Simulation Modeling

Name

Institutional Affiliation

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The term modeling refers to the process of developing models. In this case, the term model refers to digital representations of the dynamics of a particular system of interest. Typically a model is designed in such a way that it is similar but simpler than the system it represents. Models assist analysts in predicting the performance or analyzing how a certain change would impact the physical system. In modeling, one of the essential aspects is validity. Validity refers to how accurately the model predicts the actual system (Anu, 1997). Validating a model entails running it under known inputs and comparing the output of the model to that of the actual system. The process of simulation modeling involves the development of digital models of real physical systems to enable designers to predict their performance or the impact of changes on their performance (Anu, 1997).

Simulation modeling is applied during the development of new systems or making alterations to already existing systems. Through simulation modeling, designers can minimize the risk of failing to meet expectations, avoid unforeseen challenges, ensure optimum utilization of resources and save cost by reducing the number of physical prototypes developed before coming up with the final system. For example, if a company decides to develop a new communication network to link up the various departments, it can use simulation modeling to determine on the best design and to figure out how specific variations may affect the network. Through such a simulation, the company will save the amount of time and cash spent in developing a system and later making modifications after the network has already been set up.

There are several steps that companies should follow in the development of a simulation model. The first step involves identifying the problem. Problem identification entails recognizing the required amendments in an existing system or coming up with the requirements for a proposed system. The next step involves formulating the problem. Problem formulation entails developing objectives and coming up with a list of specific issues that need to be addressed by the model to be developed. The third step requires the collection of necessary data that will assist in the development and validation of the model. After data collection, the required model should be formulated and developed (Birta & Arbez, 2007). The formulation and development of a simulation model involve the use of an appropriate simulation modeling computer software. Some of the available simulation software include COMSOL, Autodesk, and Matlab among others.

After the model has been developed, the next step is to validate it. Model validation requires the established model to be tested by running it under known conditions from the actual system. If the model produces the same output as the real system using the same input, then it is a valid model. After testing the validity, the steps that follow are documenting the developed model; selecting an appropriate experimental design to test the model; establishing the different conditions to conduct the various experimental runs; performing the runs, interpreting the results; and finally, making the appropriate recommendations (Birta & Arbez, 2007).

Simulation modeling and analysis is applicable in different situations. To begin with, some occurrences or processes are too expensive to observe in real life. Such cases require modeling to be applied. For example, companies can use simulation modeling to examine the impact of internet advertising on their sales volume. Simulation modeling can also be used to find solutions to problems in which mathematical models are more comfortable to develop as opposed to analytical solutions this include stock market systems and models that involve massive queues.

The selection of appropriate simulation software is also an essential aspect of simulation modeling. The right simulation software makes a difference between a valid and an invalid model. With the right software, companies can develop models that can solve their operations problems. According to analysts, simulation modeling is currently one of the most applied techniques for operations research by corporations (Panneerselvam, 2013). Some of the known benefits of simulation modeling include the provision of an improved understanding of systems through developing their simplified models; simulation modeling also enables companies to build and test a performance-based hypothesis about their methods and test the feasibility of changes in operations or systems (Panneerselvam, 2013).

Moreover, simulation modeling also enables companies to explore various unknown conditions or situations with only a little information and identify possible challenges and solutions before undertaking particular interventions. Through simulation modeling, companies can also save the time and costs associated with the development or improvement of a system. Despite the numerous advantages, simulation modeling can be a complicated and time-consuming exercise.

To enjoy the benefits of simulation modeling, companies should ensure that they avoid developing unclear or unrealistic objectives, developing too simple or too complex simulation models, erroneous assumptions in developing the model, utilizing the wrong performance measures and using the wrong computer software for simulation (Singh, 1996). Evidently, simulation modeling is crucial for companies. However, to enjoy the benefits, companies should ensure that they follow all the steps and guidelines involved in simulation modeling.

References

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