed brainstormed designs. One or more rows may have sums equal to 1 or 0. One or more columns may have sums equal to 1 or 0.
0	Not Attempted: No answer is provided. Sample project is copied for submission.

Criterion	Step 1: Generate design variables using a DVM
Prompt	Define final enumeration range, and using simple sampling approach, propose a set of designs to be evaluated
Points	
3	Complete: More than one DV level is specified for each design variable under "Enumeration". The number of steps is an integer for each design variable (and equal to the number of DV levels listed for discrete DV levels). The number of samples for each design variable is an integer less than or equal to the number of enumerated steps. The number actual sampled equals the proposed sample and this number is less than 5000.
2	Partially Complete: Same as "complete" except the DV levels are not fully described or listed.
1	Incomplete: If the actual sampled is not the same as proposed sample or is greater than 5000. If any of the entries in the Enumeration/Sampling table are blank for the listed design variables.
0	Not Attempted: No answer is provided. Sample project is copied for submission.

Criterion	Step 2: Generate evaluation model
Prompt	Identify and briefly describe relationships between design variable and attributes
Points	
2	Complete: The Evaluation model table has entries for design variables and attributes, optionally with intermediate variables and constants. Each listed variable and constant should have indicated units. Constants should have numbers associated with them.

1	Incomplete: If units are missing from any indicated variables or constants.
0	Not Attempted: No answer is provided (i.e. indicated variables or constants all say "not used") Sample project is copied for submission.

Criterion	Step 2: Generate evaluation model
Prompt	Validate evaluation "model" using extreme value and typical value testing for face validity
Points	
2	Complete: The number of validation trials attempted is greater than 2, up to 6.
1	Incomplete: The number of validation trials attempted is 1.
0	Not Attempted: The number of validation trials is 0. Sample project is copied for submission.

Criterion	Step 3: Evaluate the designs
Prompt	For each design in the proposed set to be evaluated, execute the evaluation model (or use prior data or expert judgment) to assign attribute scores
Points	
3	Complete: In the execution of evaluation model table, the number of attribute calcs actual equals expected and the number of cost calcs actual equals expected. The number of evaluations equals the tradespace size.
2	Partially Complete: Same as "complete" but the number of evaluations is less than the tradespace size.
1	Incomplete: If any of the number of attribute calcs or number of cost calcs actuals do not equal expected.
0	Not Attempted: All actuals calcs equal 0. Sample project is copied for submission.

Criterion	Step 4: Valuate the designs
Prompt	For each design, the attribute scores have been entered into your utility value model to generate value scores (i.e. single and multi-attribute utility); please inspect for face validity (actual equals expected)
Points	
3	Complete: In the execution of valuation model table, the number of SAU calcs actual equals expected and the number of MAU calcs actual equals expected. The number of valuations equals the tradespace size.
2	Partially Complete: Same as "complete" but the number of valuations is less than the tradespace size.
1	Incomplete: If any of the number of SAU calcs or number of MAU calcs actuals do not equal expected.
0	Not Attempted: All actuals calcs equal 0. Sample project is copied for submission.

Criterion	Step 5: Summarize
Prompt	Write up a short summary of activities performed this week, highlighting assumptions made, difficulties encountered, and how you might do this differently given more time, data, or other resources
Points	
3	Complete: The write up clearly summarizes the project activities this week, and addresses assumptions, difficulties, and ideas on how they might do things differently given more time, data, or other resources.
2	Partially Complete: The write up is missing one or more elements from a complete answer (e.g. assumptions).
1	Incomplete: The write up is only a summary of activities.

0	Not Attempted: No answer is provided. Sample project is copied for submission.
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