

Tradeoff Studies and the Biases that Plague Them

Tutorial for the Enchantment Chapter of INCOSE

A Half-Day Tutorial with UTEP professor Eric D. Smith

Friday, 30 October 2009, 12:30 p.m. - 5:00 p.m.

Marriott Pyramid North, Albuquerque, NM

NOTE: Registration includes printed slides, references, and links for downloading electronic versions.

Registration starts at Noon.

Afternoon refreshments will be provided as a part of your registration!

Abstract



Tradeoff studies are broadly recognized and mandated as the method for simultaneously considering multiple alternatives with many criteria, and as such are recommended in the Capability Maturity Model Integration (CMMI) Decision Analysis and Resolution (DAR) process. Tradeoff studies, which involve human numerical judgment, calibration and data updating, are often approached with a lack of confidence by analysts and are often distrusted by decision makers. The decision-making fields of Judgment and Decision Making, Cognitive Science and Experimental Economics have built up a large body of research on human biases and errors in considering numerical and criteria-based choices. Relationships between experiments in these fields and the elements of tradeoff studies show that tradeoff studies are susceptible to human biases.

This tutorial indicates ways to eliminate the presence, or ameliorate the effects of mental mistakes and human biases on tradeoff studies.

Key words: tradeoff studies, cognitive biases, decision analysis, problem statement, evaluation criteria, weights of importance, alternative solutions, evaluation data, scoring functions, scores, combining functions, preferred alternatives, sensitivity analysis.

Intended Audience

You should attend this course if you are: *The course is aimed at:*

- Seeking practical methods to formalize, quantify and justify your choices as a decision maker
- Concerned about the uncertainty in choices, and about technical, cost and schedule impacts on choices
- Decision makers
- Systems engineers,
- Program managers
- Technical team leaders, and
- Others who participate in selecting among

- Seeking practical methods to actually create and use trade studies alternatives.

Topics Covered

- I INTRODUCTION
- II COMPONENTS OF A TRADE STUDY
- III MENTAL MISTAKES THAT CAN AFFECT COMPONENTS OF TRADEOFF STUDIES, AND RECOMMENDATIONS FOR AMELIORATING THE MISTAKE
 - 3.0 OBJECTIVITY AND SUBJECTIVITY: Prospect Theory
 - 3.1 Problem Statement Mistakes
 - 3.2 Evaluation Criteria Mistakes
 - 3.3 Weight of Importance Mistakes
 - 3.4 Alternative Solution Mistakes
 - 3.5 Evaluation Data Mistakes
 - 3.6 Scoring Function Mistakes
 - 3.7 Score Mistakes
 - 3.8 Combining Function Mistakes
 - 3.9 Preferred Alternative Mistakes
 - 3.10 Sensitivity Analysis Mistakes
- IV DISCUSSION
- V CONCLUSION

Tutorial cost includes printed slides, references, and links for downloading electronic versions.

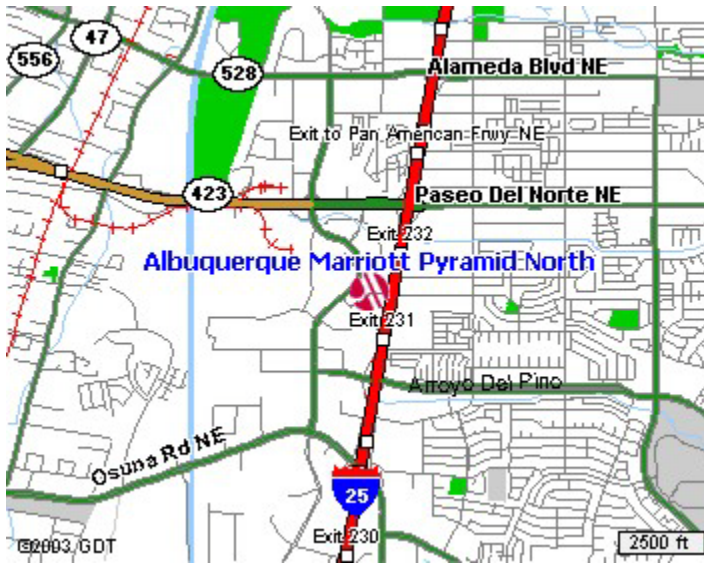
The Presenter

Eric D. Smith is currently an Assistant Professor at the University of Texas at El Paso (UTEP), working within the Industrial Engineering Department and the Systems Engineering Program. He earned a B.S. in Physics in 1994, an M.S. in Systems Engineering in 2003, and his Ph.D. in Systems and Industrial Engineering in 2006 from the University of Arizona in Tucson, AZ. His dissertation research lay at the interface of systems engineering, cognitive science, and multi-criteria decision making. He taught for two years in The Boeing Company's Systems Engineering Graduate Program at the Missouri University of Science & Technology. He has given invited talks at the The Boeing Company, on the topic of risk management, and for a Multiple University Research Initiative (MURI) composed of the Universities of Arizona, Arizona State University, Ohio State University, University of Florida, and the University of Michigan,

on the topic of ameliorating mental mistakes in uncertain and complex environments. Currently, he works with Lockheed Martin Corporation's summer project practicum for systems engineering students. His current research interests include complex systems engineering, risk management, and cognitive biases. He is a member of INCOSE, IIE, INFORMS, ASEE and ASEM.

Download the tutorial [Signup Sheet](#).

Meeting Details



Location: Marriott Albuquerque Pyramid North, 5151 San Francisco Rd NE, Albuquerque, NM 87109, (505)-821-3333, URL: <http://Marriott.com/ABQMC>.

Directions: From Junction of I-40 and I-25 in Albuquerque take I-25 North to exit 232, Paseo Del Norte. Take a left and cross the freeway to the southbound Frontage Road.

Package: The tutorial cost includes notes, and snacks. Acknowledgement of payment receipt will be by e-mail.

Payment: Please submit the [registration form](#) and \$75 (member) or \$100 (non-member) as indicated on the form. Join or renew membership for just \$175, a \$30 saving off purchase of separate items offer good through 11/30. Registration fee can be paid by check or by credit card through PayPal below. Credit card payments must be made through PayPal only. Enchantment Chapter cannot

accept a direct credit card payment.

If paying through PayPal, please either fill out and send the [registration form](#) or email the form to [Rodger Oetzel](#). If the credit card is **not in the participant's name**, please indicate both the name on the credit card and the participant's name.

Register soon as Tutorial registration is filling fast.

[Join INCOSE](#) [Renew Lapsed INCOSE Membership](#)

If you need to renew a lapsed membership and do not know your **membership number**, email the [Membership Chairman](#).

Note: if you are a non-member, and wish to join INCOSE you can:

- join INCOSE via the online link, then sign up as a non-member and be reimbursed \$30 by check when you come to the tutorial; or
- go to the link above, print out and fill in the sign up form bring that with you to the tutorial, and pay the \$175 using the drop down box below or bring a check for \$175 to the tutorial.

Two ways to sign up for the Tutorial:

- Download the tutorial [Signup sheet](#) and mail with check to the indicated address, OR
- Pay online and email the [Signup sheet](#) to [Rodger Oetzel](#):