Chapter 17
Applying the Certification’s Standards to the Simulation Study Steps

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ABSTRACT
This chapter presents the certification standards applied with the simulation study steps, in addition to the Confidence Grid which is used to assets the quality (Reliability and Accuracy) of the data and the process of the simulation study step which will be the base for the validation and verification.

INTRODUCTION
Simulation certification is one of the most important tasks that should be applied to ensure the simulation Model’s credibility. The Certification process is used to ensure the target behavior and the expected characteristics of the simulation Model (SM) are achieved. It should be integrated within the development process of the SM to make sure that the entities of each process are certificate and fulfills the expected target. The process entities include Input Data, Process and Output Data, in addition to the over all certification for the system as a whole.

The certification has been defined by the International Organization for Standardization (ISO) as follows (Balci and Saadi 2002):

Certification is a procedure by which a third party gives written assurance that a product, process, or service conforms to specified characteristics.

On the other hand, according to wikipedia-1 (2009)

Certification refers to the confirmation of certain characteristics of an object, person, or organization. This confirmation is often, but not always provided by some form of external review, education, or assessment.
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This definition in general can be applied anywhere to check if the product quality satisfies the requested, expected and the unexpected requirements, characteristics and behavior. Certification should be applied to all the steps; which means that a concurrent process should be run during the development of the SM steps which includes Verification and Validation V&V to make sure the product quality possesses the desired set of characteristics. In this chapter we will present the applying of the certification standards to the simulation study steps in addition to the confidence Grid as a technique to assess the quality of the processes and data based on its reliability and accuracy.

BACKGROUND

What is the Simulation?

According to Pidd (2004) simulation’s definition is the development of a model which is:

an unambiguous statement of the way in which the various components of the system interact to produce the behavior of the system. Once the model has been translated into a computer program the high speed of the computer allows a simulation of, say, six months in a few moments. The simulation could also be repeated with various factors at different levels.

Chung (2004) defined the simulation as:

the process of creating and experimenting with a computerized mathematical model of a physical system.

On the other hand, Abu-Taieh (2004) has quoted El Sheikh Simulation definition as:

Simulation is the use of a model to represent over time essential characteristics of a system under study.

which is the most comprehensive and complete definition.

Why Do We Need the Simulation?

Instead of using direct experiments using real model, we can use the simulation model for the following reasons:

• Cost: real experiments might be expensive; such as materials and construction time.
• Time: using simulation we can simulate days, weeks, months, or even years in few seconds which is not available in the direct experimentation.
• Replication (Re-Runs): using the simulation model we can repeat the experiment with different scenarios which allow testing all the aspects that might affect the behavior of the system.
• Safety and legality: according to Pidd (2004), he claimed that “one of the objectives of simulation study may estimate the effect of extreme condition, and to do this in real life may be dangerous or even illegal.”

On the other hand, the mathematical models will not represent the dynamic effects and the behavior of the system. Due to that the simulation model will be the best choice because it provides a study of all dynamic effects during the operation instead of values and averages in the mathematical models. Furthermore, as Pidd (2004) claimed:

Is it possible to sample from non-standard probability distributions in a simulation model. However, queuing theory models permit only certain distributions and therefore cannot cope with many types of problems.