

multi-attribute tradespace exploration

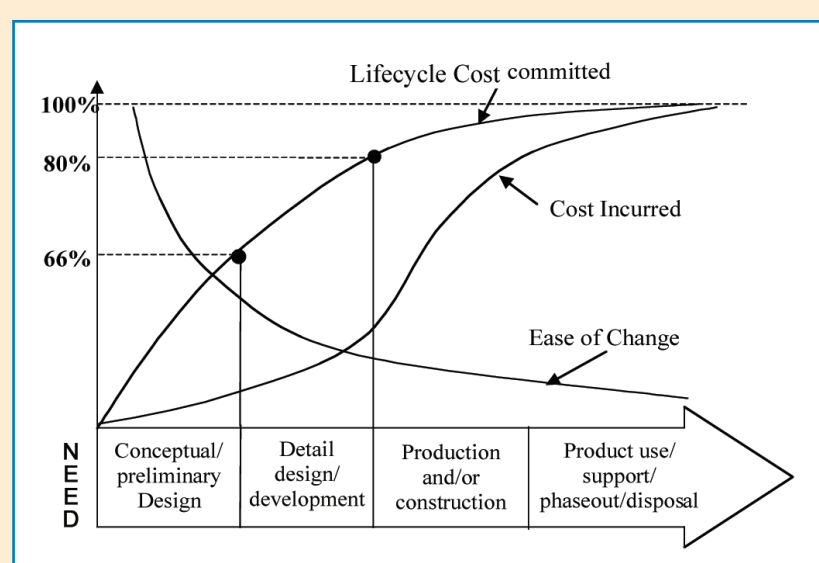
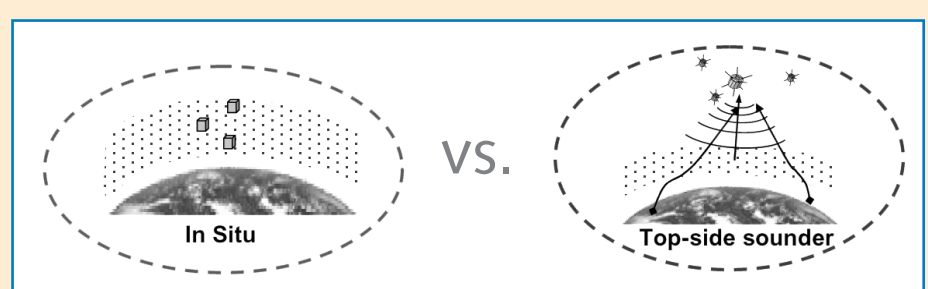
RESEARCH: INCORPORATING SYSTEM PROPERTIES INTO MULTI-ATTRIBUTE TRADESPACE EXPLORATION WITH CONCURRENT DESIGN

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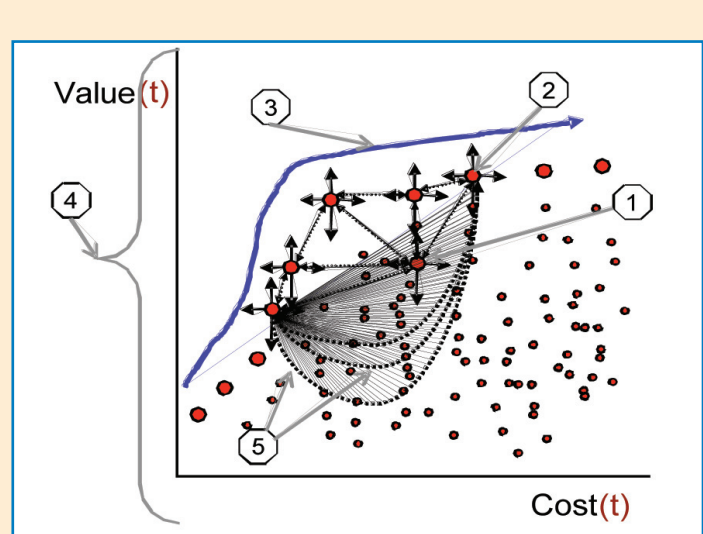


Motivation

Conceptual Design is a high leverage phase in system development



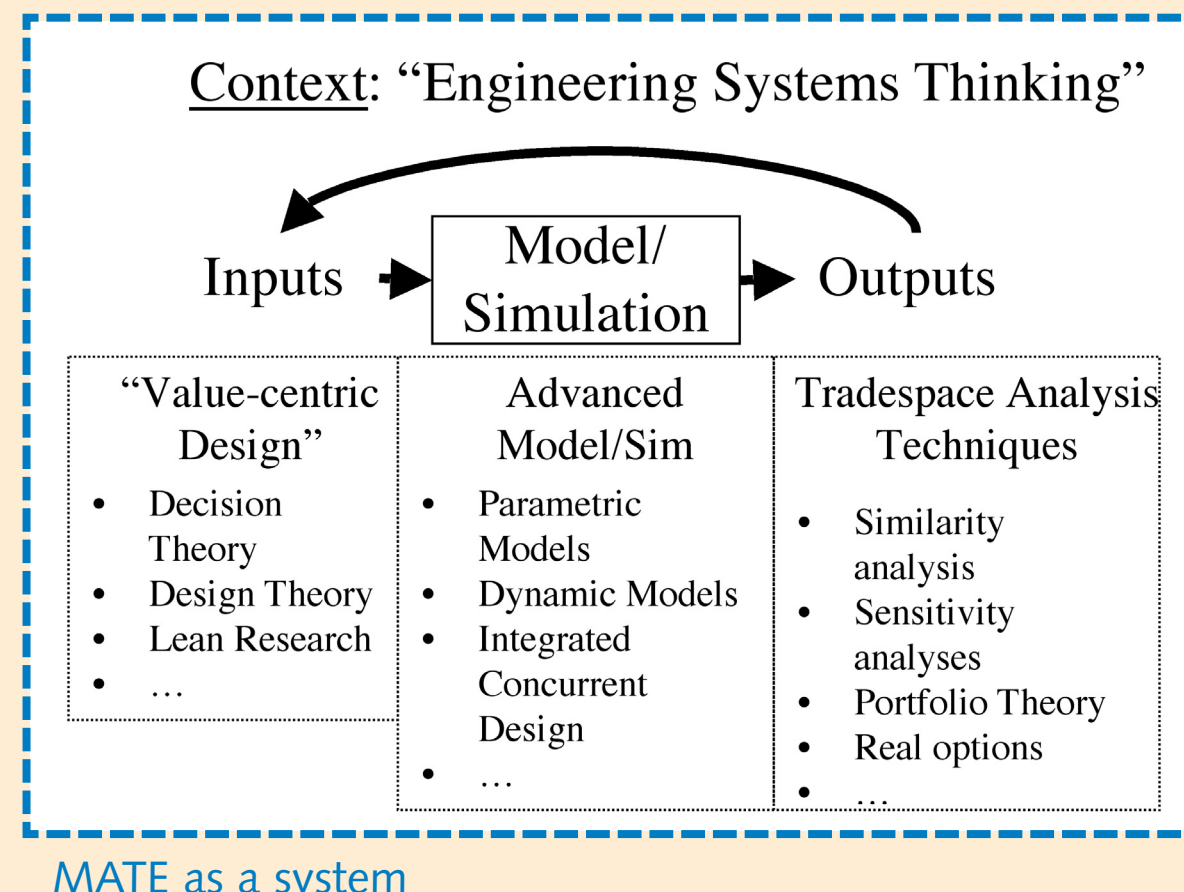
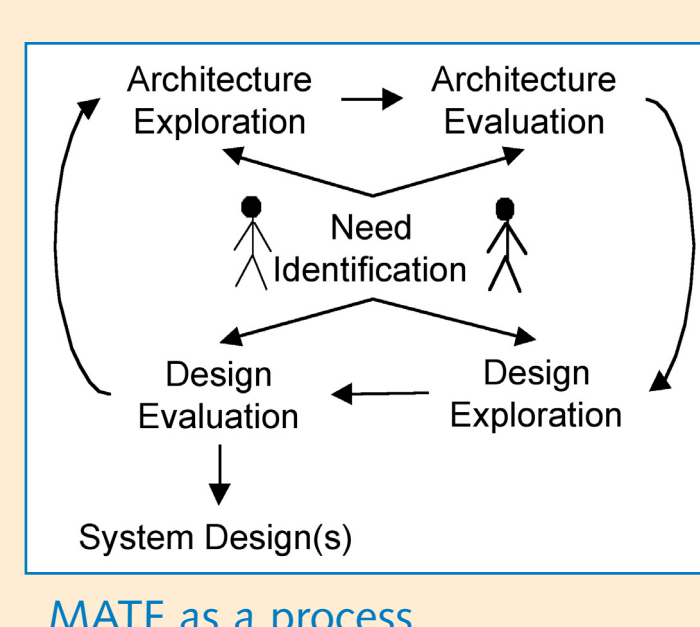
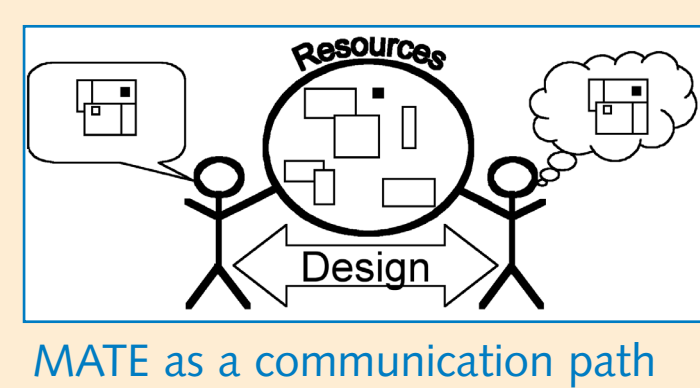
Tradespace Exploration enables 'big picture' understanding



- Design Scope**
1. Point design
 2. "Optimized" designs
 3. "Optimized" sets
 4. Full tradespace
 5. Dynamic tradespace

The "MATE" System

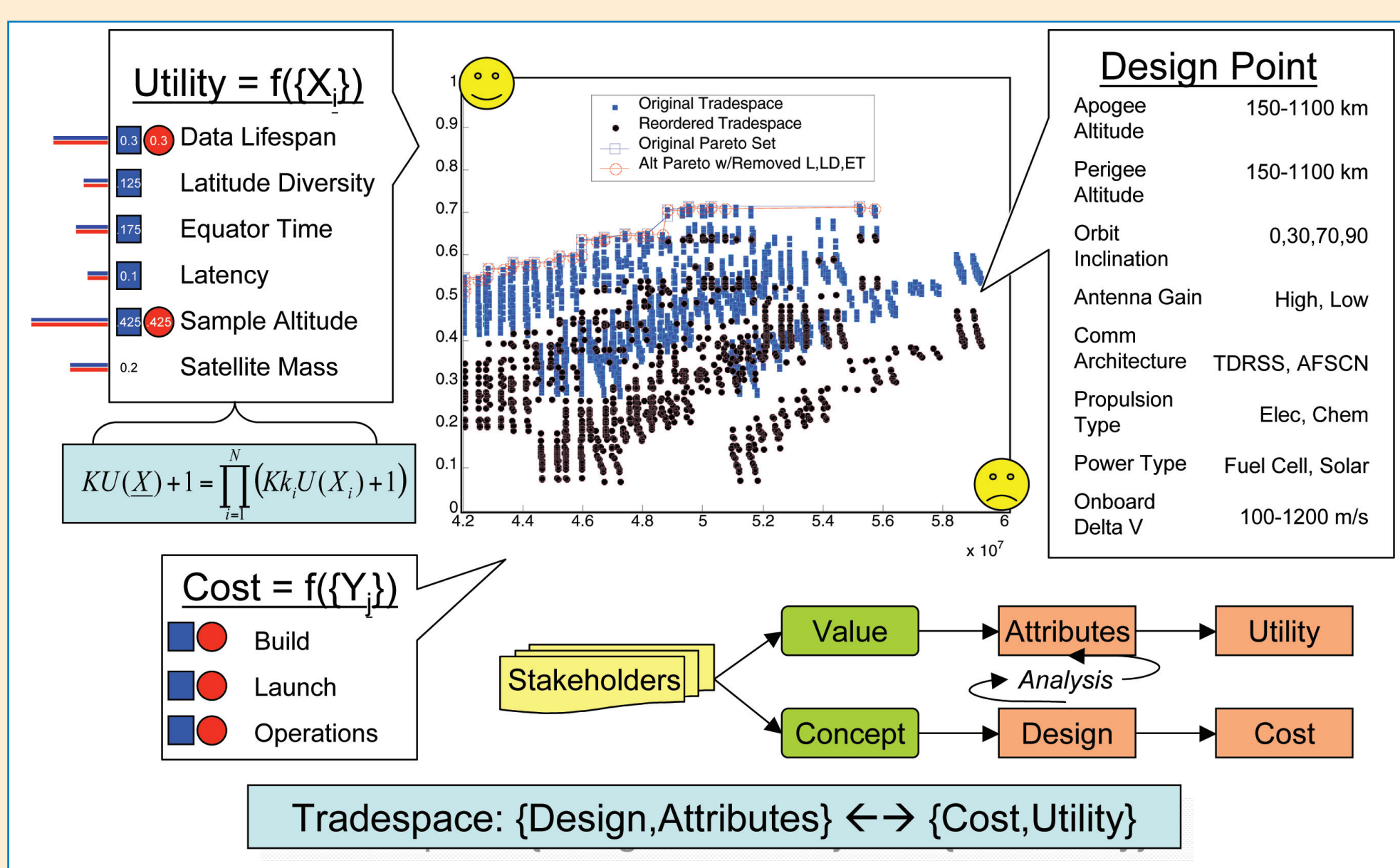
Multi-Attribute Tradespace Exploration



Academic Pursuits

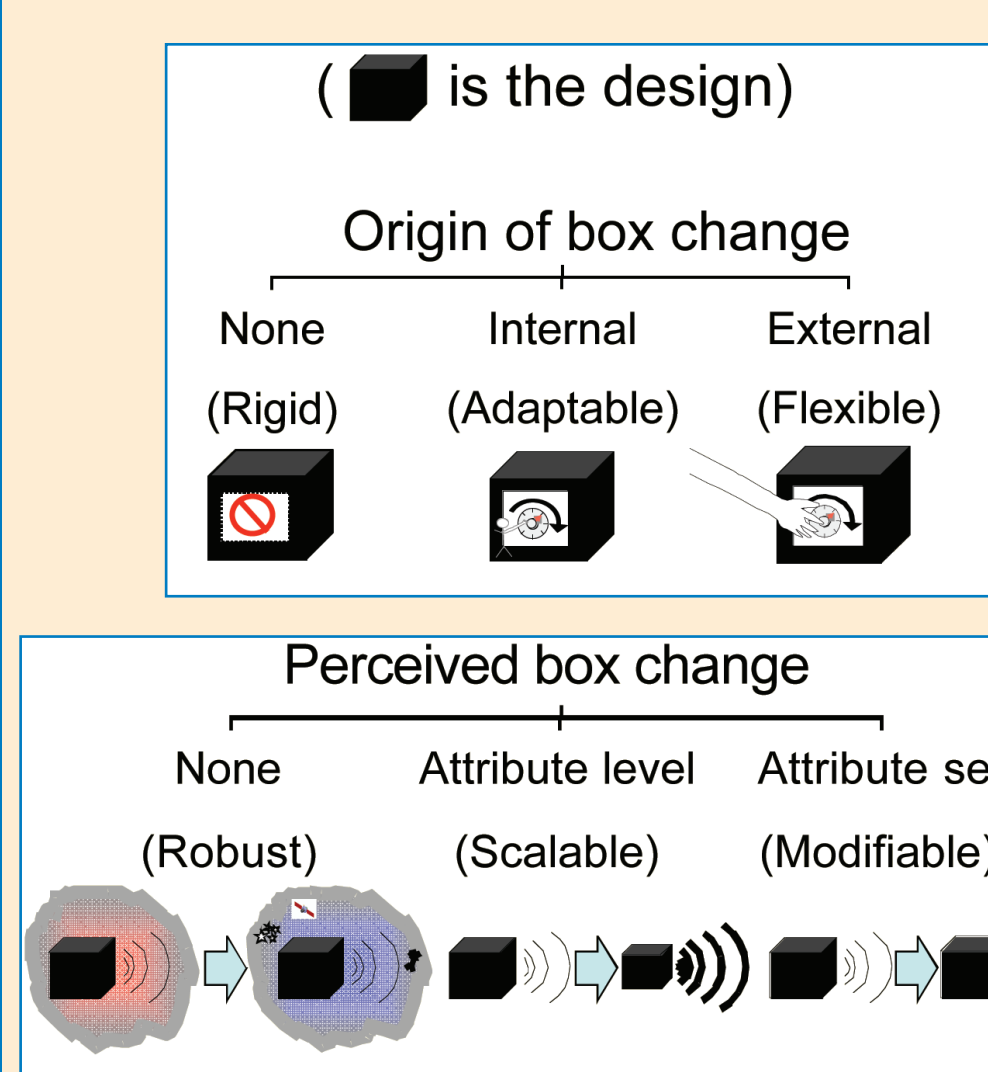
- **Research Questions**
 1. What are the relationships between flexibility, adaptability, robustness, and scalability for space systems?
 2. How can these "ilities" be quantified and/or used as decision metrics when exploring tradespaces and revealing unarticulated value over time?
- **Objective**
 - Extend the Multi-attribute Tradespace Exploration with Concurrent Design process to include consideration of several of the ESD defined "ilities" system properties
- **Anticipated contribution (by end of 2005):**
 - Expanded generalized framework for Multi-Attribute Tradespace Exploration with Concurrent Design (MATE-CON) process
 - Analysis for incorporating and understanding tradeoffs of certain "ilities" in MATE-CON; impact assessment on quality of system design through tradespace perspective

Anatomy of a Tradespace

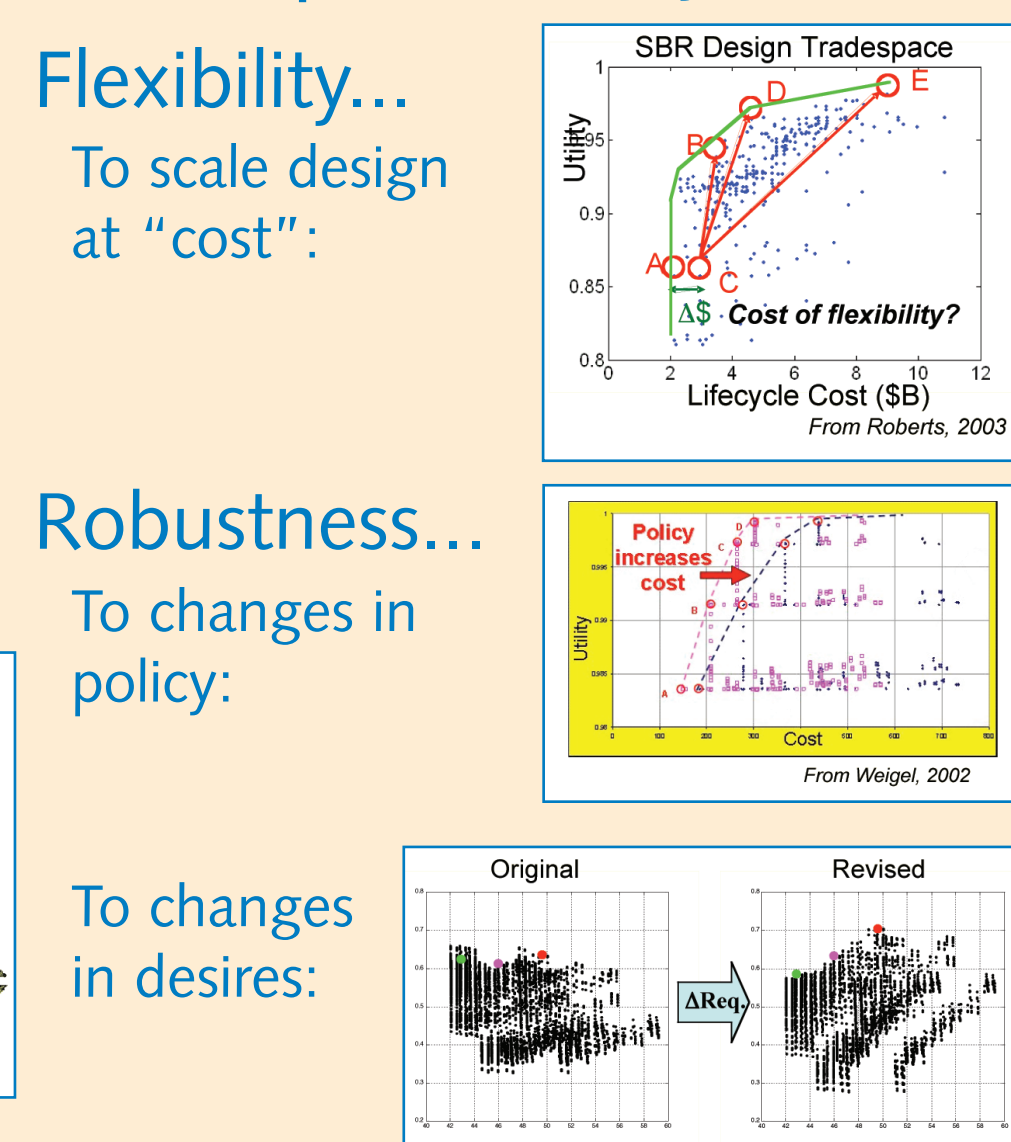


Dynamic Tradespaces

Classifying Change



Tradespace Analysis



Publications

- Ross, Adam M., Nathan P. Diller, Daniel E. Hastings, and Joyce M. Warmkessel. "Multi-Attribute Tradespace Exploration in Space System Design." In *World Space Congress*, 1-14. Houston, TX: IAF, 2002.
- Ross, Adam M., Daniel E. Hastings, and Nathan P. Diller. "Multi-Attribute Tradespace Exploration with Concurrent Design for Space System Conceptual Design." In *Aerospace Sciences Meeting*, 14. Reno, NV: AIAA, January 2003.
- Ross, Adam M. "Multi-Attribute Tradespace Exploration with Concurrent Design as a Value-Centric Framework for Space System Architecture and Design." *Dual-SM*, Massachusetts Institute of Technology, 2003.
- Ross, Adam M., Nathan P. Diller, Daniel E. Hastings, and Joyce M. Warmkessel. "Multi-Attribute Tradespace Exploration with Concurrent Design as a Front-End for Effective Space System Design." *Journal of Spacecraft and Rockets* 41, no. 1 (2004): 20-28.
- Ross, Adam M., and Daniel E. Hastings. "The Tradespace Exploration Paradigm." Paper presented at the INCOSE 2005 International Symposium, Rochester, NY, July 10-15 2005 (Submitted).