

Conference on

Innovations in Travel Analysis and Planning

Indianapolis, IN • June 4–6, 2023

Uncertainty Modeling in Practice

Presented by
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Qualitative

Takes advantage of easily accessible resources like local experts, surveys, and public engagement strategies.

Quantitative

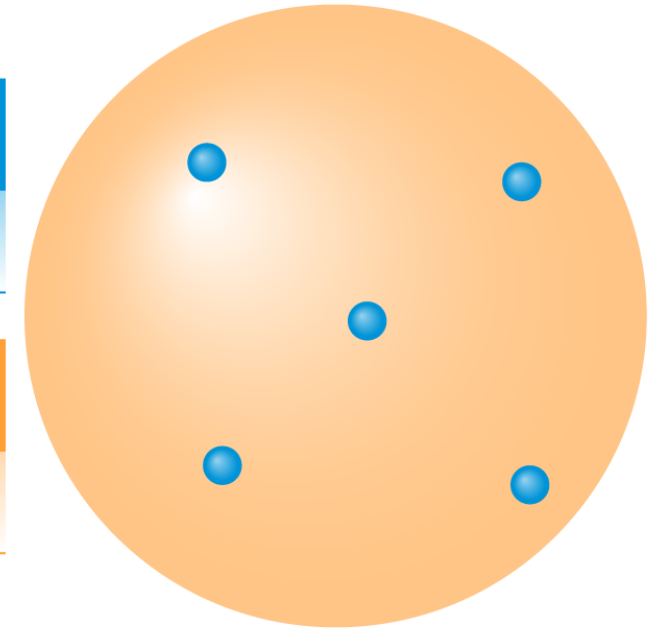
Uses mathematical models to quantify the impacts to operational questions

SCENARIO PLANNING

SEVERAL BEST GUESSES

EXPLORATORY ANALYSIS

ANALYZES THE ENTIRE UNCERTAINTY SPACE

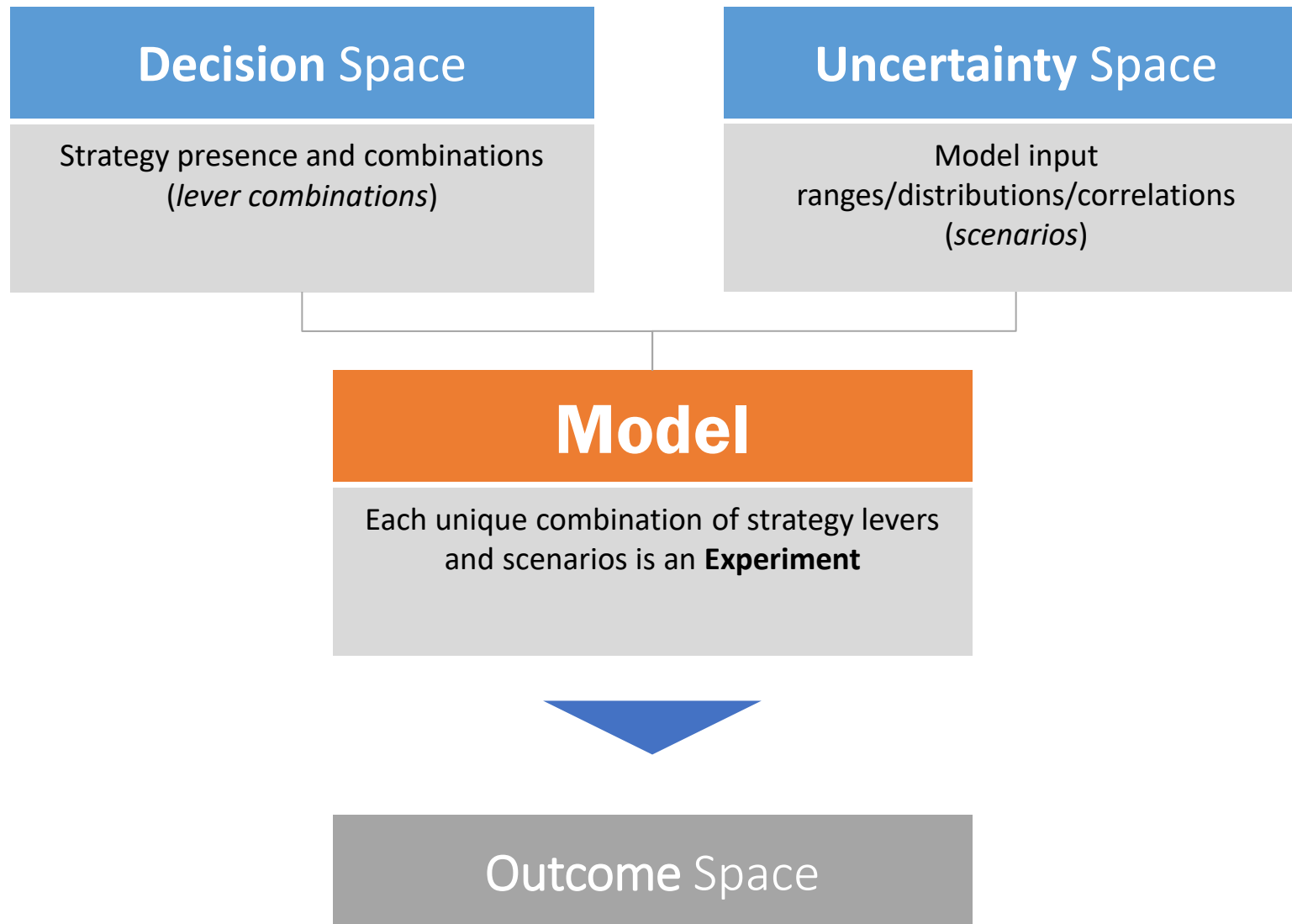


Exploratory Modeling and Analysis

Can be used to identify decisions that are the most robust and resilient against thousands of possible futures.

Traditional scenario planning

- Carefully designed distinct outlooks
- Quantitatively assessed via discrete inputs to a model
- Benefits: cost-effective and efficient
- Drawbacks: Limited in the insights drawn



Step 1: **Scoping**—Define uncertainty and decision space

Scope

- Strategy levers
- Measures
- Uncertainties

Step 2: **Model** development to produce outcome space

Step 3: Simulation (populate outcome space) and **Analysis**

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Each unique combination of strategy levers and uncertainties is an **Experiment**

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Monte Carlo simulation of experiments

Risk analysis

Exploratory analysis

Exploratory and risk analysis

- Exploratory analysis enables exploring the entire uncertainty space
- Risk analysis quantifies level of certainty that policies will perform as expected
- Benefits: Produces a rich set of data allowing for a rigorous, data-driven approach to policy evaluation
- Drawbacks: Requires more resources for comprehensive analysis

FHWA Tools Available for Uncertainty Analysis

VisionEval <https://visioneval.org>

- Common framework for strategic planning tools that includes both modeling and visualization tools
- Embeds a set of models you can calibrate and customize for your needs
- Network-free aggregate measures of congestion replace expensive traffic assignment algorithms and deliver relatively fast performance, but limits types of analysis

TMIP-EMAT <https://tmip-emat.github.io/>

- A set of tools and methods for automation, experimental design, metamodeling, and visualization
- Wraps around your existing travel forecasting model, inheriting that model's capabilities and limitations
- Use some or all of the EMAT tooling, and/or replace parts of it with your own code

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