

Inquiring Beautiful Minds

Presented by Ravi Roy

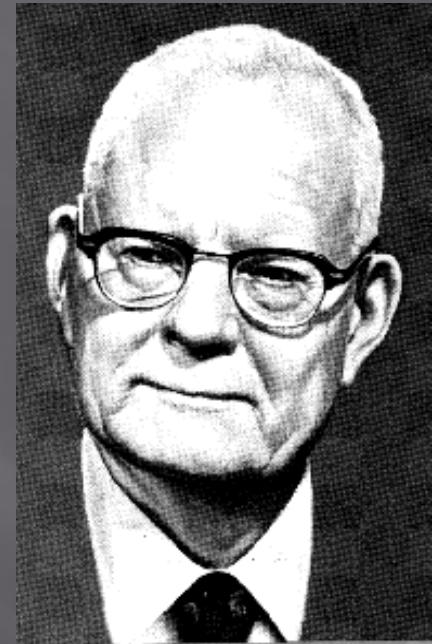
In2:InThinking Network 2014 Forum



John Nash



Doug North



W. Edwards Deming

LEARNING THE GAME: COGNITIVE CONSTRUCTIONS OF MULTIPLE NASH EQUILIBRIA

Arthur T. Denzau

&

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Building Conceptual Bridges Between the *New Economics* (Deming) and the *New Institutional Economics* (North)

- ▣ Systems of Profound Knowledge As A Set of Shared Mental Models:
 - What are mental models

Improving the Formal Models We Use to Analyze and Operate Organizational Environments

- ▣ Traditional game theory often fails to predict the amount of cooperation that actually occurs in the real-world.
- ▣ Why: assumptions built into more rigid notions of positivist rationality

Improving Formal Models

- ▣ We analyze the Nash Equilibrium solution concept to illustrate this point and suggest how using Denzau and North's (1994) concept of learning through mental models may assist us in developing improved rationalist-based game theoretic models for real-world application.

- ▣ **The Unique Nash equilibrium** is the dominant strategy to a non-cooperative game where no single player can improve their own position by playing any other strategy

- ▣ “If playing Nash is not always the best way to play a game when your opponents do not play Nash, what would be?” (Denzau & Roy, 2005)

Traditional Nash and Game Theory

- ▣ Nash solutions revealed through traditional game theory models are often based upon strong assumptions that rational preferences are universally axiomatic and logically predetermined for all actors possessing like material constraints and opportunities. In assuming preferences to be universal for all actors, these models offer an oversimplified portrayal of reality and hence may not be especially useful in helping us study critical issues, problems, and solutions in the real world. This is true for at least three reasons:
 - First, actors who are faced with highly similar material circumstances nonetheless often make very different choices from one another. They seem to do so based upon on their own beliefs as to consequences.
 - Second, cooperation among actors in the real world occurs far more often than traditional game theory models allow us to predict.
 - Third, as stated by Denzau and North (1994: 3), “uncertainty, not risk, characterizes choice-making for most of the interesting outstanding issues in political and economic markets.”

(Denzau & Roy, 2005)

Perth Wool Auctions Experiment (Burns 1985)

- ▣ 7 Experienced Wool Traders (average experience: 35 years)
- ▣ College Students

Three Nash Equilibria

- ▣ We propose refining the Nash equilibrium concept to reflect subjective and inter-subjective interpretations that actors develop through learning about the world in which they are interacting.
- ▣ Instead of a singular concept of Nash Equilibrium, we propose three: Subjective Nash Equilibrium, InterSubjective Nash Equilibrium and Objective Nash Equilibrium (hereafter SNE, ISNE, and ONE, respectively), where ONE is the usual Nash Equilibrium of traditional game theory.

Building Systemic Thinking Involves Building Shared Models

- ▣ Shared Mental Models involve developing shared Interpretations of the way the world works or a given environment is structured
 - (note: this does not imply that there needs to be shared agreement or consensus on the way it should structured)
- ▣ *Two Types of Learning*
- ▣ *Two Means (Epistemologies) of Learning*

Two *Types of Learning*

- ▣ We suggest two *types of learning* in game theory--learning the parameters of a given model, and learning a new model.

Two Means of Learning

- ▣ Training
- ▣ Experiential

Deming's Systems of Profound Knowledge as a set of Shared Mental Models

- ▣ When Our Mental Models Expand From Seeing Our Positions In Terms of Merely Parts to a System, Our NASH Changes

Building Better Models of How Things Works

- ▣ Deming's Ideas In Helping Actors Get from SNE to ISNE
 - Developing Common Interpretations & Aims
 - The independent variables that drives the transition is Type II Learning

Applications: Why Don't Counties Talk

- ▣ Improving systems thinking in the real world involves improving our understanding of how things work.
- ▣ This means improving the tools we use to that world: in this case formal models that better and more accurately reflect that world
- ▣ How can learning assist in this process:
 - ▣ Improving our formal models
 - ▣ Improving organizational capacity