

Chapter 17

Optimal Variability and Complexity: A Novel Approach for Management Principles

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ABSTRACT

Management seeks to provoke system optimization throughout ever changing environmental and internal conditions. Typically, perturbations to stable organizations are unpredictable and difficult to define, except from within a chaos perspective. How should management staff set up their workforce to be best responsive to these changes? It is proposed that a dynamic systems theoretical approach to the organization of the management system would foster the ideal scenario. This approach lends well to the inclusion of discovery learning strategies that promote the valuable use of optimal variability in the exploration and self-discovery of optimal solutions to existent and novel problems. In this text, the authors walk the reader through a brief history of the development of the systems perspective on human movement optimization. Next, they extend the related discoveries to applications within management systems. It is hoped that a new appreciation for complexity and beneficial aspects of variability is conveyed.

THE GROWING NEED FOR A COMPLEX ADAPTIVE SYSTEMS APPROACH

During the 41st annual meeting of the Society for Neuroscience, Dr. Robert Shiller led the session ‘Dialogues between Neuroscience and Society’ with the theme of ‘Animal Spirits: How Human Behavior Drives the Economy’. He presented with quite rigorous historical detail and highlighted the many parallels between current neuroscience models of individual behavioral development and the similar current attempts of economists trying to model national and global market behavior. It was quite remarkable to witness such a timely conversation occurring after the global economic down-turn of 2008, during which nearly every national economy (of developed nations) experienced fiscal decline.

What was truly phenomenal about the lecture and following discussion was the level of appreciation afforded by the audience, to his less traditionalist view that economies may be interactively dependent on both the behavior of the society and that of the individuals of and by which they are organized. Evidence was presented that the level of serum testosterone of stock traders (information at the level of individual physiological state) correlated with and was influential on those individual’s performance on the trading floor; activity which has a direct effect on the national market (information at the level of society) (Coates, Gurnell, Rustichini, 2009). Also notable is the influence of the daily performance of these individuals (and the outcome state of the daily market) upon their subsequent day’s physiological state. This interactive cycle continues on a daily basis, passing complex information back and forth between the state of the individuals and the state of the group (Coates, Gurnell, Sarnyai, 2010).

Literally hundreds of questions were submitted for the following discussion panel, however only about a dozen of these were able to be entertained during the allotted hour. Nearly all of these

presented audience questions, and the responses delivered by the panel (Society for Neuroscience President Dr. Susan Amara, and neuroscientists Drs. Antonio Rangel and Wolfram Schultz), continued to remind us of the intricate levels of interconnectedness between the individual and society. Nearly everyone was interested in developing a more complete understanding of the ‘rules’ which coordinate the activities of individuals to observable behaviors at the societal level, and some ability to predict this from an evaluation of the behaviors at both the individual and societal level. Ultimately, the conversation continued to conclude that the global market downturn of late 2008 was unpredictable because the composing events “were just too complicated” and that “economic models always miss out on information because economists must work without closed, controlled experimentation”. Only occasionally did the panelists hint to the concept of emergent behavior and its place in the conversation. Emergence suggests that some behaviors at the societal level are organized by the combined activity of the individuals at the individual level, however no active controller is responsible for this organization; i.e. self-organization. Although none of the panelists actually delivered the term, they all seemed to hover around the notion that both systems (that of the individual, at the neuroscience level; and the society, at the economy level) may best be modeled as complex adaptive systems, and their level of interconnectedness as an upward and downward flux of emergent states.

This discussion being held in such context, and amongst the most distinguished of individuals with such diverse backgrounds, is presented as strong evidence that the underlying principles of chaos are becoming ever more popular amongst scientists and even non-scientists. Chaos refers to the emergence of behavior from complex adaptive systems and ‘unpredictable’ outcomes due to conditional sensitivity, and the bifurcation points identified in common analyses of chaotic systems (mathematics) and their correspondence

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