

## Applied Agent-based Modeling in Management Research

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Professional Development Workshop  
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1

8/16/2009

## Schedule

- 8.30 – 8.45 Why build an ABM model? (Mike Prietula)
- 8.45 – 9.30 How to Build an Agent-Based Model I: CA and GA (Bill McKelvey)
- 9.30 – 10.15 How to Build an Agent-Based Model II: NetLogo (Bill Rand)
- 10.15 – 10.30 (break)
- 10.30 – 11.15 How to Build an Agent-Based Model III: Repast Symphony (Eric Tatara & Jonathan Ozik)
- 11.15 – 12.00 How to Validate an Agent-based Model (Kathleen Carley)
- 12.00 – 12.45 Editors' Forum: Publishing Your Research (Phil Anderson, Rich Burton, John Lin)

8/16/2009

2

## Why Model?

- o *Verbal models* are a good first step but must be made more rigorous lest they become simply more "just-so stories." [Germ theory of disease]
- o *Lab-Experimental models* are good at demonstrating and isolating phenomena. [Do they scale up and out?]
- o *Game theoretic models* are mathematically consistent, but may become either intractable or irrelevant, depending on constructs addressed. [Rational herd models assumptions of Bayes]
- o *Computational models* can provide insight into theory construction, hypothesis generation, articulation, testing, and revision.

3

## Computational Models...

- o Focus on organizational phenomena that go together
  - Set of mechanisms operating dynamically
  - Individual and collective behavior over time
  - Address multiple levels of representations

4

● ● ● | Computational Models...

- Focus on organizational phenomena that *go together*
- Focus on *process* as well as *product* of decision making
  - Trace behaviors over time
  - Reductionist type of argument, but indifferent to upward or downward causality
  - Behavior ≠ Performance

5

● ● ● | Computational Models...

- Focus on organizational phenomena that *go together*
- Focus on *process* as well as *product* of decision making
- Enforces a *uniformity* and *formalism* in describing organizational phenomena
  - A uniformalism
  - Is “homunculus resistant”

6

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- **Permits postulated mechanisms to be explicitly *manipulated***

7

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- Focus on *process* as well as *product* of decision making
- Enforces a *uniformity* and *formalism* in describing organizational phenomena
- Permits postulated mechanisms to be explicitly *manipulated*
- **Allows Multi-Level Perspectives (& Theories) to be brought to bear**

8

## Why Agents?

- Population members **cannot be aggregated** into a single state variable
- **Properties of individual members** are constructs of interest
- **Loss of information** can occur by averaging over members (attributes or behaviors)
- **Proximity** matters (physical, logical, ...)
- **Structure** matters (physical, logical, ...)
- **Interaction** matters (physical, logical, ...)
- Matter of perspective, type → **heterogeneity**
- **Properties of the collective** are derivative constructs of interest

9

## What is an agent?

A conceptual entity that has the autonomy, resources, properties, and theoretical standing to *act* in a particular context.



- Communication?
- Mobility?
- Intelligence?
- Physical embodiment?
- A wad of rules?
- Driven by physical laws?
- Can they learn?
- Etc.

10