

REPORTS OF  
SCS TECHNICAL COMMITTEES

# Terminology for model credibility

*The standard set of terminology herein described was compiled by the SCS Technical Committee on Model Credibility as a report to the general membership.*

MEMBERS OF THE SCS  
TECHNICAL COMMITTEE ON MODEL CREDIBILITY

Dr. Stewart Schlesinger, Chairman  
The Aerospace Corporation  
2350 E. El Segundo Boulevard  
El Segundo, California 90245

Dr. Roy E. Crosbie  
Department of Electrical Engineering  
University of Salford  
Salford M5 4WT, England

Dr. Roland E. Gagné  
Analysis Laboratory  
Division of Mechanical Engineering  
Ottawa, Ontario K1A 0R6, Canada

Dr. George S. Innis  
College of Natural Resources  
Utah State University  
Logan, Utah 84322

Dr. C.S. Lalwani  
Maritime Studies  
University of Wales  
Institute of Science and Technology  
Cardiff CFI 2NU, United Kingdom

Dr. Joseph Loch  
USAF Human Resources Lab  
AFHRL/ASM  
Wright Patterson Air Force Base, Ohio 45433

Dr. Richard J. Sylvester  
ASD/EN  
Wright Patterson Air Force Base, Ohio 45433

Dr. Richard D. Wright  
National Defense University/DMNSA  
Ft. McNair  
Washington, D.C. 20319

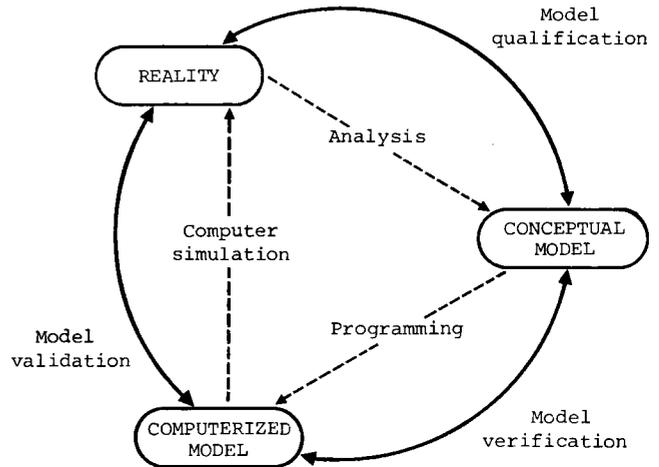
Dr. Naim Kheir  
University of Alabama  
P.O. Box 1247  
Huntsville, Alabama 35807

Dale Bartos  
U.S. Department of Agriculture  
Forest Service  
Forestry Sciences Laboratory  
860 North 12th Street  
Logan, Utah 84321

## INTRODUCTION

Since the cornerstone for establishing the credibility of a computer simulation is effective communication between the builder of a simulation model and its potential user, the SCS Technical Committee on Model Credibility has developed a standard set of terminology to facilitate such communication.

To provide a proper framework to review the credibility of a simulation, it is convenient to divide the simulation environment into three basic elements as depicted in the following figure. The inner arrows describe the processes which relate the elements to each other, and the outer arrows refer to the procedures which evaluate the credibility of these processes.



Each of the basic elements and their interrelationships are dealt with in the following set of definitions.

## DESCRIPTION OF TERMINOLOGY

REALITY	An entity, situation, or system which has been selected for analysis
CONCEPTUAL MODEL	Verbal description, equations, governing relationships, or "natural laws" that purport to describe REALITY
DOMAIN OF INTENDED APPLICATION (OF CONCEPTUAL MODEL)	Prescribed conditions for which the CONCEPTUAL MODEL is intended to match REALITY
LEVEL OF AGREEMENT (OF CONCEPTUAL MODEL)	Expected agreement between the CONCEPTUAL MODEL and REALITY, consistent with the DOMAIN OF INTENDED APPLICATION and the purpose for which the model was built
MODEL QUALIFICATION	Determination of adequacy of the CONCEPTUAL MODEL to provide an acceptable LEVEL OF AGREEMENT for the DOMAIN OF INTENDED APPLICATION
COMPUTERIZED MODEL	An operational computer program which implements a CONCEPTUAL MODEL

MODEL VERIFICATION            Substantiation that a COMPUTERIZED MODEL represents a CONCEPTUAL MODEL within specified limits of accuracy

DOMAIN OF APPLICABILITY (OF COMPUTERIZED MODEL)    Prescribed conditions for which the COMPUTERIZED MODEL has been tested, compared against REALITY to the extent possible, and judged suitable for use (by MODEL VALIDATION, as described below)

RANGE OF ACCURACY (OF COMPUTERIZED MODEL)    Demonstrated agreement between the COMPUTERIZED MODEL and REALITY within a stipulated DOMAIN OF APPLICABILITY

MODEL VALIDATION            Substantiation that a COMPUTERIZED MODEL within its DOMAIN OF APPLICABILITY possesses a satisfactory RANGE OF ACCURACY consistent with the intended application of the model

CERTIFICATION DOCUMENTATION    Documentation to communicate information concerning a model's credibility and applicability, containing, as a minimum, the following basic elements:

- (1) Statement of purpose for which the model has been built
- (2) Verbal and/or analytical description of the CONCEPTUAL MODEL and COMPUTERIZED MODEL
- (3) Specification of the DOMAIN OF APPLICABILITY and RANGE OF ACCURACY related to the purpose for which the model is intended
- (4) Description of tests used for MODEL VERIFICATION and MODEL VALIDATION and a discussion of their adequacy

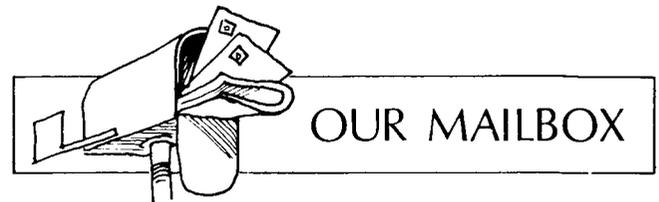
MODEL CERTIFICATION            Acceptance by the model user of the CERTIFICATION DOCUMENTATION as adequate evidence that the COMPUTERIZED MODEL can be effectively utilized for a *specific* application

COMPUTER SIMULATION            Exercise of a tested and *certified* COMPUTERIZED MODEL to gain insight about REALITY

RECOMMENDATION

This terminology was developed by the committee, which is composed of members from diverse disciplines and backgrounds, with the intent that it could be employed in all types of simulation applications. Great care was taken to develop definitions which would be equally applicable to simulations of physical

systems (embodying readily measurable phenomena) and social and biological systems (for which data may be ill-defined). Adherence to this terminology, and the discipline implied therein, will greatly facilitate communication between various simulation developers as well as between developers and users. Therefore, the committee recommends that each member use this terminology in all documentation and publications which pertain to the credibility of simulations.



Romeo R. Favreau  
Director of Publications

Dear Mr. Favreau:

The five-year cumulative index in the December issue of *Simulation* is a great help indeed. In particular, its emphasis of general topics brings forth a good overview of the many contributions that simulation is making today.

George D. Meier  
Health Sciences Center  
School of Medicine  
Temple University  
Philadelphia, Pennsylvania 19140



SIMULATION COUNCILS PROCEEDINGS SERIES  
*Numerical Integration Methods in Simulation*

Contributions are invited for the above forthcoming issue in the *Simulation Councils Proceedings* series. Papers on new methods and on improvements to established methods will be welcome, but particular emphasis will be placed on descriptions of practical experience with established methods in simulation applicators, and on comparisons between methods.

Contributions are solicited on comparisons between methods—benchmarks, practical hints for improving performance, methods for stiff systems, methods for partial differential equations, and methods for real-time applications.

It is the aim of this volume to provide not a textbook on numerical analysis but rather a working guide reflecting the accumulated experience of its contributors which will be of practical use to simulation workers.

Please send contributions to Dr. Roy E. Crosbie, Department of Electrical Engineering, University of Salford, Salford M5 4WT, England.