RT-138: Enterprise Systems Analysis

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Research Task / Overview

Many of the challenges that confront the Department of Defense (DoD) are characterized by the intersection of complex social, political, economic, and technical phenomena where conventional modeling techniques are inadequate. Human and organizational effects can dominate technical outcomes. For example:

- Combating the proliferation of counterfeit parts in military systems

- Managing joint and international acquisition programs

- Coordinating disaster and humanitarian responses involving governments, NGOs, and US agencies

- Sustaining the defense supplier base in the face of declining acquisition quantities

This task is creating systems-oriented modeling methodologies to study and assist policy formulation for such enterprise problems, along with case study demonstrations and validations.

Data & Analysis

Counterfeit Parts Enterprise Model: What policies are most effective in mitigating the intrusion of counterfeit parts in the DoD supply chain?

Model Architecture
- Core supply chain and systems model
- Multi-stakeholder policy model (DoD, programs, Dept of Justice, Customs, Congress)
- Exogenous model with peripheral elements
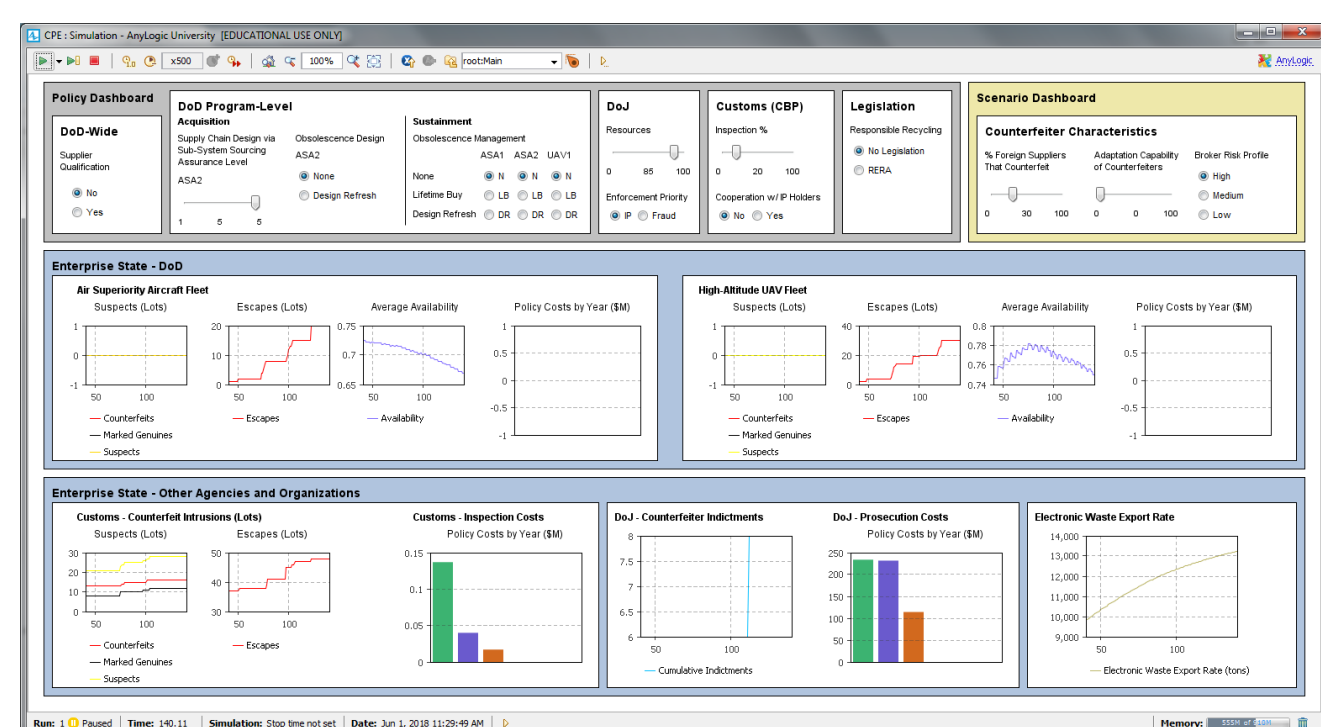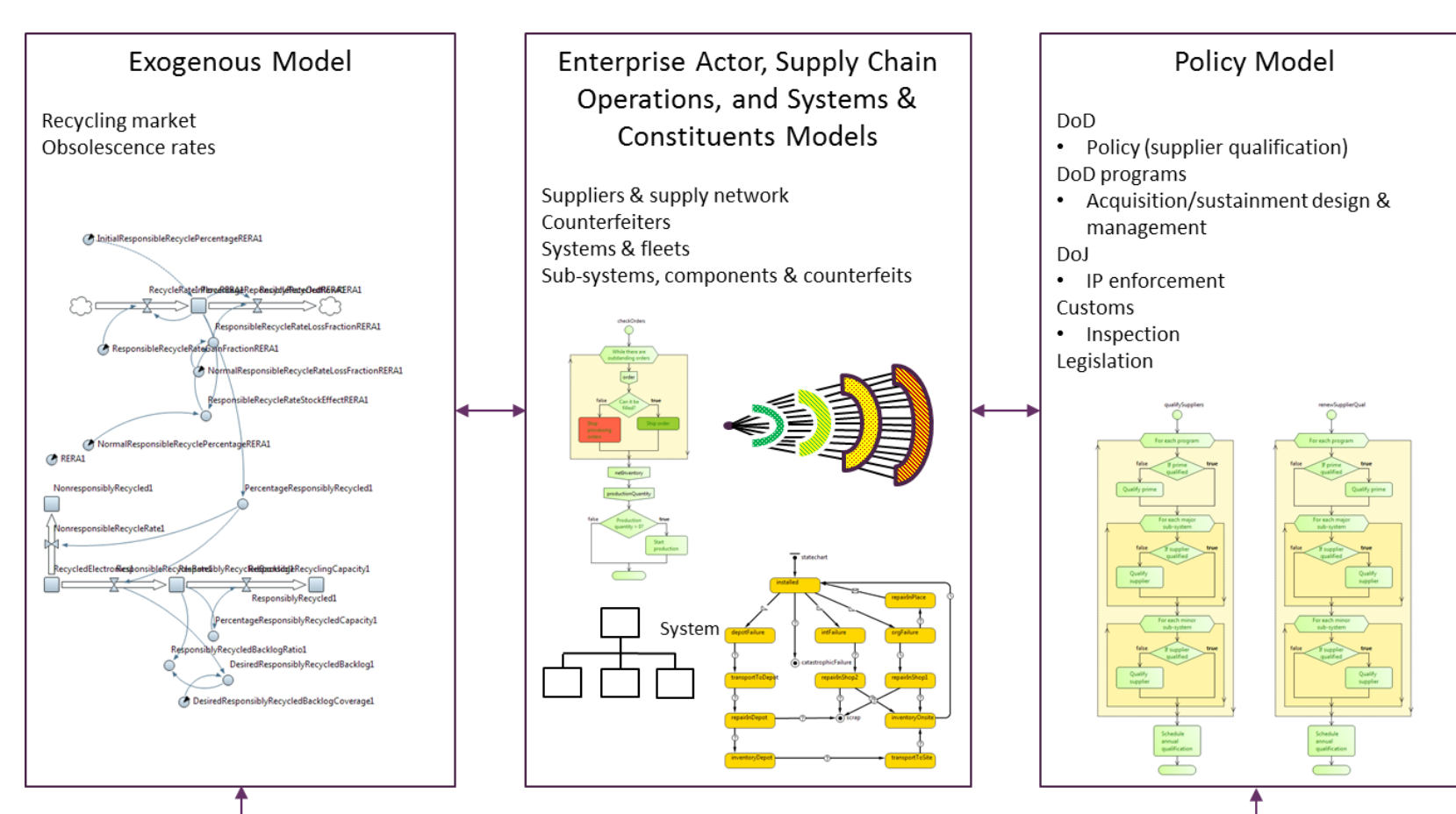
Dashboard & Interface
- Interactive, multi-stakeholder policy dashboard
- Supplier qualification, obsolescence management, customs inspections, recycling export restrictions
- Enterprise status displays – cost, system availability, counterfeit intrusions
- Demonstrated to academic peer review and MITRE

Visualization: What types of visualizations best inform policy-makers on complex enterprise decisions?

Visualization Experiment
- Identify root causes of auto market failures
- Experts vs. novices, complexity of problem, type of aiding
- How can visualizations be designed to avoid jumping to false conclusions for complex problems?
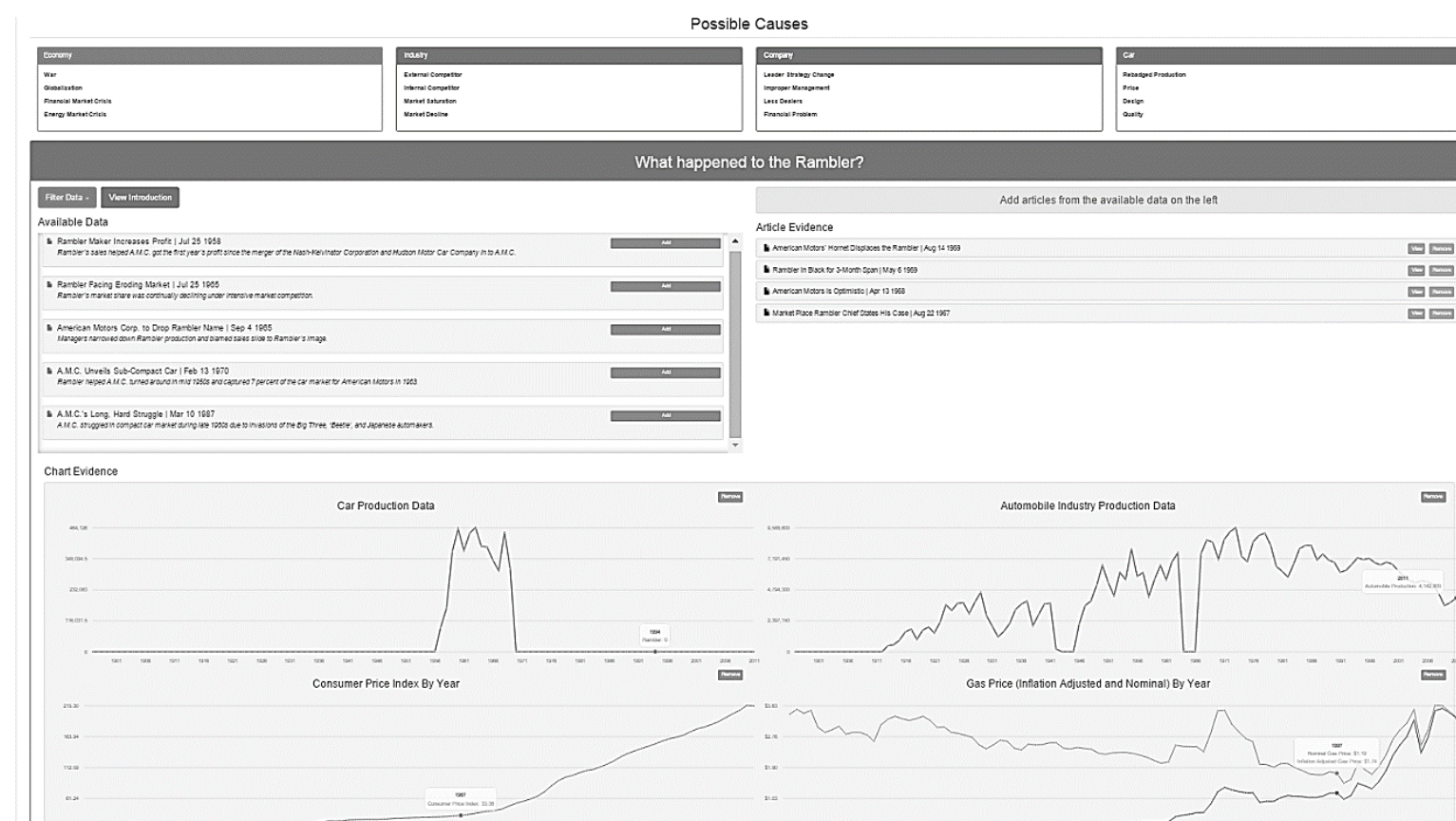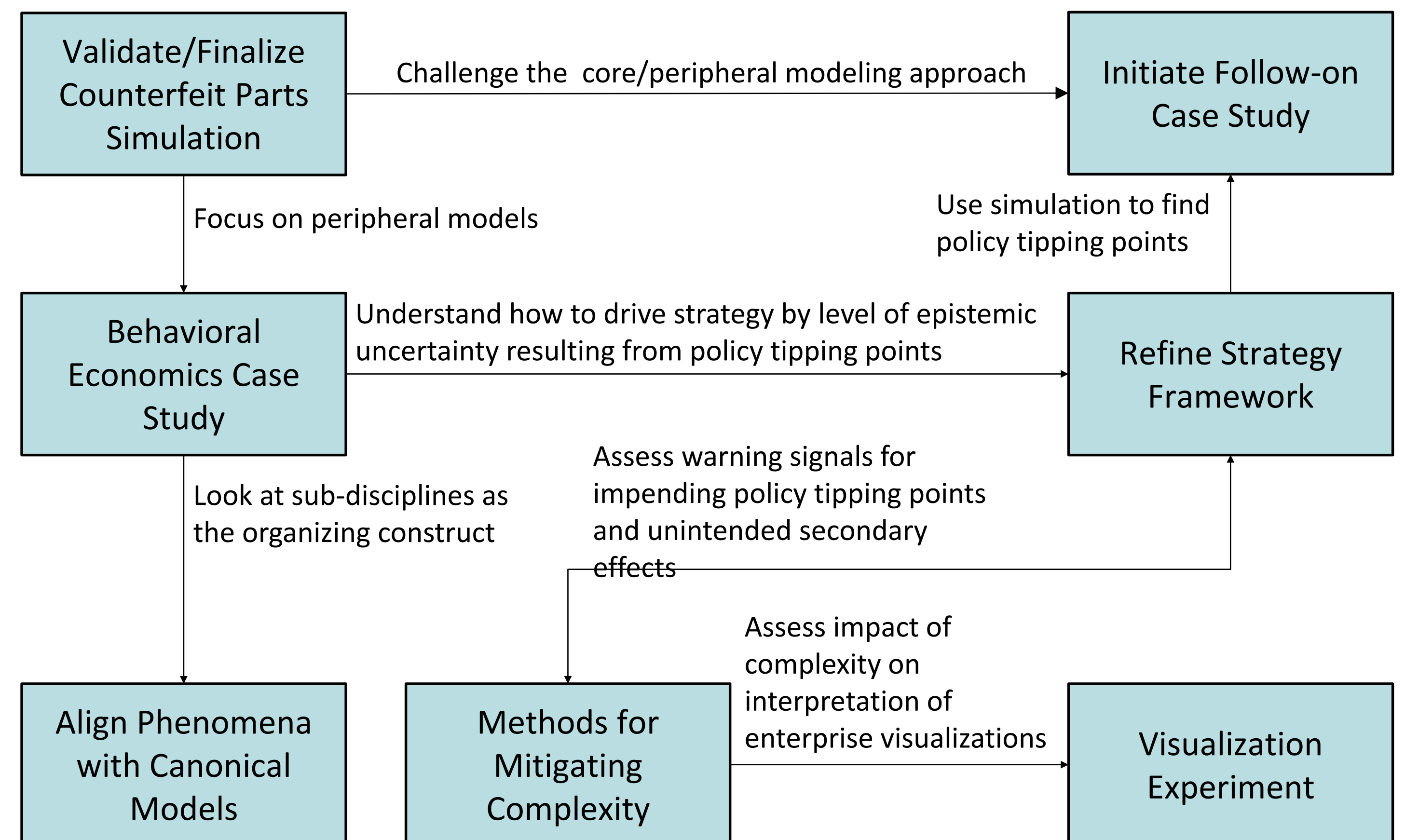

Tipping Points: When do policy tipping points occur, and how can we identify them?
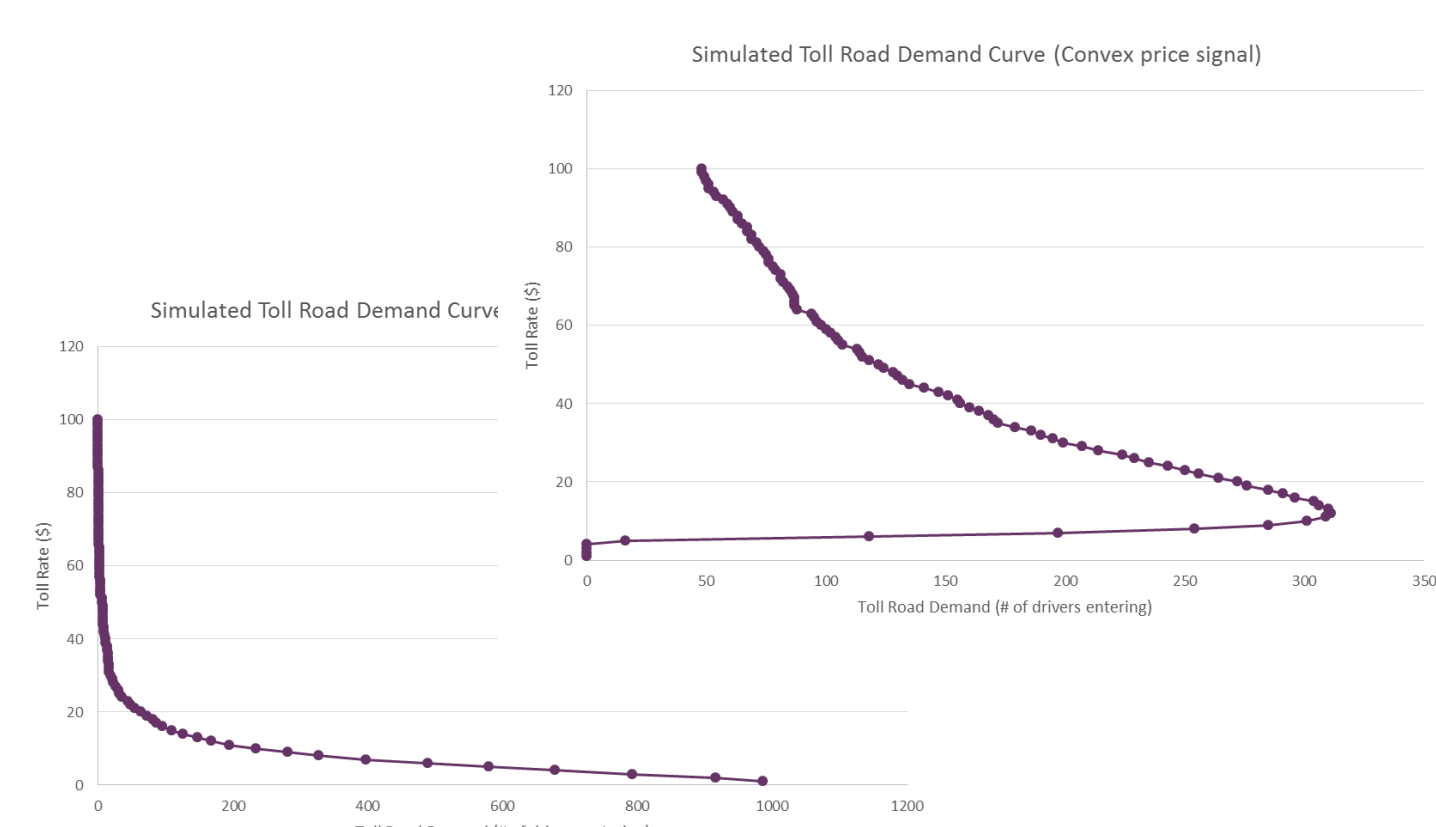

Toll Lane Simulation
- Prospect theory vs. information economics
- Drivers change behavior when they perceive a signal that increased price means increased traffic congestion
- Increased price results in increased toll lane usage

Goals & Objectives

Methodology

- Develop methodologies for modeling enterprises.

- Iterate with case studies to test, validate and improve the methodology.

- First spiral started with a ten-step methodology. The first case study applied it to counterfeit parts detection and avoidance.

- Methodology enhancements include specification of a core model for the critical phenomena in the enterprise with peripheral models for additional phenomena of interest.

- Next step is to test with a follow-on case study.

- Additional methodological work involves studying the role of visualization in decision support, understanding how to map models to strategies, and identifying policy tipping points and secondary effects.
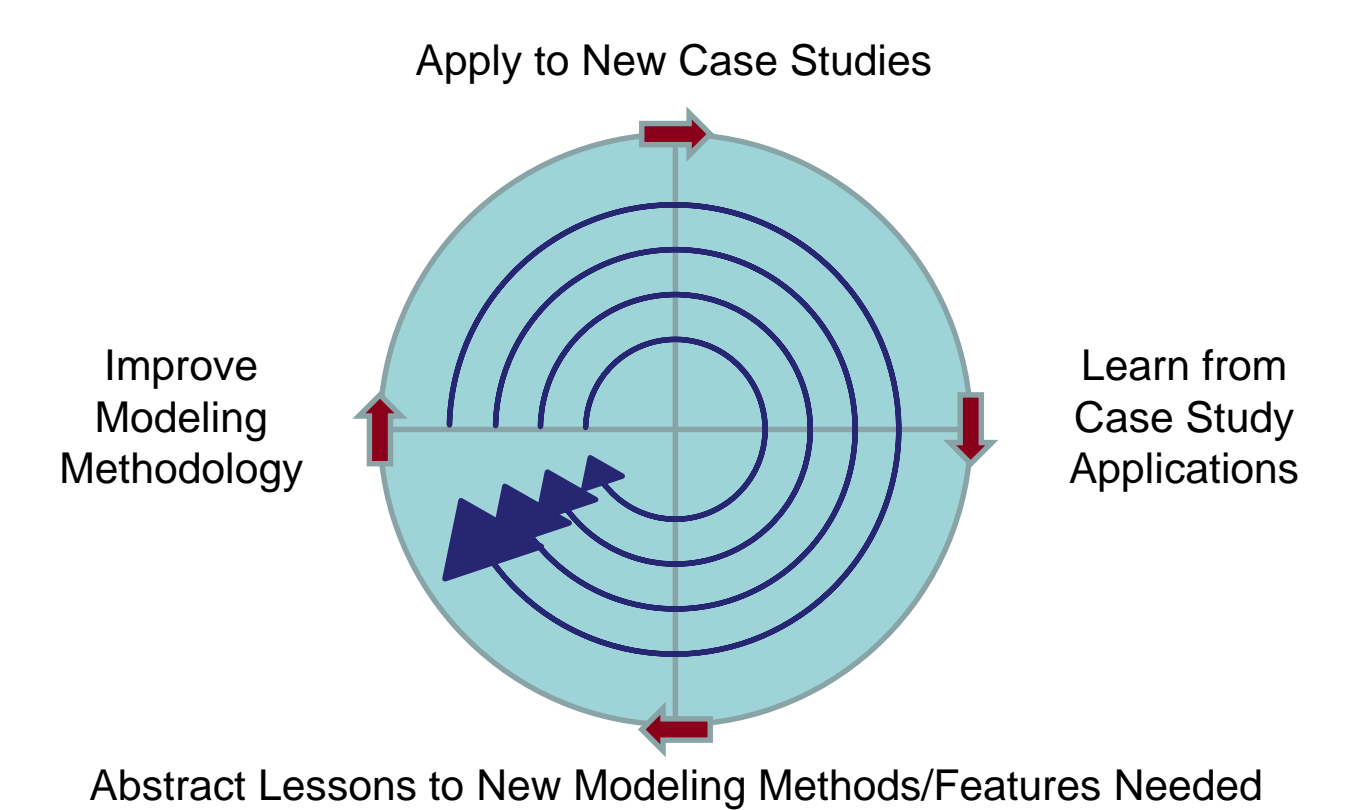
Future Research

- Iterate and validate current enterprise modeling methodology with follow-on case study.

- Specify approaches to identify policy tipping points and validate counter-intuitive results using complex enterprise models.

- Expand canonical phenomena catalog and model reuse to address multi-scale enterprise ontologies

- Continue updating enterprise modeling methodology with results.

Contacts/References

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