

Modeling and Simulation Body of Knowledge (M&S BoK) - Index

updated and © by: Dr. [Tuncer Ören](#) - 2010-12-16

Modeling and Simulation: Definitions

1. Definitions of "simulation" [on the Internet](#)

2. M&S Definitions - from Defense-related Sources

Modeling and Simulation (M&S):

"The use of models and simulations, either statistically or over time, to develop data as a basis for making managerial or technical decisions. This includes, but is not limited to, emulators, prototypes, simulators, and stimulators." DOD M&S VV&A, DoDI

Modeling and Simulation (M&S)

The use of models, including emulators, prototypes, simulators, and stimulators, either statically or over time, to develop data as a basis for making managerial or technical decisions. The terms "modeling" and "simulation" are often used interchangeably. DMSO M&S Glossary

Simulation:

"A simulation is a method for implementing a model. It is the process of conducting experiments with a model for the purpose of understanding the behavior of the system modeled under selected conditions or of evaluating various strategies for the operation of the system within the limits imposed by developmental or operational criteria. Simulation may include the use of analog or digital devices, laboratory models, or 'testbed' sites. Simulations are usually programmed for solution on a computer; however, in the broadest sense, military exercises, and wargames are also simulations." [DAU](#)

Simulation:

"A method for implementing a model over time. Also a technique for testing, analysis, or training in which real-world systems are used, or where real-world and conceptual systems are reproduced by a model (reference b: 'DoD modeling and Simulation (M&S) Management,' January 4, 1994) [DOD M&S VV&A](#)

Simulation:

"the exercising of a model over time. A simulation may be:

- 'live' - exercising real people and/or real equipments in the real world (e.g. a live trial or exercise)
- 'virtual' - exercising real people and virtual people/equipments, possibly in a virtual world
- 'constructive' - exercising virtual people and/or equipments, usually in a virtual world."

[UK-SEMS](#)

Simulation:

"A method for the implementation of a model over time. (DoD 5000.59-M)" [DoD A M&S MP](#)

Simulation:

"A simulation is the implementation of a model over time. Human-in-the-loop (HITL) simulations are commonly referred to as "simulators" [DND/CF](#)

Simulation:

"The execution over time of models representing the attributes of one or more entities or processes. Human-in-the-Loop simulations, also known as simulators, are a special class of simulations." [NATO M&S Master Plan version 1.0 1998, August 7](#)

3. M&S Definitions - from Civilian Sources

- **An early compilation** of definitions of simulation was done by Pritsker: Pritsker, A.A.B. (1979). Compilation of Definitions of Simulation. Simulation, 33: 2 (Aug. 1979), 61-63.
- From a systemic point of view simulation can be used to find the values of output, input, or state variables of a system; provided that the values of the two other types of variables are known."

4. Some Suggested Definitions of Simulation

Experience aspect of simulation

- **Definition:** Simulation is use of a representation (a model) of reality to provide experience under controlled conditions (1) for training to gain/enhance three types of skills; or (2) for entertainment.
- **Aim:**
 - Simulation is used to enhance
 - (1) motor skills (virtual simulation),
 - (2) decision making and/or communications skills (constructive simulation, serious games, gaming simulation), and
 - (3) operational skills by getting real-life-like experience in a controlled environment (live simulation).
 - Simulation is used for entertainment (simulation games)
- **Application categories:** Simulation is used for training, education, and entertainment.

Experiment aspect of simulation

- **Definition:** Simulation is goal-directed experimentation with dynamic models.
- **Application categories:** Simulation is used for understanding, decision support, and education.

A comprehensive perception of simulation

- Simulation offers a very rich paradigm to perform experiments with dynamic models and to provide experience either for entertainment or for training to develop/enhance three types of skill, i.e., motor skills, decision-making skills, or operational skills. For the last three categories, associated three types of simulation are virtual, constructive and live simulations, respectively.

Model-oriented activity perception of simulation provides several additional practical and methodological benefits.