



## **Chapter XIV**

# **Simulation in IS Research: Technique Underrepresented in the Field**

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## **ABSTRACT**

*Simulation has been a fundamental research approach in the social and physical sciences. Through the modeling, experimentation, and analysis processes of simulation, the functional dependencies in systems can be probed statistically. The approach has enabled social and physical science researchers to examine dynamically complex systems. Even though information systems (IS) can fall into both of categories of social or physical systems—depending upon the aspect of the system being analyzed – IS researchers have not embraced the paradigm. The reasons for simulation not being more common in IS research can be attributed to four points: the structure of IS curriculums, the level of modeling sophistication driving the research, the separation of the field's IS developments from the physical reality of the usage of the systems, and the level of maturity with the field. The chapter presents the basic concepts for the construction and use of simulation, the need and potential for simulation in IS research, the reasons why IS research has not utilized simulation, and the way IS research can embrace simulation in the future.*

# INTRODUCTION

Simulation has become a standard research technique of the natural sciences, social sciences, and engineering disciplines. The paradigm of simulation provides an accepted mode of development, validation, and verification by which complex, highly dynamic interactions can be probed and analyzed. The approach enables researchers to phrase experiments in a controlled environment where the concepts, variables, and relationships of the domain can be manipulated. Unfortunately, to date, simulation has not become a general paradigm in IS research even though many problems can be viewed from a simulation perspective. The following example shows how simulation can be applied to an IS research problem.

Consider the problem of determining the appropriate sourcing policies for software project development. The analysts for a global manufacturing and software development corporation wish to examine the correct mix of domestic and offshore developers over the different components of an application's development. Numerous connections relate sourcing, contracts, distribution, and costs to quality, security, and acceptance. If the question were viewed from an operations management perspective, then an optimization problem may be feasible. However, the aspects of quality, security, and acceptance push this question into the realm of IS research and often out of the realm of optimization solutions. In such a situation, simulation offers another formal framework for examining the behavior of complex, dynamic systems.

In order to insure validity, the examination of quality, security, and acceptance from a simulation perspective requires a standard framework. For instance, analysts need to know the characteristics of the past and current development project, of their sourcing pools, of their contract options, and of their development processes. Relationships are expressed, connecting the current task to historical characteristics. The analysts build these relationships into the simulation model using them to investigate a variety of system-specific questions as they relate to the statistically parameterized simulation.

By defining and employing the experimental framework that is simulation, researchers can benefit in a variety of ways. First, in order to construct a simulation, the underlying system and its relationships need to be understood and characterized. The researcher benefits by formalizing the phenomena of the system into the structure of a simulation, thus formalizing the underlying assumptions of the system. Next, the development of the simulation requires a statement about inputs and outputs. The researcher benefits by acknowledging the observable and manipulable aspects of the systems in question. Third, a developed simulation provides an ongoing, readily accessible platform for a variety of interaction questions. The researcher benefits by gaining a validated model through which current and future hypotheses can be examined. Overall, the researcher is able to apply the scientific method to highly complex and dynamic systems which may not offer themselves to normal modes of controlled experimentation.

IS research has not taken advantage of simulation to examine complex situations as other domains have. A variety of reasons exist for the limited use of simulation in IS research.

- The field is relatively young compared to the other domains using simulation. As such, IS researchers have not had simulation presented to them as a potential technique.

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