Chapter VI

Instrument Validation for Strategic Business Simulation

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Abstract

This paper aims to provide a synopsis on the design science of agent-based modeling and how to adapt an agent-based research strategy for the scientific study of complex business systems. Research in information systems (IS) has begun to advance knowledge in the use of agent-based systems as a means to seek different computational explanations for business phenomena that have eluded scientific inquiry reliant on traditional, specifically, law and axiomatic explanation (Kimbrough, 2003). The focus on business problems requires a different research approach than what is successful in computer science. One key modification is to make instrument validation explicit. This chapter extends a discussion of emerging insights on the subject to ensure the rigor of management science research in agent-based IS (Schlueter Langdon, 2005a).
Foundation in Economics

The design science paradigm is foundational to the information systems (IS) discipline. It “seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artifacts” (Hevner, March, Park, & Ram, 2004, p. 75). This includes research on agent-based IS. Work on intelligent agents has been explicitly identified as “a way to deal with the staggering variety and volume of data in distributed and heterogeneous environments” (March, Hevner, & Ram, 2000, p. 334). In today’s world of instant, anytime, anywhere communications everything appears to be connected with everything else. Innovation in information technology appears to be constantly connecting stand-alone objects into distributed systems or business ecosystems. While the Internet has improved interconnectivity globally in the 1990s, Web-services computing has begun to improve interoperability between spatially and functionally disparate elements. As one consequence, decision-making in business has become more complicated. Specifically, today’s connectedness has made recognition of interaction effects or feedback loops a crucial requirement in business planning. Often, business strategies that make perfect sense at the company or individual level can aggregate up to industry-level conditions, which can have the adverse effect and for all incumbents. A primitive but instructional example is ad spending: Companies often increase advertising activities and expenditures to boost sales to create a profit. However, if all competitors do the same, the strategy will fail. Instead of higher profits, the outcome will likely be higher cost and lower margins for everyone.

Agent-based research strategies have been identified as particularly suitable for the study of distributed systems and services (e.g., Sikora & Shaw, 1998). Despite its innovativeness, the core underpinnings of agent-based information systems (ABIS), including computational simulation, are from the same traditional disciplines that undergird work in so many other management-science areas. One of the best-hidden secrets in ABIS is that much of its foundation is based on theory and Nobel-prize winning work in economics. From the conceptualization of an “agent” to laboratory experiments and even computational simulation, all correspond with theory and work in economics.

Agent Metaphor

The “agent” metaphor used to anchor ABIS research is compliant with linguistics and rooted in economics. The Merriam-Webster Collegiate Dictionary defines “agent” as “one that acts or exerts power; something that produces or is capable of producing an effect; a means or instrument by which a guiding intelligence achieves a result.” Holland (1995), an artificial intelligence scholar and pioneer of genetic algorithms and complex adaptive systems, borrowed the term “agents” from economics “to
Modelling Dimensions for Agent Organizations
www.igi-global.com/chapter/modelling-dimensions-agent-organizations/21094?camid=4v1a