

How to Validate Your Models and Simulations

The purpose of this one and a half day seminar is to present a comprehensive discussion of **practical techniques** for validating your models and simulations. All techniques will be illustrated by one or more examples based on actual simulation projects. **At the end of the seminar, each attendee will be familiar with “the” twelve fundamental validation techniques and know how to apply them to their models and simulations.** The development of this seminar has benefited from contracts with the Defense Modeling and Simulation Office (now the Modeling and Simulation Coordination Office) and the Office of Naval Research.

A particular highlight of this seminar is the discussion and illustration of an **assumptions document**, which is a detailed report delineating all model concepts, assumptions, algorithms, and data summaries. It serves as the main vehicle for communications among the project team, and it is a “blueprint” for creating the simulation computer program. It should not be confused with a conceptual model, which can be thought of as initial ideas on what a model will look like. Dr. Averill M. Law, the course instructor, has been intimately involved in the problem formulation, validation, and analysis of approximately 40 simulation models.

He has been a validation consultant to organizations such as Booz Allen and Hamilton, ITT, Stanley Tools, U.S. Air Force, U.S. Army, U.S. Marine Corps, and U.S. Navy.

Versions of this seminar have been presented to Boeing, Lockheed Martin, NSA, Raytheon, Sasol Technology (South Africa), U.S. Army, U.S. Navy, and International Council on Systems Engineering (INCOSE).

What You Will Learn:

- 1. Seven Important Steps in a Sound Study**
- 2. Formulating the Problem Precisely**
- 3. Talking to Appropriate Subject-Matter Experts (SMEs)**
- 4. Interacting with the Decision-Maker on a Regular Basis**
 - Helps insure that the correct problem is being addressed
 - Enhances the credibility of the simulation model
- 5. Using Quantitative Techniques to Validate Components of the Model**
- 6. Developing a Written Assumptions Document**
 - Purpose, components, and format
 - Detailed example
- 7. Performing a Structured Walk-Through of the Assumptions Document**
 - Format and important benefits
 - Required attendees
- 8. Using Sensitivity Analysis to Determine Important Model Factors**
 - The critical danger of varying one factor at a time
 - Introduction to the proper design of experiments

9. Results Validation

- Comparison of model output data with the comparable output data from a similar *existing system* using numerical statistics and graphical plots
- Use of a Turing test
- Evaluation of model output by SMEs
- Comparison of model output data with the comparable output data from *another model* that is thought to be “valid”
- Use of confidence intervals and hypothesis tests to make comparisons

10. Using Animation to Show that a Model is not Valid and to Enhance Credibility

11. Guidelines for Obtaining Good Model Data

- Two fundamental principles
- Common problems with data

12. Additional Topics

- Model calibration and how it differs from validation
- Independent model validation

13. 6 Critical Pitfalls and How to Avoid Them

Averill M. Law & Associates
4729 East Sunrise Drive, #462
Tucson, AZ 85718
520-795-6265
Fax: 520-795-6302
averill@simulation.ws
www.averill-law.com