



A Framework for Representing and Analyzing Socio-Technical Systems Using Coupled Design Structure Matrices




Jason Bartolomei
Graduation Date: Summer 2007 (expected)
Massachusetts Institute of Technology

Doctoral Thesis Committee:
 Professor Daniel Hastings (Chair)
 Professor Richard de Neufville
 Professor Donna Rhodes

Biography

- > US Air Force acquisitions officer with experience as a systems engineer and an integrated product team lead at the F/A-22 System Program Office at Wright-Patterson Air Force Base in Dayton, Ohio
- > Prior to MIT served as an Assistant Professor of Engineering Mechanics and Director of Systems Engineering at the US Air Force Academy in Colorado Springs, Colorado
- > Academics:
 - BS Mechanical Engineering, Marquette University
 - MS Systems Engineering, Air Force Institute of Technology




Desired Contributions

Theoretical Contributions:


- Develop a framework for describing socio-technical systems that explicitly considers both social and technical details
- Develop methods and tools that allow for the examination of an evolving socio-technical system
- Develop a new methodology for identifying real options in a socio-technical system

Practical Contributions:

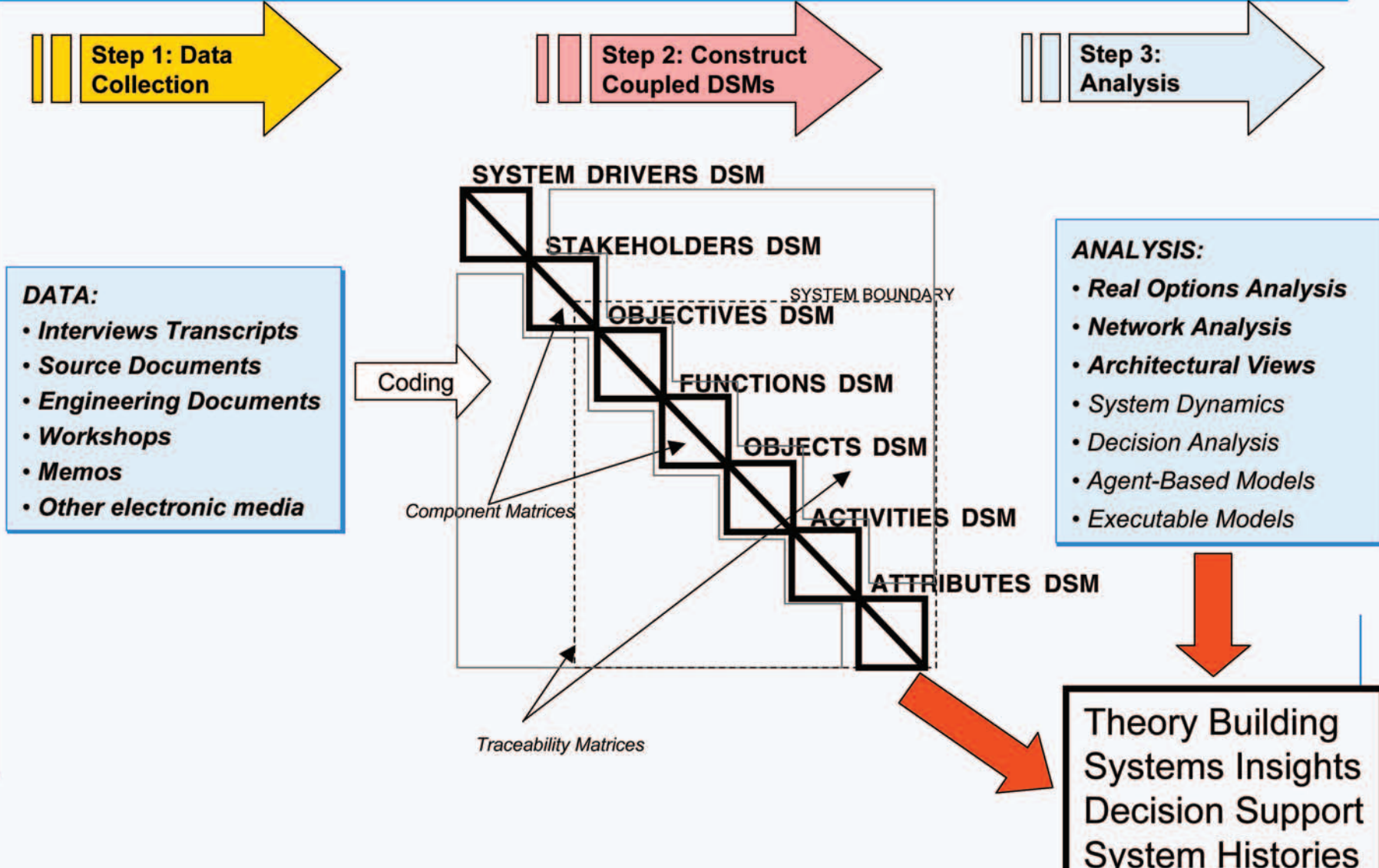
- Demonstrate how to integrate Real Options Theory with SE Methods
- Demonstrate how Real Options Thinking can be applied to weapon system development programs

Methodological Contribution:

- SE-Tailored Grounded Theory approach—demonstrate the advantages of integrating qualitative coding with systems engineering methods

Methodology





DATA:

- Interviews Transcripts
- Source Documents
- Engineering Documents
- Workshops
- Memos
- Other electronic media

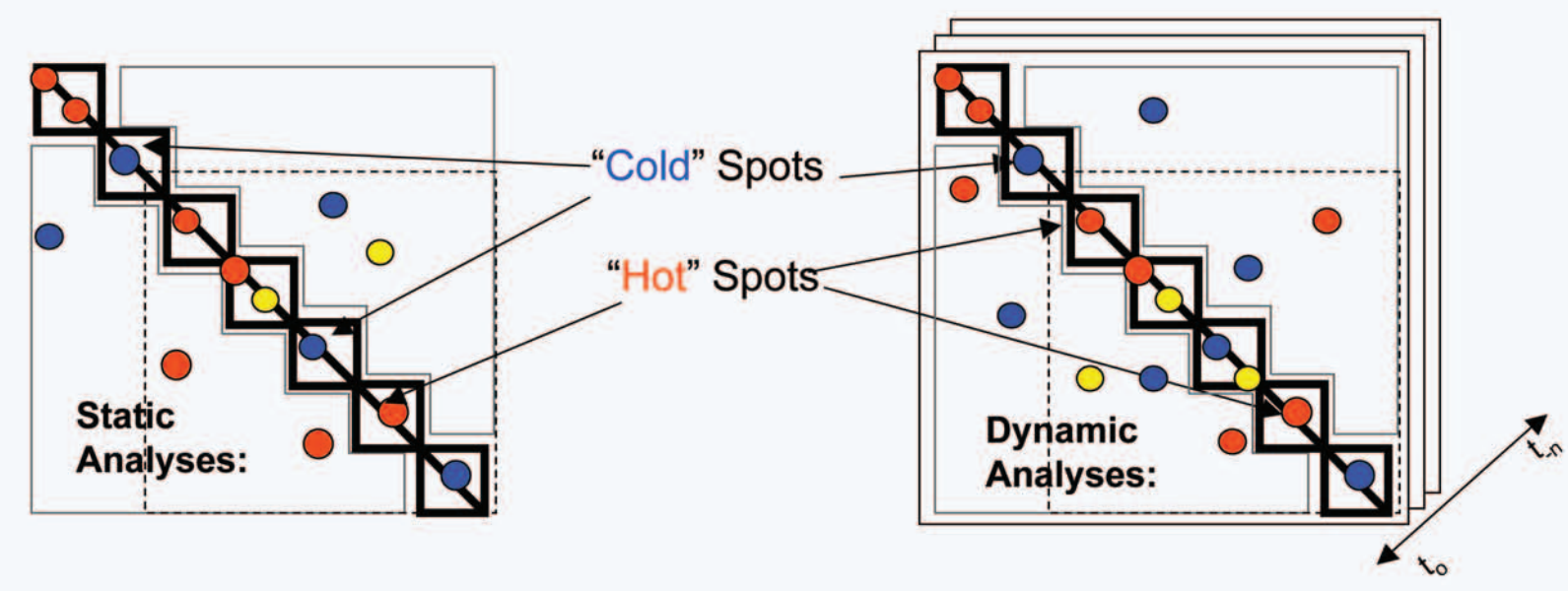
ANALYSIS:

- Real Options Analysis
- Network Analysis
- Architectural Views
- System Dynamics
- Decision Analysis
- Agent-Based Models
- Executable Models

Theory Building
Systems Insights
Decision Support
System Histories





Screening for Real Options: Identifying "Hot" and "Cold" Spots



Identifying Options in a System:

- Entities in an engineering system are "Hot" if future states are likely to change and changes have significant upside or downside consequences
- Entities are "Cold" if they are unlikely to change and/or likely changes have insignificant consequences




Papers and Presentations

Book Chapters:

- Technical Appendix: Modeling Violent Non-State Actors. *Warlord's Rising: Confronting Violent Non-State Actors*, T.S. Thomas, W.D. Casebeer, S.D. Kiser, Lexington Books, 2005
- "Using Systems Engineering Tools to Rethink U.S. Policy on North Korea." *Perspectives on U.S. Policy Toward North Korea: Stalemate or Checkmate?*, edited by Sharon Richardson, Lexington Books, 2006

Publications:

- Bartolomei, J.E., D.E. Hastings, R. de Neufville, D. Rhodes, "Screening for Real Options in" Engineering Systems: A Step Towards Flexible Systems Development," 16th Annual International Symposium of the International Council on Systems Engineering (INCOSE), Orlando FL, July 2006
- Bartolomei, J.E., "Complex Systems Engineering and Acquisitions: Coping with Dynamic Stakeholder Utility," Proceedings CSER 2005, Hoboken NJ, March 23-25.
- Bartolomei, J.E., Casebeer, W.D., Thomas, T., "Modeling Violent Non-State Actors: A Summary of Concepts and Methods," Institute for Information Technology Applications (IITA) Technical Report, Colorado Springs CO, November 2004.
- Bartolomei, J.E., Casebeer, W.D., "Using Systems Engineering and System Dynamics to Model a Terrorist Organization," Proceedings 72nd MORS Symposium, NPGS, Monterey, CA, 22 - 24 June 2004.
- Bartolomei, J.E.; Barlow, D.N., CadetSIM: A System Dynamic Simulation of Cadet Life at the United States Air Force Academy, Proceedings 2004 ASEE Annual Conference & Exposition: Engineering Education Reaches New Heights, Salt Lake City, UT, USA; 20-23 June 2004.
- Scott, B. and Bartolomei, J.E., "U.S. Air Force Academy Launches New Majors: Systems Engineering and Systems Engineering Management," Program Manager, September-December 2003.

