



Public Accounting in the New Millenium: On the Edge of Chaos

John R. Kuhn

College of Business, University of South Florida, Tampa, FL, United States of America

Abstract

Change is a constant feature of organizational existence. Successfully managing change requires an understanding of the environment in which an organization operates. The complex and interconnected world in which public accounting operates presents many challenges to the traditional neo-classical view of research and management. Awareness of the constantly-changing, networked environment and the dynamics of agent interactions offers distinct competitive advantages to the astute. The current paper strives to convey the appropriateness and necessity for recognizing the public accounting profession as a *complex adaptive system* (CAS) that operates in an ever-changing, unpredictable environment impacted by local and global politico-economic entities, professional organizations, clientele, internal organizational members, higher education institutions, technological advances, and others. Drawing on complexity theory, the paper develops and presents testable propositions to examine the public accounting profession as a CAS with the express purpose of stimulating more holistic research efforts in accounting.

Keywords: Complex adaptive system; Complexity theory; Public accounting profession; Networks.

Introduction

The old adage “nothing is certain but death and taxes” could reasonably be modified to include change. Change is a constant feature of organizational existence; those that can adapt survive, those that cannot wither away. Successfully managing change first requires an understanding of the environment or system in which an organization operates. This paper argues the necessity for and appropriateness of recognizing the public accounting profession as a *complex adaptive system* (CAS) that operates in an ever-changing, unpredictable environment impacted by local and global politico-economic entities, professional organizations, clientele, internal organizational members, higher education institutions, technological advances, and others. Viewing public accounting in such

light will hopefully provide insight into possible methods to successfully research the profession in an ever-flattening, continuously evolving world full of competing interests and players with unpredictable events lurking around every corner.

Mainstream accounting research and literature operates under neo-classical economic assumptions utilizing theories of rational, utility-maximizing behavior such as that ingrained in the efficient markets hypothesis (EMH) that states market prices fully reflect all publicly available information (Fama 1970). The general reductionist approach of this research attempts to reduce the complex down to the simple by creating regression models of phenomena to analyze individual components. These theories fail to incorporate or acknowledge differences in individual behavior and the impact of that

behavior on capital markets, judgment and decision-making, as well as other areas of accounting and, more broadly, fail to account for the interconnectedness of the system the phenomenon functions in.

Practitioners, regulators, and certain pockets of academics appear disenchanted with EMH due to observed irrational market behavior evidenced by under-reaction of prices to large earnings changes, odd ratios of prices to fundamentals, and other statistics derived from fundamental accounting analyses (Bloomfield 2002). Tim Bell, a managing partner with KPMG, questions the reductionist research approach:

"In our time, the confidence, maturity and promise of a science should be measured not by its power to reduce the complex to the simple ... but instead by its willingness to study complexity with advanced methods under descriptions that respect the reality of what is being studied." (Bell et al., 1997, p. 1).

Malkiel (2003) concludes stock markets are more efficient than some recent academic studies indicate but are far less predictable as well while Chambers (1993) challenges the neo-classical assumption, in general, that earnings releases dominate stock price changes:

"There are scores of events, or bits of information about events, that may influence the price of a stock at any point of time ... <investor> response is the outcome of a complex evaluative process, of states and stimuli and needs and preferences, at a stated time."

To date, however, no alternative theory offered to explain market inefficiency has been widely embraced and therefore, studies showing mispricing are viewed as statistical flukes resulting from fishing expeditions (Fama, 1998; Kothari, 2001; Bloomfield, 2002). Reality may be more complex than the neo-classical approach permits. Perhaps this narrowness accounts for the inability to fully explain long-standing phenomena such as the

post-announcement earnings drift and the scarcity of alternate theories facilitates continued acceptance of imperfect theories.

Historically, many non-believers of the neo-classical approach have been intimidated by the "scientific" bluff and bluster of academic research, especially when the research includes highly abstract mathematical notations (Mouck 2000). The Santa Fe Institute (SFI), a private research organization founded in 1984, developed an alternative view of reality (including economic and social contexts) grounded in the natural sciences that focuses on an evolutionary model of continual change, instability, and adaptation appropriately termed CAS. The group of scientists that comprise SFI hail from many disciplines and backgrounds including physics, biology, mathematics, economics, psychology, decision sciences, etc.

Organizational theorists have embraced the concepts of CAS for nearly 20 years as a viable lens to view organizational change, leadership, strategic management, and other organizational behavior from a holistic/contextual perspective; early examples include Tushman et al. (1986), Cartwright (1991), Stacey (1992), Wheatley (1992), Zimmerman (1993), Levy (1994), & Mintzberg (1994). CAS theory views organizations as open, non-linear dynamical systems that adapt and evolve in the process of interacting with their environments where outcomes of their actions are unpredictable, but not random. The key to successfully managing a CAS is to keep the organization operating 'on the edge of chaos': too much stability results in stagnation and ultimate organizational death while too much chaos can cause an organization to flounder under the weight of excessive change.

Recently, other business disciplines started to espouse the virtues of complexity science and undertake research activities from a CAS perspective. For instance, Jacucci et al. (2006) establishes the need for the use of complexity theory in a special issue of

Information Technology & People dedicated to complexity theory and information systems research. An exhaustive literature review leading to this study revealed scant CAS-related research in accounting, regardless of field specialty. A few management accounting articles (O'Brien et al., 1996; Ahrens et al., 2004) and a study of changes in accounting (Burns, 2000) touch on aspects of complexity but only in passing. Mouck (1998; 2000) truly introduces CAS to the accounting literature by exploring SFI studies and their implications for capital investment and budgeting theories and overall capital investment strategy that directly challenges neo-classical assumptions for capital markets. Sutton et al. (2006) presents complexity theory as an explanation for the impact of enterprise resource planning (ERP) systems on organizations contending that ERP systems represent the antithesis of the model for a best performing organization by stifling innovation through a highly ordered structure that struggles to respond to competitive pressures.

Continuing the groundwork laid by Mouck (1998; 2000) and Sutton et al. (2006) this paper proposes CAS as a necessary and viable theoretical approach to study accounting in the new millennium. The paper examines the public accounting profession in the context of the CAS framework constructed by Choi et al. (2001) and continues as follows: first, an overview of the CAS theoretical foundation and the Choi et al. (2001) framework; second, application of CAS concepts and principles to the public accounting profession and development of testable propositions; and lastly, discussion of implications theory building and research.

An Overview of Complex Adaptive Systems

The theory of CAS arose from the complexity theories spawned in the natural sciences to develop mathematical models of systems in nature. Many variations of the definition and key premises of CAS exist. A quote from John H. Holland, one of the original researchers in

the area, best depicts the general principles underlying CAS:

“A Complex Adaptive System (CAS) is a dynamic network of many agents (which may represent cells, species, individuals, firms, nations) acting in parallel, constantly acting and reacting to what the other agents are doing. The control of a CAS tends to be highly dispersed and decentralized. If there is to be any coherent behavior in the system, it has to arise from competition and cooperation among the agents themselves. The overall behavior of the system is the result of a huge number of decisions made every moment by many individual agents” (Waldrop, 1992).

Although seemingly random, the chaotic nature of the dynamic interactions among CAS agents actually contains a hidden order in which patterns of behavior occur in irregular but similar forms and can be modeled to simplify the complex; CAS examples include economies, social systems, ecologies, cultures, politics, technologies, traffic, weather, etc. (Dooley, 1997). To examine a CAS, Choi et al. (2001) develop a comprehensive framework comprised of three interacting and intertwined foci: 1) internal mechanisms, 2) an environment, and 3) co-evolution. The remainder of this section reviews these foundational concepts and principles in more depth.

Internal Mechanisms

Agents and Schema

Agents represent the building blocks of a CAS and are semi-autonomous units which seek to maximize some measure of goodness, or fitness, by evolving over time where fitness corresponds to the general well-being of the system (Dooley, 1997). Giddens (1984) defines agency as the ability to intervene meaningfully in the course of events. Therefore, by definition, a system must include agents that can impact the state of the system by their actions in order to be considered a CAS. Examples of agents in a social CAS include individuals inside firms,

firms comprising a profession, or even a profession operating in a global marketplace. The latter two illustrate a network of multiple CASs functioning in concert. Defining agents and CASs thus depends entirely upon the perspective of the onlooker.

CAS agents interact with other agents, both within their own CAS as well as with the environment which may include other CASs and their respective agents, commonly referred to as meta-agents (Benbya & McKelvey, 2006). The exchange of information and resources between agents facilitate the generation of schema that Schein (1997) defines as the norms, values, beliefs, and assumptions shared among the collective that dictate the manner in which agents interpret information and perform actions. Organizational leaders often declare formalized mission statements, create codes of conduct, ethic statements, etc. that represent core values and guide the behavior of agents, in particular, the interaction between agents and other stakeholders (e.g. employees, customers, vendors, and other related parties).

Within the bounds of these “rules of behavior” and shared values, agents strive to increase the fitness of their system, both locally and globally (Choi et al., 2001). The actions of agents can result in non-linear impacts to the local system and network of systems depending upon the interconnectedness of the system(s); a more connected system will generally experience larger ripple effects throughout as agents interact in a dynamic fashion. Complex system behavior, therefore, can occur when multiple non-linear processes interact (Choi et al., 2001).

Self-Organization and Emergence

Self-organization refers to the emergence of a pattern of order from a simple set of rules in an interconnected network without the intervention of a central controller (Anderson, 1999; Luoma, 2006; Mason,

2007). The self-organization process occurs from the bottom up through the interactions and inter-relationships of agents creating new structures or behaviors unintentionally. These emergent phenomena seem to have a life of their own with their own rules, laws, and possibilities (Goldstein, 1994; Zimmerman et al., 1998; Choi et al., 2001).

Choi et al. (2001) present the phenomenon of flocking birds as an illustration from nature of the self-organization process. The flocking pattern (i.e. the new structure) neither occurs because of a predetermined plan or unilateral control by the lead bird. The pattern emerges from the actions of individual birds acting upon simple rules based on local information. Each bird determines the speed and direction by flying toward the center of the flock, mimicking the velocity of the neighboring birds, and staying a safe distance away.

From an organizational perspective, individual managers cannot predict or plan long-term outcomes (Wilkinson & Young, 1998; Frederick, 1998; Kelly, 1999; Mason, 2007), but can adapt the simple rules to manage movement of the aggregate (i.e. the CAS) between stability and chaos (Lewin, 1993; Mason, 2007). The aforementioned examples of mission statements, codes of conduct, and ethic statements embody the underlying principles of simple rules that guide agent behavior, rather than directly controlling the eventual outcome of dynamic agent interaction. Examples of self-organization and emergence in the business setting include development of new strategies (Conner, 1998), development of marketing tactics (Forrest & Mizerski, 1996), self-directed teams (Gault & Jaccaci, 1996), and growth of strategic alliances (Wilkinson & Young, 1998).

Connectivity

A key premise of CAS revolves around the concept of connectivity: the linkages of agents inside the system with each other and to neighboring systems. Different elements

(agents, meta-agents, other CASs) continuously interact producing intertwined reactions nearly impossible to anticipate or trace afterwards (Luoma, 2006). As the number of agents increase, the volume and layers of relationships, both direct and indirect, grow exponentially to such a complex state that differentiating between cause and effect becomes too onerous.

The theory of reductionism asserts that complex data and phenomena can be explained by a process of reducing to simpler terms and analyzing the components independently to gain insight into the whole. Bettis & Prahalad (1995) and Dent (1999) argue the reductionist approach fails to effectively provide knowledge of the whole when studying organizations due to their complex nature. Viewing organizations as a CAS requires a holistic focus on the system in aggregate, not individual agents or pockets of agents. The performance of the whole cannot be enhanced by optimizing the performance of each individual agent nor should the problem with one agent be examined in isolation from the system (Luoma, 2006). A wider context must always be at the forefront promoting examination of the unit in the broader perspective of agent relationships, dependencies, and downstream effects. Analysis of these interconnected relationships in a CAS offers a distinct opportunity to make the most of the agent diversity inherent in the system facilitating richer interpretations of the environment and fostering creative solutions.

Dimensionality

Dooley & Van de Ven (1999) define the dimensionality of a CAS as the degrees of freedom that individual agents within the system have to enact behavior in a somewhat autonomous fashion. Controls such as rules and regulations, budgets, limits of authority, etc. constrain agent behavior and thus reduce dimensionality and change the complexity of the system's aggregate behavior (Stacey, 1995; Thietart & Forgues, 1995; Glass, 1996; Choi et al., 2001). The CAS becomes

predictable, stable, and less flexible. CAS researchers refer to these constraints as negative feedback in the sense the system works to maintain some stable condition where deviations lead to corrective action. When agents are allowed more autonomy to make decisions locally, outcomes then have the ability to emerge and cascade throughout the system possibly leading to the generation of more creative solutions and competitive advantage. This emergence reflects the concept of positive feedback where the system works to reinforce the phenomena increasing the overall effect. As an example, two scientists working together potentially can advance more rapidly than if in isolation due to the opportunity to leverage the unique perspectives, background, and knowledge each individual offers. Increased dimensionality thrives on positive feedback.

Environment

The environment in relation to a CAS depends entirely upon the scale of analysis chosen. For a CAS defined as the supply chain function of a manufacturing company, internal agents may consist of the employees in the production planning, inventory management, and warehouse departments that interact with other potential internal CASs such as the purchasing and accounting departments and even executive management. Externally, meta-agents may include customers, suppliers, and transportation vendors. An expanded scale might consider the manufacturing company, in aggregate, as the CAS which interacts with numerous other meta-agents in addition to the ones that interface with the supply function such as regulatory agencies, corporate shareholders, taxing authorities, etc. Regardless of scale chosen, Choi et al. (2001) characterize environments as dynamic and rugged.

Dynamism

The Merriam-Webster Online Dictionary defines dynamism as “a theory that all phenomena can be explained as manifestations of force” (Merriam-Webster, 2007). CASs experience many sources of force, internally and externally. While a CAS attempts to emerge through agent interaction and proactively influence other neighboring CASs, the external environment simultaneously exerts pressure on the CAS causing a reaction that, in turn, affects the environment. Complexity theory posits that a CAS both reacts to and creates its environment through experiences of positive and negative feedback (Choi et al., 2001).

The constantly changing relationships among agents, between CASs, and with the environment result in changes to the schema organizations incorporate into their day-to-day interpretations of reality and behavior. The emergence of the Internet offers an excellent example of a dynamic change in the environment. The Internet delivered broad-based changes to the organization of economic activity so profound to warrant the title of a revolution; the declining cost of information led to increased business traffic, greater information access, personal autonomy in local decisions, and ultimately, greater dispersion of economic activity (Feldman, 2002). A number of simultaneous developments resulted in positive feedback that reinforced and strengthened the Internet movement: expanding personal computer use, technological advances in hardware and software, increased awareness by users, improvements in telecommunications, falling technology prices, etc. (Luoma, 2006).

As the Internet fever began to take hold, new competitors emerged for traditional brick and mortar companies. Barnes and Noble operates the largest chain of bookstores in the U.S. In 1997, the company surpassed the \$2 billion revenue mark yet encountered a new competitive threat in Amazon.com, a two-year old online bookseller with 1997

revenues of \$148 million, an increase of 840% over the previous year, and which subsequently reported 1998 revenues of \$610 million. Barnes and Noble saw the writing on the wall: the Internet would upend the traditional bookselling business model. In response to the changing environment, Barnes and Noble launched an online platform to sell books and eventually developed an in-stock inventory of over 750,000 titles ready for immediate delivery and eight million new, out-of-print, and rare books— both of which the company claimed were the largest in the industry (Answers.com, 2007). The experiences of Barnes and Noble and many others during the early years of the Internet demonstrate the interaction of numerous CASs and the broader effects of agent actions in a dynamic environment.

Rugged Landscape

By nature, the eventual outcomes of agent interaction in CASs are unknown and unpredictable. CAS researchers represent the potential states that a CAS can attain in a dynamic environment as a rugged landscape with many hills and valleys (Kauffman, 1995; Choi et al., 2001). The highest point in the landscape symbolizes the optimal state of the system. However, many system components (agents) operate in a tightly, coupled manner each contributing to the overall direction of the system. The optimal state becomes difficult to locate as many local optima exist for the individual components. Further exasperating the complexity of a CAS, environmental pressures force the landscape to change eliciting system members to exploit existing knowledge and explore new knowledge (March, 1994) necessary to overcome the uncertainty imposed by the environment and ensure survivability (Choi et al., 2001).

Choi et al. (2001) discuss the inter-dependencies of agents and the overall state of a CAS in the context of a supply chain network. The authors explain that incorporating modular design in the

automotive supply chain process reduced the number of peaks in the rugged landscape creating a condition more conducive to overall system optimization. As opposed to the manufacture of individual parts, the automotive industry reorganized the entire supply chain process to a point where first-tier suppliers produce entire modules or subsystems (e.g. complete engines, steering systems, etc.) minimizing the cost of coordination across the entire supply network.

Co-Evolution

Co-evolution directly relates to the concept of connectivity in that multiple systems and/or sub-systems emerge together because “there is feedback among the systems in terms of competition or co-operation and utilization of the same limited resources” (Goldstein, in Zimmerman et al., 1998, p. 263). Symbiotic relationships exist as different parties (agents and neighboring CASs) depend upon and interact with each other. The environment imposes changes on its members who react thus changing themselves and consequently changing the environment. Therefore, co-evolution occurs when system members are forced to adapt continually to the changing context wrought by others’ strategies in order to remain relatively fit (van Valen, 1973; Kim & Kaplan, 2006).

In a business context, the increasing prevalence of partnerships and alliances in a traditionally competitive environment indicates a general shift of practice and strategy towards co-evolution (Luoma, 2006). Many organizations seek to expand operations into foreign markets not through acquisitions and mergers but through mutual agreements in order to leverage the knowledge and resources of each party. Grant & Baden-Fuller (2004) present a theory of strategic alliances that focuses on alliances as a strategic tool to access knowledge resources of other firms rather than acquire. Alliances contribute to the efficiency in the application of knowledge by

improving the integration of knowledge into the production of complex goods and services and increasing the efficiency of knowledge utilization. The efficiency advantages of alliances are enhanced when uncertainty exists in the environment.

Quasi-Equilibrium and State Change

Unlike chaos theory that focuses on the discovery of unpredictable behavior, complexity science strives to explain how order emerges from self-organizing agent interaction (Kauffman, 1993; Holland, 1995). Within the apparent randomness of a CAS, order can be unmasked to predict broad behavior, not at the individual agent level but in the aggregate. Mainzer (1994) & McKelvey (2004) refer to complexity as an order-creation science.

Systems under complexity science can exist or vacillate between any of three states—stable, chaotic, and one in between (Lewin, 1992). Many complexity researchers label the middle state as the “edge of chaos” (Lewin, 1992; Kauffman, 1995). A CAS maintains this quasi-equilibrium state, balancing between complete order and incomplete disorder (Goldstein, 1994). Highly ordered systems exhibit too much rigidity to effectively respond to environmental changes while highly chaotic systems cannot maintain any semblance of consistency and eventually collapse from excessive disruption. The “poised” systems that lie in the middle “may have special relevance to evolution because they seem to have the optimal capacity for evolving” (Kauffman, 1991, p. 82). These systems adhere to the principle of maximum entropy production where the system moves towards the brink of complete disorder (entropy) but never quite falls over the edge as new energy flows into the system forcing redirection back to a quasi-equilibrium state; the order lies not at the individual level, but in the aggregate (Luoma, 2006).

The Luoma (2006) discussion of complexity and management development asserts

disequilibrium and disorder should not be seen as negative organizational attributes. Attempts to entirely eliminate disorder suppress the system's ability to self-organize (Stumpf, 1995). Luoma (2006) recommends that management exert some control but supports the approach of allowing an organization to exploit the innate ability to spontaneously develop behavior that most effectively moves the whole in a given direction. Weick (1979) notes managers tend to get in the way of activities that have their own self-regulation, form, and self-correcting tendencies.

Non-Linear Changes

The level of sensitive dependence on initial conditions delineates a CAS from a stable system (Briggs & Peat, 1999; Phillips & Kim, 1996). Generally, small changes in a stable system result in small effects while large changes produce large effects. Changes in a CAS generate unpredictable effects; small changes can grow exponentially with each interaction through the system and large changes may languish or disintegrate altogether through agent inattention. Gibson (1996) & Wheatley (1996) advocate management application of small "nudges" to guide an event or process rather than dramatic actions intended to control. As in many instances in business, timing is everything. The right kind of nudge at the correct time can lead, through positive feedback, to major change (Nilson, 1995).

Mason (2007) presents the first-mover advantage as an illustration of non-linear change in a business context. Sensitive dependence on initial conditions and positive feedback create a "flywheel affect" that reinforces early success, providing a significant advantage over the long term. A number of studies discount first-mover advantage as a myth (Suarez & Lanzolla, 2005; Pfeffer & Sutton, 2006) yet others contend the opposite:

"To gain advantage, first movers must capitalize on the opportunities that come

with being a pioneer while at the same time manage the threats that arise. The bottom line: Being first in a market is only an advantage when you do something with it" (Finkelstein, 2007, p. 3).

The differing opinions on the validity of first-mover advantage epitomize core concepts of CAS theory. First-mover advantage occurs as a result of non-linear relationships and positive feedback yet the interaction between agents (pioneers, competitors, and the environment) results in unpredictable outcomes, i.e. whether or not a pioneer can maintain the advantage through proactive and reactive action. Traditional forecasting and prediction models inexorably fail to adequately account for the dynamic nature of CASs due to the exponential growth of specification errors as the future unfolds (Peitgen et al., 1992).

Non-Random Future

Although the nature of CASs prevents exact prediction of future actions and outcomes, distinct patterns of behavior exist underneath apparent randomness allowing examination and general predictive ability. Small changes may lead to drastically different future paths; however, the same characteristic pattern of behavior emerges despite the change (Choi et al., 2001).

Recent work in financial economics highlights patterns of non-random behavior that result in varied outcomes. Baker et al. (2002) attempt to solve the "dividend puzzle" by examining how managers determine dividend policy. Calling upon earlier work on habitual behavior (Waller, 1989; Frankfurter & Lane, 1984), the authors conclude that various market imperfections and frictions affect firms differently; therefore, dividend policy differs firm to firm and models should consider competing frictions on a firm-specific basis. Underlying this work, Waller (1989) suggests the concept of habit (nonreflective behavior) may be a useful tool for institutional policy analysis and can "be a fatal blow to work that

is based on rational behavior" (Baker et al., 2002). Habits reflect cultural and societal norms and standards that may contradict rational economic behavior. Further, Frankfurter & Lane (1984) assert habitual behavior causes problems for models attempting to explain dividend policy assuming rational behavior and claim socioeconomic consequences of modern corporate evolution best explain dividend behavior. This stream of research, although not explicitly stated, exhibits core CAS principles.

This section presented the elements of the CAS theoretical foundation developed by Choi et al. (2001) and provided examples from academic research, the business environment, and natural systems in order to explain the fundamentals underlying complexity science and to demonstrate application outside the realm of accounting. The subsequent section examines the public accounting profession as a CAS and develops testable propositions for future consideration.

Viewing Public Accounting as a Complex Adaptive System

For the purpose of this discussion, the term 'public accounting profession' relates to firms that provide accounting and auditing, tax, and consulting services to publicly-held entities with an emphasis on auditing. The remainder of this section explores several aspects of the profession under the Choi et al. (2001) CAS framework to establish an alternative way of viewing and researching the profession that offers a more holistic, richer perspective than the traditional neo-classical approach allows.

Internal Mechanisms

Agents and Schema

Agents, by definition, represent the core of a CAS and must possess the ability to influence the direction of the system in order for the system to be classified as a CAS. At the lowest

level of the public accounting CAS, auditors constitute the agents. Auditors employed by a public accounting firm perform financial statement attestation, working in localized audit teams with a defined hierarchical structure. Staff auditors work under the direct supervision of managers that report to an engagement partner who simultaneously reports to the local office managing partner (OMP) and a quality assurance audit partner, typically located in a different office for increased objectivity. The OMP leads and coordinates all activity of a particular office and is accountable to a regional partner that functions under the overall direction of a national office. The various national offices located around the world each represent a member firm of a global group of firms. For example, Ernst and Young Global Limited (EYG), a UK private company limited by guarantee, is the principal governance entity of the global EY organization comprised of legally separate member firms that have no liability for the actions of each other (Ernst & Young, 2007a). As such, the individual EY auditors executing fieldwork embody a corporeal organization comprised of agents, meta-agents, and interconnected CASs that collectively form the EYG public accounting firm.

Arguably, accounting can be traced back to the dawn of intelligence among human beings where primitive man began the process of numbering (Brown, 1905). Over time, numeration evolved from ancient forms of accounting for transactions to the double-entry bookkeeping format of today. Widely referred to as "the language of business" (Davidson et al., 1987) accounting consists of specialized phrases and terminology that collectively create a common body of socially-constructed schema to interpret the practice of accounting.

Within the profession, individual firms extend the general accounting schema by developing firm-specific policies and procedures that guide the behavior of internal agents. Each of the Big Four public accounting firms created and published

information about the core values of the firm and related codes of conduct on their global website. Deloitte and Touche established the following set of firm-wide core values:

“The shared values of DTT and its member firms bind the people of DTT’s member firms together and promote trust among partners and professionals ... These values join together all employees across different cultures, customs and languages and are the foundation for collective successes. Carefully identified through a global consultation process, these values are all-encompassing and embrace the cultures in which DTT’s member firms operate. This thorough process resulted in universal shared values that form a basis for a consistent approach to service delivery worldwide. The shared values are: Integrity, Outstanding value to markets and clients, Commitment to each other, Strength from cultural diversity” (Deloitte & Touche, 2007a).

The Ernst and Young website includes the following statement about their firm’s code of conduct:

“The Ernst and Young Global Code of Conduct sets out a comprehensive ethical and behavioral framework that guides the decisions we make every day. The Global Code reflects our commitment to delivering Quality in Everything We Do, underscored by the strength of our Values Statement. The Global Code of Conduct provides a series of guiding principles grouped into five categories that cover the breadth of our activities. They are: 1) Working with One Another 2) Working with Clients and Others 3) Acting with Professional Integrity 4) Maintaining our Objectivity and Independence 5) Respecting Intellectual Capital” (Ernst & Young, 2007b).

The guidance developed by these two firms illustrates schema created to generate consistent agent behavior across the firm that lays the foundation for overall firm culture and image thus increasing the “fitness” of the firm. The *AuditAnalytics*

database lists 647 public accounting firms that issued an audit opinion in 2005 for a Securities and Exchange Commission (SEC) registrant. The number of firms invariably leads to a variety of business approaches, organizational infrastructures, management styles, values, cultures, and agent behavior operating in the profession simultaneously.

Proposition 1. *The greater the level of shared schema within a public accounting firm, the higher the level of fitness achieved (e.g. performance, survivability).*

Self-Organization and Emergence

The activities of the public accounting profession prior to the passage of the Sarbanes-Oxley Act of 2002 (SOX) demonstrate examples of self-organization and emergent behavior. With the advent of technological advances and the Internet Boom in the latter part of the 20th century, the accounting profession felt compelled to alter the structure and perception of the profession to keep pace with changes in business. The American Institute of Certified Public Accountants (AICPA) Vision Project, Canadian Institute of Chartered Accountants (CICA) Vision Statement, and Institute of Chartered Accountants in England and Wales 20/20 Vision Project initiatives represent attempts by the accounting professional bodies to redefine themselves and their practices under the rubric of “vision” (Fogarty et al., 2006). The AICPA sought to broaden the services of the traditional accounting and audit-oriented focus to a point where accountants could be viewed as trusted business advisors. The AICPA heralded the vision statement as “the basis for expanding the value of the CPA to tomorrow’s marketplace” (AICPA, 2000) and stated the profession’s core purpose as “making sense of a changing and complex world”. Text from the vision statement offers evidence of the desired shift:

“CPAs are the trusted professionals who enable people and organizations to shape their future. Combining insight with integrity,

CPAs deliver value by: Communicating the total picture, Translating complex information into critical knowledge, Anticipating and creating opportunities, and Designing pathways that transform vision into reality” (AICPA, 2000).

The firms quickly latched on to this movement to expand the array of services delivered. When the AICPA championed a global consulting credential, many in the accounting profession vociferously objected. Kliegman (2001, p. 49) complained that “hundreds of thousands of people who lack the rules, regulations and ethics of CPAs [will] be admitted to compete with the professional CPA as consultants.” BDO Seidman joined the debate asking:

“Why would the profession want to dilute its invaluable “trusted advisor” reputation by sharing it with others who are not similarly grounded in ethics and objectivity?” (Klein, 2001, p. 4).

The professional accounting bodies led the charge to adapt to the changing business environment and public accountants, particularly the larger firms, self-organized and embraced the emergence from the role as merely a provider of accounting and audit services to one of a valued business consultant.

Proposition 2. *Public accounting firms that adjust vision, strategy, and infrastructure quickly in response to environmental changes (e.g. legal, marketplace) will perform better and survive longer.*

Connectivity

Savage (1994) asserts that professions are neither occupations nor firms, but instead represent an example of the network form of organization that has evolved and continues to survive because they represent comparatively efficient and adaptable solutions to certain kinds of dynamic production problems. Collectively, the public accounting profession consists of many

entities ranging from sole practitioners to the Big Four international firms and various national and international professional bodies. The profession interacts externally with regulatory agencies, governments, higher education institutions, financial markets, existing and potential clients, and future employees. The communication between these parties creates a myriad of intertwining, dynamic relationships– each party with their own goals and agendas.

The structure and international focus of the larger public accounting firms reflect the global connectivity of the profession. PriceWaterhouseCoopers (PWC) and its international member firms, for instance, conduct business in 149 countries with more than 140,000 employees and state on the corporate website:

“People ... across our network share their thinking, experience and solutions to develop fresh perspectives and practical advice. In this Global Annual Review we describe our performance ... in helping clients address the challenges of the global marketplace” (PriceWaterhouseCoopers, 2007).

The interplay of the international public accounting firms with international regulatory bodies offers another example of the global connectivity of the profession. The World Trade Organization (WTO) develops the ground-rules for international commerce and mediates trade disputes. Arnold (2005) examines how transnational accounting firms in Europe and the U.S. use international trade agreements such as the *General Agreement on Trade in Services* and *Disciplines on Domestic Regulation in the Accountancy Sector* developed and enforced by the WTO to create a global market for accounting and auditing services by eliminating domestic regulation viewed as barriers to trade and investment. Caramanis (2002) explores the interconnectedness of national politics with global forces and the ramification of this interaction for accounting regulation and the relationship between the state and the profession. After analyzing

historical documents of the liberalization of the Greek auditing profession in the 1990's and the pressure exerted on the Greek government by intergovernmental politico-economic organizations at the behest of the public accounting profession, Caramanis (2002) asserts:

"The politics of international accounting professionalism in the 'globalization' era are becoming more polycentric with (lesser) nation-states as merely one level (of diminishing importance) in a complex system of superimposed, overlapping and often competing national and international agencies of governance."

The author concludes by stating, "The paper has shown how intertwined accountancy and the broader socio-economic and political domain are, not only at the local, but also at the international level." The accounting profession clearly functions in an interconnected, ever-evolving world comprised of many distinct agents and CASs whose actions affect others in the system.

Proposition 3. *Public accounting firms aware of the interconnectedness of the agents, meta-agents, and CASs they interact with directly and indirectly will be more effective at expanding operations, achieving objectives, and managing resources.*

Dimensionality

Although the bread and butter line level work of auditing public companies occurs in a small team-based environment, these individual silos need certain controls to uphold a high level of professional quality across the firm and reduce liability. As evidenced by the Enron scandal, actual or perceived failure in only a single audit can devastate a firm. In order to maintain a consistent level of performance and minimize risk, public accounting firms implement a wide variety of institutional

controls that reduce the dimensionality of agents and sub-CASs. Examples include structured training for each professional level, client acceptance procedures, internal quality reviews, firm guidance (i.e. auditing standards- e.g. materiality judgments), quality assurance partners, national technical partners, mentoring, formalized compensation and evaluation structure, etc.

Several academic studies examined various aspects of public accounting institutional control mechanisms. Dirsmith et al. (2005) deconstructed the structure of international public accounting firms identifying two general modes of governance rhetoric, the objective bureaucracy managed by administrative partners and the subjective expertise of practice partners that exercise professional judgment in the field. The authors conclude the distinction between objectivity and subjectivity compete yet supplement the shortcomings of the other creating an intertwined relationship. The administrative controls reduce the dimensionality of the practitioners preventing the collective firm from entering a state of complete chaos. Covaleski et al. (1998) examine the mentoring structure in public accounting firms and determine that the mentoring process shapes the identities of organizational participants but the discourse of professional autonomy, in contrast, generates resistance to total conformity. Mentoring accomplishes the goals of both creating and ingraining shared schema throughout the organization while simultaneously reducing the dimensionality of agents.

Proposition 4. *Implementation of institutional control mechanisms in public accounting firms leads to consistent performance quality but may, in turn, reduce the professional autonomy of practitioners leading to less organizational commitment, job satisfaction, innovativeness, and ultimately performance.*

Environment

Dynamism

As a direct result of SOX legislation requirements in the U.S., particularly Section 404 that requires assessment of internal controls over financial reporting, public accounting firms are hiring more accountants than ever before in an environment already short of supply. According to the managing partner of the Deloitte and Touche Pittsburgh office, "All our young people wanted to be dot.commers, investment bankers and consultants," (Boselovic, 2004). In 2004 alone, the Ernst and Young Pittsburgh office increased staffing by over 25% (Boselovic, 2004). In discussing the hiring outlook for 2007 Monster.com, one of the largest online employment websites, expects continued effects of SOX on the accounting profession:

"Sarbanes-Oxley will have a profound effect for years to come. There wasn't the talent to backfill slots emptied by accounts pulled onto SOX compliance projects. There's a huge demand for auditors, CPAs and people in internal controls. The Big Four accounting and consulting firms continue to hire aggressively as they face competition from smaller competitors and corporate employers. "We've seen a fairly robust increase in business across all three of our practices: audit, tax and advisory," says Manny Fernandez, national managing partner for campus recruiting at KPMG. "Now that we've stabilized the turnover in the wake of Sarbanes-Oxley, we're trying to come back to a sense of balance in terms of people's workloads" (Rossheim, 2007).

In the face of a staffing strain propagated by the existing shortage of accountants and the most significant legislation since the SEC Acts of 1933 and 1934 driving ever more demand, public accounting firms reacted aggressively by implementing creative approaches to hiring and retention practices. In 2004, EY established an internal network called bEYond for gay and lesbians employees to

interact and feel connected to the firm. The company website provides the following information about bEYond:

"Ernst and Young is committed to providing a work environment that is, and feels, inclusive for all our people. Through People Resource Networks (PRNs), various affinity groups within our firm can network and exchange information as well as advise senior leadership about inclusiveness issues.

bEYond, a network for lesbian, gay, bisexual, and transgender people and their allies (LGBTAs), was the first PRN established by the firm, and it worked to add the inclusion of "gender identity/expression" as a covered category within the firm's antidiscrimination policy" (Ernst & Young, 2007c).

EY reportedly needs more than 5,500 college recruits for internships and entry-level jobs in North America in 2007 (White, 2007). In an attempt to reach this demographic in their natural habitat (the Internet), EY became the very first employer to create a webpage on Facebook, a social networking website that caters to college and university students, dedicated solely to recruiting (Rothberg, 2007). The EY Facebook page contains information and discussion boards targeted specifically at the internet-savvy audience. The bEYond PRN and Facebook recruiting efforts exemplify the concept of dynamism; the dynamic external environment exerted pressure on the firm resulting in a staffing crisis and the firm quickly and ingeniously adapted to address the threat.

Proposition 5. *Public accounting firms that respond quickly to threats from a dynamic external environment will gain competitive advantage over those that either fail to respond or react slower.*

Rugged landscape

Each public accounting firm may consist of many groups internally that collectively comprise the firm. These groups can be delineated by function (e.g. audit, tax,

consulting, etc.) or nationality, each striving towards an optimal level of fitness locally yet experiencing inter-dependencies that may overwhelm the local contribution to the direction of the collective. Similar to the modular design of the automobile industry in Choi et al. (2001), the architecture of public accounting firms can be optimized independently to allow the emergence of high dimensionality reducing coordination costs across the entire firm.

Arthur Andersen was the last true globally-organized public accounting firm. The U.S.-led audit team on the Enron engagement essentially brought down the entire firm. Today, the larger firms operate autonomous groups as separate legal entities, both nationally and functionally. Deloitte and Touche Tohmatsu (DTT), similar to EYG, acts as an alliance of legally-separate member firms. Within the U.S., the national member firm of DTT further decomposes into legal subsidiaries on a functional basis with subsidiaries for audit and assurance, consulting, financial advisory, and tax services (Deloitte & Touche, 2007b) providing some level of legal protection in the event an incident occurs reminiscent of the tax shelter fraud exposed in 2003 which nearly ruined the KPMG U.S. member firm.

Proposition 6. *Modularization of structure (nationally and functionally) will decrease overall inter-dependencies within a public accounting firm allowing greater efficiency of operations while simultaneously mitigating risk.*

Co-Evolution

Quasi-Equilibrium and State Change

Changes and actions by the public accounting profession during the mid-1990's to today embody the quasi-equilibrium and state change elements of the CAS framework. In the period prior to the passage of SOX the profession attempted to broaden the services provided by CPAs (evidenced by the actions of the AICPA during the Vision Project) to

expand the jurisdictional domain of the profession. Most firms bolstered and grew their consulting service lines to "grab a bigger piece of the pie" until the rash of financial reporting scandals (Enron, WorldCom, and HealthSouth, etc.) rocked the financial markets resulting in a loss of confidence in the auditing firms and compelling U.S. legislators to intervene. EY, PWC, and KPMG each either sold or spun-off their larger consulting groups in order to re-focus on the core competency and tradition of objective, independent financial statement attestation. During this era, the profession crept eerily close to the 'edge of chaos'. Concern for the lack of independence in the profession led to structural changes (e.g. peer review discontinued in lieu of PCAOB oversight) bringing the profession back into a quasi-equilibrium state.

Proposition 7. *Structural changes in line with traditional values of objectivity and independence will survive longer and be more successful than those in conflict.*

Non-Linear Changes

As Mason (2007) and Finkelstein (2007) note, positive feedback reinforces early success creating a long-term advantage for first-movers as long as the organization does something with the advantage. The Big Four public accounting firms can arguably be viewed as having secured a first-mover advantage in the audits of U.S. public companies. The roots of each firm can be traced back well over a 100 years and some of the auditor-client relationships span many years; Davis et al. (2000) find that 585 (69%) of their sample companies retained the same auditor over the entire 18 year period of 1981-1998.

Canada et al. (2007) refer to the formulation of SOX as the "perfect storm" where the set of events leading to the legislation individually would have far less impact than the synergistic effect from combination (i.e. non-linear impact). The Act continues to change the landscape of the public accounting

profession five years after passage. The cost of compliance for SOX Section 404 resulted in and continues to offer opportunities for smaller firms to obtain an increasing number of public company audits. The Big Four resigned from many audits due to the inability to staff all the existing engagements and opted to keep only the most profitable and least risky clients and on the reverse side, clients dismissed Big Four firms due to increased audit fees (Boselovic, 2004). The *AuditAnalytics* database shows that the Big Four issued 67% of the 2003 opinions on financial statements of SEC registrants, dropping to 62% in 2004 and 59% in 2005. Data thus suggests collective changes in a dynamic, interconnected environment may have resulted in an unpredictable outcome—the Big Four losing their stranglehold on the audits of public companies. The slippage possibly could have been quicker and even more severe if smaller accounting firms had placed themselves in proper position to leverage the structural change in the landscape.

Proposition 8. *Public accounting firms cognizant of non-linear effects and positive reinforcement are more likely to be prepared for, less likely to be affected by, and more prepared to take advantage of unforeseen changes in the environment.*

Non-Random Future

The audit failures early in this century, subsequent legislation, and impact on the public accounting profession reasonably could not have been predicted with any precision due to the many participants involved and the 'building up' effect of their actions that culminated in a drastic structural change to the manner in which U.S. companies conduct business and are audited. However, general agent and CAS behavior can be recognized to reduce the surprise and facilitate proactive behavior. For instance, client management that exhibits habitual

earnings management behavior, even to a small degree, may be inclined to commit fraudulent behavior when conditions or events occur jeopardizing their position of power. Even though Scott Sullivan, the ex-CFO of WorldCom, probably realized treating operating expenses as capital expenditures was not a 'healthy business' that could be sustained indefinitely (eventually a write-down would need to occur) he exhibited irrational behavior by continuing to authorize reclassification entries period after period for over three years (Wharton School, 2002).

Proposition 9. *Auditors aware of past agent and CAS behavior have a higher likelihood of predicting the general direction a CAS may proceed (given similar circumstances) than those anticipating consistent rational behavior.*

Discussion and Conclusion

Practitioners, regulators, and academics increasingly view the traditional neo-classical view as too myopic and simplistic for the increasing complexity and interconnectedness of today's business world. Academic disciplines outside and within the business area have recently embraced complexity theory and CASs as a manner to conduct research. This paper extends the work of Mouck (1998, 2000) and Sutton et al. (2006) in the accounting literature by introducing the CAS framework developed by Choi et al. (2007) as an alternative lens to examine the public accounting profession. The paper presents a set of research propositions associated with each concept and principle contained in the framework based upon extant literature and knowledge of practice. The ultimate goal of this paper is to broaden the perspective of accounting academicians to consider the complex nature of the world we live in and conduct research reflective of that reality.

References

- Ahrens, T. & Chapman, C. S. (2004). "Accounting for Flexibility and Efficiency: A Field Study of Management Control Systems in a Restaurant Chain," *Contemporary Accounting Research*, Vol. 21, No. 2, pp. 271-301.
- American Institute of Certified Public Accountants. CPA Vision: 2011 and beyond (Pamphlet) (New York: American Institute of Certified Public Accountants, 2000).
- American Institute of Certified Public Accountants. Different is good (and profitable) at California CPA firm (The CPA Letter, April, 1999, pp. 11-12).
- Anderson, P. (1999). "Complexity Theory and Organization Science," *Organization Science*, Vol. 10, No. 3, pp. 216-232.
- Answers.com. (2007). "Barnes and Noble," Retrieved March 28, from the Answers.com web site:
<http://www.answers.com/topic/barnes-noble-inc>
- Arnold, P. J. (2005). "Disciplining Domestic Regulation: The World Trade Organization and the Market for Professional Services," *Accounting, Organizations and Society*, Vol. 30, pp. 299-330.
- Baker, H. K., Powell, G. E. & Veit, E. T. (2002). "Revisiting the Dividend Puzzle: Do All of the Pieces Now Fit?," *Review of Financial Economics*, Vol. 11, No. 4, pp. 241-261.
- Bell, T. B., Marrs, F. O., Solomon, I. & Thomas, I. (1997). Auditing Organizations through a Strategic Systems Lens: The KPMG Business Measurement Process (Montvale: KPMG LLP).
- Benbya, H. & McKelvey, B. (2006). "Toward a Complexity of Information Systems Development," *Information Technology & People*, Vol. 19, No. 1, pp. 12-34.
- Bloomfield, R. J. (2002). "The Incomplete Revelation Hypothesis and Financial Reporting," *Accounting Horizons*, Vol. 16, No. 3, pp. 233-243.
- Boselovic, L. (2004). "New SOX Rocks Accounting Industry: Law Cracking Down on Auditing Procedures Spurs More Business for Regional, Local Firms," *Pittsburgh Post-Gazette*, November 28.
- Briggs, J. & Peat, F. D. (1999). *Seven Life Lessons of Chaos: Timeless Wisdom from the Science of Change* (New York: HarperCollins).
- Brown, R., Mackay, J. S., Boyd, E., Fogo, J. R. & Sloan, A. (1905). *A History of Accounting and Accountants* (London: Frank Case).
- Burns, J. (2000). "The Dynamics of Accounting Change Inter-Play between New Practices, Routines, Institutions, Power and Politics," *Accounting, Auditing & Accountability Journal*, Vol. 13, No. 5, pp. 566-596.
- Canada, J., Kuhn, J. R. & Sutton, S. G. (2007). "Accidentally in the Public Interest: The Perfect Storm that Yielded the Sarbanes-Oxley Act," *Working paper, University of Central Florida*.
- Cartwright, T. J. (1991). "Planning and Chaos Theory," *Journal of American Planning Association*, Vol. 57, pp. 44-56.
- Chambers, R. J. (1993). "Positive Accounting Theory and the PA Cult," *Abacus*, Vol. 29, No. 1, pp. 1-26.
- Choi, T. Y., Dooley, K. J. & Rungtusanatham, M. (2001). "Supply Networks and Complex Adaptive Systems: Control versus Emergence," *Journal of Operations Management*, Vol. 19, 2001, pp. 351-366.
- Conner, D. R. (1998). *Leading at the Edge of Chaos: How to Create the Nimble Organization* (New York: John Wiley).

- Covaleski, M. A., Dirsmith, M. W. & Samuel, S. (1998). "The Calculated and Avowed: Techniques of Discipline and Struggles over Identity in Big Six Public Accounting Firms," *Administrative Science Quarterly*, Vol. 43, No. 2, pp. 293-327.
- Davidson, S., Stickney, C. & Weil, R. (1986). 'Accounting: The Language of Business,' (*Sun Lakes: Thomas Horton and Daughters*).
- Davis, L. R., Soo, B. & Trompeter, G. (2000). "Auditor Tenure, Auditor Independence, and Earnings Management," *Working paper, Boston College*.
- Deloitte & Touche. 'Tax: Deloitte Tax LLP,' Retrieved April 26, 2007b, from the web site: http://www.deloitte.com/dtt/section_node/0,1042,sid%253D2152,00.html
- Deloitte & Touche. 'Uniting Through Shared Values,' Retrieved April 22, 2007a, from the web site: http://www.deloitte.com/dtt/section_node/0,1042,sid%253D73379,00.html
- Dirsmith, M. W., Samuel, S., Covaleski, M. A. & Heian, J. B. (2005). "A Thematic Deconstruction of Formalist and Expertise Voices in Big Five (Four) Public Accounting Firms," *Critical Inquiry in Language Studies*, Vol. 2, No. 1, pp. 13-34.
- Dooley, K. J. (1997). "A Complex Adaptive Systems Model of Organization Change," *Nonlinear Dynamics, Psychology, and Life Sciences*, Vol. 1, No. 1, pp. 69-97.
- Dooley, K. J. & Van De Ven, A. H. (1999). "Explaining Complex Organizational Dynamics," *Organizational Science*, Vol. 10, No. 3, 358-372.
- Ernst & Young. 'About Ernst and Young,' Retrieved April 20, 2007a, from the web site: http://www.ey.com/global/content.nsf/International/About_EY
- Ernst & Young. 'Global Code of Conduct,' Retrieved April 22, 2007b, from the web site: http://www.ey.com/global/content.nsf/International/Global_Code_of_Conduct
- Ernst & Young. 'Global Code of Conduct,' Retrieved April 26, 2007c, from the web site: <http://www.ey.com/global/content.nsf/WebPrint/F4E32DB0BA79B043852572830076B77F?openDocument&>
- Fama, E. F. (1998). "Market Efficiency, Long-Term Returns, and Behavioral Finance," *Journal of Financial Economics*, Vol. 49, No. 3, pp. 283-306.
- Feldman, M. P. (2002). "The Internet Revolution and the Geography of Innovation," *International Social Science Journal*, Vol. 54, No. 171, pp. 47-56.
- Finkelstein, S. (2002). "First Mover Advantage for Internet Startups: Myth or Reality?," *Tuck School Business article adapted from Handbook of Business Strategy* (New York: ED Media Group, 2007, pp. 39-46).
- Fogarty, T. J., Radcliffe, V. S. & Campbell, D. R. (2006). "Accountancy before the fall: The AICPA Vision Project and Related Professional Enterprises," *Accounting, Organizations and Society*, Vol. 31, pp. 1-25.
- Forrest, E. & Mizerski, R. (1996). 'Interactive Marketing: The Future Present,' (*Lincolnwood: NTC Books*).
- Frankfurter, G. M. & Lane, R. W. (1992). "The Rationality of Dividends," *International Review of Financial Analysis*, Vol. 1, pp. 115-130.
- Frederick, W. C. (1998). "Creatures, Corporations, Communities, Chaos, Complexity: A Naturalogical View of the Corporate Social Role," *Business and Society*, Vol. 37, No. 4, pp. 358-376.

- Gault, S. B. & Jaccaci, A. T. (1996). "Complexity Meets Periodicity," *The Learning Organization*, Vol. 3, No. 2, pp. 33-39.
- Gibson, R. (1996). 'Rethinking the Future,' (London: Nicholas Brealey).
- Giddens, A. (1984). 'The Constitution of Society,' (Cambridge: Polity Press).
- Glass, N. (1996). "Chaos, Non-Linear Systems and Day-to-Day Management," *European Management Journal*, Vol. 14, No. 1, pp. 98-105.
- Goldstein, J. (1994). *The Unshackled Organization: Facing the Challenge of Unpredictability through Spontaneous Reorganization* (Portland: Productivity Press).
- Grant, R. M. & Baden-Fuller, C. (2004). "A Knowledge Accessing Theory of Strategic Alliances," *Journal of Management Studies*, Vol. 41, No. 1, pp. 61-84.
- Holland, J. H. (1995). *Hidden Order* (Reading: Addison-Wesley).
- Jacucci, E., Hanseth, O. & Lyytinen, K. (2006). "Introduction: Taking Complexity Seriously in IS Research," *Information Technology & People*, Vol. 19, No. 1, pp. 5-11.
- Kauffman, S. A. (1991). "Antichaos and Adaptation," *Scientific American*, Vol. 265, No. 2, 1991, pp. 78-84.
- Kauffman, S. A. (1993). 'The Origins of Order,' (New York: Oxford University Press).
- Kauffman, S. A. (1995). *At Home in the Universe* (New York: Oxford University Press).
- Kelly, S. (1999). *The Complexity Advantage: How the Science of Complexity Can Help Your Business Achieve Peak Performance* (New York: Business Week Books).
- Kim, R. M. & Kaplan, S. M. (2006). "Interpreting Socio-Technical Co-Evolution: Apply Complex Adaptive Systems to IS Engagement," *Information Technology & People*, Vol. 19, No.1, pp. 35-54.
- Klein, M. (2001). "Nebraska Society, BDO Seidman Veto Global Credential," *Accounting Today*, September 24-October 7, pp. 3-4.
- Kliegman, E. J. (2001). 'XYZ is Good PR but bad for Profession,' *Accounting Today*, October 22-November 4, pp. 49-50.
- Kothari, S. P. (2001). "Capital Markets Research in Accounting," *Journal of Accounting and Economics*, Vol. 31, pp. 105-231.
- Levy, D. (1994). "Chaos Theory and Strategy: Theory, Application, and Managerial Implications," *Strategic Management Journal*, Vol. 15, pp. 167-178.
- Lewin, R. (1992). 'Complexity,' (Chicago: University of Chicago Press).
- Lewin, R. (1993). 'Order for Free,' *New Scientist*, Vol. 13, pp. 10-11.
- Luoma, M. (2006). "A Play of Four Arenas: How Complexity Can Serve Management Development," *Management Learning*, Vol. 37, No. 1, pp. 101-123.
- Mainzer, K. (1994). *Thinking in Complexity: The Complex Dynamics of Matter, Mind, and Mankind* (New York: Springer-Verlag).
- Malkiel, B. G. & Fama, E. F. (1970). "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance*, Vol. 25, No. 2, pp. 383-417.
- March, J. G. & Heath, C. (1994). *A Primer on Decision Making: How Decisions Happen* (New York: Free Press).

- Mason, R. B. (2007). "The External Environment's Effect on Management and Strategy: A Complexity Theory Approach," *Management Decision*, Vol. 45, No. 1, pp. 10-28.
- McKelvey, B. (2004). "Toward a 0th Law of Thermodynamics: Order-Creation Complexity Dynamics from Physics and Biology to Bioeconomics," *Journal of Bioeconomics*, Vol. 6, No. 1, pp. 65-96.
- Merriam-Webster. (2007). "Merriam-Webster's Online Dictionary," Retrieved March 19, from the web site: <http://www.m-w.com/dictionary/dynamism>
- Mintzberg, H. (1994). "The Rise and fall of Strategic Planning: Preconceiving Roles for Planning, Plans, Planners," (*New York: Free Press*).
- Mouck, T. (1998). "Capital Markets Research and Real World Complexity: The Emerging Challenge of Chaos Theory," *Accounting, Organizations and Society*, Vol. 23, No. 2, pp. 261-283.
- Mouck, T. (2000). "Beyond Panglossian Theory: Strategic Capital Investing in a Complex Adaptive World," *Accounting, Organizations and Society*, Vol. 25, pp. 261-283.
- Nilson, T. H. (1995). *Chaos Marketing: How to Win in a Turbulent World* (London: McGraw-Hill).
- O'Brien, J. & Sivaramakrishnan, K. (1996). 'Coordinating Order Processing and Production Scheduling in Order Initiated Production Environments,' *Journal of Management Accounting*, Vol. 8, pp. 151-170.
- Peitgen, H. O., Jurgens, H. & Saupe, D. (1992). *Chaos and Fractals: New Frontiers of Science* (New York: Springer).
- Pfeffer, J. & Sutton, R. I. (2006). "Three Myths of Management," *HBS Working Knowledge*, March 27.
- Phillips, F. & Kim, N. (1996). "Implications of Chaos Research for New Product Forecasting," *Technological Forecasting and Social Change*, Vol. 53, No. 3, pp. 239-261.
- PriceWaterhouseCoopers. "2006 Global Annual Review," Retrieved April 24, 2007, from the web site: <http://www.pwc.com/extweb/home.nsf/docid/A9131AB36EE9448C852570960058B27D>
- Rosshiem, J. (2007). "Hiring Outlook 2007," Retrieved April 26, 2007, from the web site: <http://content.monster.com/articles/3471/18598/1/industry/7/home.aspx>
- Rothberg, S. (2007). "Ernst and Young Becomes First Employer to Use Facebook," *CollegeRecruiter.com*, Retrieved April 24, 2007, from the web site: http://www.collegerecruiter.com/weblog/archives/2007/01/ernst_young_bec.php
- Savage, D. A. (1994). "The Professions in Theory and History: The Case of Pharmacy," *Business and Economic History*, Vol. 23, No. 2, pp. 130-160.
- Schein, E. H. (1997). *Organizational Culture and Leadership* (San Francisco: Jossey-Bass).
- Schneider, M. & Somers, M. (2006). "Organizations as Complex Adaptive Systems: Implications of Complexity Theory for Leadership Research," *The Leadership Quarterly*, Vol. 17, pp. 351-365.
- Stacey, R. (1992). 'Managing the Unknowable,' (San Francisco: Jossey-Bass).
- Stumpf, S. A. "Applying New Science Theories in Leadership Development Activities," *Journal of Management Development*, Vol. 14, No. 5, 1995, pp. 39-49.
- Suarez, F. & Lanzolla, G. (2005). "The Half-Truth of First-Mover Advantage," *Harvard Business Review*, Vol. 83, No. 4, pp. 121-129.

- Sutton, S. G., Arnold, V. & Hunton, J. E. 'On the Death and Dying of Originality in the Workplace: A Critical View of Enterprise Resource Planning Systems' Impact on Workers and the Work Environment,' *Working paper, University of Central Florida*, 2006.
- Thietart, R. A. & Forgues, B. (1995). "Chaos Theory and Organization," *Organization Science*, Vol. 6, No. 1, pp. 19-31.
- Tushman, M. L., Newman, W. & Romanelli, E. (1986). "Convergence and Upheaval: Managing the Unsteady Pace of Organizational Evolution," *California Management Review*, Vol. 29, No. 1, pp. 29-44.
- van Valen, L. (1973). "A New Evolutionary Law," *Evolutionary Theory*, Vol. 1, No. 1, 1-30.
- Waldrop, M. M. & Gleick, J. (1992). *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York: Simon and Shuster).
- Waller Jr., W. T. (1989). "The Concept of Habit in Economic Analysis," *Journal of Economic Issues*, Vol. 22, pp. 113-126.
- Weick, K. E. (1979). *The Social Psychology of Organizing* (Reading: Addison-Wesley).
- Wharton School. "Drawing Lessons from WorldCom," *CNET News.com*, July 14, 2002, Retrieved April 26, 2007, from the web site: http://news.com.com/Drawing+lessons+from+WorldCom/2009-1022_3-943517.html
- White, E. (2007). "Employers Reach Out to Recruits With Facebook," *The Wall Street Journal Online*, January 11, 2007, Retrieved April 26, 2007, from the web site: <http://www.careerjournal.com/columnists/theorypractice/20070111-theorypractice.html>
- Wheatley, M. J. (1992). *Leadership and the New Science: Learning about Organization from an Orderly Universe* (San Francisco: Berrett-Koehler).
- Wheatley, M. J. (1996). 'The Unplanned Organization,' *Noetic Sciences Review* (Spring), pp. 16-23.
- Wilkinson, I. & Young, L. (1998). 'On Competing: Firms, Relations and Networks,' Presented at Research Conference on Relationship Marketing, Emory University (October).
- Zimmerman, B. (1993). "The Inherent Drive towards Chaos," In P. Lorange, B. Chakravarthy, J. Roos and A. Van de Ven (eds.), *Implementing Strategic Processes: Change, Learning, and Cooperation*, (Oxford: Basil Blackwell).
- Zimmerman, B., Lindberg, C. & Plsek, P. (1998). 'Edgeware,' (Irving: VHA).