INTRODUCTORY TUTORIAL ON AGENT-BASED MODELING

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ABSTRACT: Agent-based modeling (ABM) and simulation is an approach to modeling systems comprised of autonomous, interacting agents. The need for modeling complex and adaptive systems comprised of populations of natural (people, organizations, communities) and engineered (drones, robotic swarms) entities continues to drive the application of ABM in a variety of application areas, including those where simulation has not been extensively applied. Applications range from modeling agent behavior in supply chains, consumer goods markets, and financial markets, to predicting the spread of epidemics and providing insights on the factors responsible for the growth and fall of ancient civilizations. ABM is having far-reaching effects on the way that governments and businesses use computer models to support decision-making and how researchers use models as in silico electronic laboratories. Some contend that ABM "is a third way of doing science" and could augment traditional discovery methods for knowledge generation. This brief tutorial introduces agent-based modeling by describing key concepts of ABM, discussing some illustrative applications, and addressing toolkits and methods for developing agent-based models. **Keywords:** agent-based model, complex adaptive system, simulation.

By completing this tutorial, participants will be able to:
- Understand agent-based modeling concepts and terminology, and the roots of ABM.
- How to think about, design and build agent-based models, emphasizing their basic, unique structure, independent of implementation platforms.
- Understand the relationship of ABM to other modeling and simulation approaches, such as System Dynamics, discrete-event simulation, and Monte-Carlo simulation.
- Know where to go to begin doing agent-based modeling.

2 OVERVIEW
This is the outline for topics to be covered in the ABM tutorial:

Bio for Charles "Chick" M. Macal

Charles is recognized leader in the field of agent-based modeling and simulation, focusing on the modeling of social and behavioral components of socio-technical systems. In addition to infrastructure, he has developed innovative computer simulation models in the areas of energy, critical materials, environmental sustainability, technology adoption, and infectious diseases. He holds Senior Fellow appointments at the Computation Institute of the University of Chicago and the Northwestern-Argonne Institute for Science and Engineering. Charles received a PhD in Industrial Engineering & Management Sciences from Northwestern University and holds an MS in Industrial Engineering and a BS in Engineering Sciences from Purdue University. He is a registered professional engineer in the State of Illinois and is a senior member of the Association for Computing Machinery (ACM), the Institute of Electrical and Electronics Engineers (IEEE), the Society for Computer Simulation International (SCSI), and the Institute for Operations Research and the Management Sciences (INFORMS). Charles serves on the editorial boards of several computer modeling and simulation publications.