THE COMPLEXITY SCIENCES AS AN EMERGING ORGANIZATIONAL PARADIGM IN HIGHER EDUCATION: AN EXPLORATORY STUDY

By

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ABSTRACT

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Paradigms are central to our ability to organize and make sense of everyday life. Embodying fundamental ontological truths, paradigms establish the boundaries of a particular view of reality—determining socially acceptable mindsets, expected behaviors, appropriate practice, and possible actions. In every field, current paradigms give way periodically to new paradigms in momentous transformations called paradigm shifts.

The complexity sciences, based on new understandings about the quantum nature of the physical and biological world, are causing paradigm shifts in fields as varied as finance, supply chain management, public relations, and medicine. It is not clear, however, if and how the complexity sciences might influence in higher education.

The purpose of this naturalistic, interpretive study was to explore the influence of the complexity sciences on organizational paradigms in higher education. Executive managers and senior faculty at one major institution in the Midwest were interviewed as part of this qualitative study. Snowball sampling was used to identify 14 participants who participated in semi-structured, open-ended interviews. The data were analyzed to uncover themes associated with participants' perspectives on the complexity sciences in higher education.

Reflexive journaling, peer debriefers, and an external reviewer were employed to establish the study's credibility, based on the criteria of coherence, consensus, and instrumental utility. The study's findings were reported in thick, descriptive detail.

The major findings were: (1) Ideas about organizational change were met with skepticism, as participants felt that true paradigmatic shifts were rare in higher education; (2) While present and future interpretations of the complexity sciences were forthcoming, none of the participants believed that a complexity sciences paradigm is or would become the dominant paradigm in higher education; (3) Dimensions of organizational life were not uniformly thought to be influenced by the complexity sciences now, or considered open to the influence of the ideas in the future; (4) In both the present and the future, complexity science concepts were not consistently interpreted as having an influence on organizational life in higher education; (5) A few participants believed that the current organizational paradigm and a complexity sciences organizational paradigm co-exist in higher education today and that this co-existence would continue into the future; (6) If the complexity sciences were to become the dominant paradigm in higher education, participants believed that managing the human dimensions of perpetual change would be a challenge; and (7) In a complexity sciences organizational paradigm, approaches to leadership and management would be significantly different. The study revealed preliminarily what the complexity sciences might mean for higher education and for organizational change management in higher education.

DEDICATION

To my grandmother,

Margaret Connor Doberneck,

who taught me to embrace change with grace

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CHAPTER ONE

INTRODUCTION

It's all a question of story. We are in trouble just now because we do not have a good story. We are in between stories. The Old Story—the account of how the world came to be and how we fit into it—is not functioning properly, and we have not learned the New Story. The Old Story sustained us for a long period of time. It shaped our emotional attitudes, provided us with life purpose, energized action. It consecrated suffering, integrated knowledge, guided education. We awoke in the morning and knew where we were. We could answer the questions of our children. We could identify crime, punish criminals. Everything was taken care of because the story was there. It did not make men good, it did not take away the pains and stupidities of life, or make for unfailing warmth in human association. But it did provide a context in which life could function in a meaningful manner.

We call the stories paradigms or worldviews, but we are saying the same things: a fundamental shift in basic beliefs and assumptions about the nature of things and the human condition is going on. Because those beliefs and assumptions are among the foundations of human existence, where they change, radical shifts in individual values and societal conditions will follow (Schwartz & Ogilvy, 1983, p. 1).

Stories

This study was about The Old Story and about The New Story. In the end, it turned out to also be about being "in between stories." The Old Story is based on Newtonian, Cartesian, LaPlacian notions of the universe working as clock-like machine. The Old Story is founded on simplicity. The New Story, which has not fully come into being yet, is based on the notion that the universe is a living organism. The New Story is founded on complexity. The Old and the New Story reflect different ontologies, different paradigms. It's all a question of the story. It's all a question of the paradigm.

Paradigms

Paradigms are central to our ability to organize and make sense of everyday life. Embodying implicit and explicit assumptions and fundamental ontological truths, paradigms establish the boundaries of a particular view of reality. Paradigms determine socially acceptable mindsets, expected behaviors, appropriate practice, and possible actions (Barker, 1992; Kuhn, 1996; Smith, 1975). Paradigms provide shared meaning, coherence, and shape to the activities of our everyday lives. They help us make sense of the world (Smith, 1975, p. 19). Broadly construed,

> A paradigm is the set of those beliefs, axioms, assumptions or fundamentals that order and provide coherence to our picture of what is and how it works (Schwartz & Ogilvy, 1983, p. 77).

By providing a picture of "what is" and "how it works," paradigms are "like a map of reality" (Schwartz & Oglivy, 1983, p. 77). The maps may be individual, organizational, or societal maps.

Paradigm Shifts

"There comes a time in the cycles of society where radical breakthroughs...are likely to occur. Change forces reach a breaking point" (Fullan, 1993, p. ix). These breaking points signal that the dominant paradigm is giving way to a new, emerging paradigm. Such momentous transformations are called paradigm shifts. Paradigm shifts are not gradual or incremental; instead, they are dramatic, often sudden, changes in our collective way of viewing reality.

> The transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of an old paradigm. Rather it is a reconsideration of the field from new fundamentals, a reconstruction that changes some of the field's most elementary theoretical generations as well as many of its paradigm methods and applications (Kuhn, 1996, pp. 84-85).

Paradigm shifts force a redefinition of boundaries, expectations, and acceptable norms for practice. Simply stated, paradigm shifts are a "change to a new game, to a new set of rules...And, when we change the rules, the whole world can change (Barker, 1992, pp. 37-38).

The Old Story

The Old Story emerged and gained prominence more than 300 years ago when Sir Isaac Newton's work sparked the Scientific Revolution. The seeds of the scientific revolution were sown earlier by scientists, Pythagorus and Decartes. The Pythagorean tradition promoted the belief that the universe operates according to mathematical principles. Mathematics became "the cornerstone for understanding and expressing the underlying structure of the universe" (Sanders, 1998, p. 47). Decartes viewed nature as fundamentally lifeless and passive, only to be acted upon by outside forces. He believed that all matter, including the human body, operates like a machine with mechanisms that are understandable by the mind's rationale intellect. "In separating the mind from matter, Decartes depersonalized knowledge...separating objective reality from the subjective experience of reality" (Sanders, 1998, p. 45). Together, their views

gave rise to the idea that the nature of the universe could be studied and known through mathematics.

In 1687, in his work, *Philosophia Naturalis Principia Mathematica* (The Mathematical Principles of Natural Philosophy), Newton proposed a new philosophy based on a mechanical, mathematical view of nature. In *Principia*, Newton

unified celestial and terrestrial motion under one set of mechanical principles that could be expressed mathematically;

- proposed new laws of motion, including his well-known third law, which states that for every action there is an equal and opposite reaction;
- proposed that all motion is linear; and
- theorized that the universe is infinite, not finite (Sanders, 1998, p. 48).

Bringing together the ideas of Decartes and Pythagorus, "Newton articulated an entirely new, mechanistic view of the universe that ultimately overthrew the Nature-centered, holistic view that had prevailed for more than a millennia" (Youngblood, 1997, p. 5). The Newtonian-Cartesian notion of the world as a machine took hold in scientific thought, sparking modern physical sciences, and later, "influencing the social sciences—economics, psychology, sociology, anthropology, and others" (Youngblood, 1997, p. 5).

The Old Story, which by the late 1800s had come to fully dominate Western thought, can best be summed up: "nature is a huge machine that operates with order and precision, and whose understanding is accessible only through the power of mathematics" (Sanders, 1998, pp. 49-50).

The New Story

A radically different way of thinking runs through the scientific literature of the late twentieth century. New theories, metaphors, and conceptions of the physical and biological world are coalescing into a distinctly different way of understanding how the world works. This new perspective rejects the linear, machine-like views of the Newtonian-Cartesian world. Instead, it rests on the assumption that natural systems—be they living ones or organizational ones—are inherently dynamic, nonlinear, and uncertain.

The New Story is informed by relativity, quantum physics, neo-evolutionary theory, chaos, and complexity theory (Marshall & Zohar, 1997). The seeds of the new paradigm can be found in other fields, such as neurosciences, as well (see Caine & Caine, 1997; Schwartz & Ogilvy, 1983). Unlike the Old Story, which is founded on simplicity, the New Story is founded on complexity. The word *complexity*, which comes from a Latin root meaning "to entwine," is formally defined as "intricately interconnected or interwoven" (Youngblood, 1997, p. 12). The New Story promotes a living systems view of the world, where complex, adaptive networks or complex adaptive systems function in dynamic relationship to one another (Stacey, 1996, p. 10). The New Story's fundamental premise is that "we do not live in a static, linear, cause-effect world. We live in a world made up of nonlinear, dynamical systems. Our world is full of motion, change, and emergent events" (Sanders, 1998, p. 70).

> The emergent pattern is for the future; it is the underpinnings of future values and beliefs. Its outline is becoming visible; and, as the future paradigm begins to take shape in the years ahead, an understanding of that pattern should aid us in interpreting the meaning of various changes at the societal [organizational,] and individual level (Schwartz & Ogilvy, 1983, p. 13).

Complexity Sciences and New Organizational Paradigms

Innovative managers and leaders in a number of business-related fields have borrowed complexity sciences concepts or have adopted a complexity sciences paradigm completely. They have used these ideas to create flexible structures and innovative processes in their organizations. The complexity sciences paradigm has allowed them to negotiate rapidly changing environments, deal with ambiguity effectively, and manage well despite high degrees of uncertainty. Some well-known examples include:

- **Supply chain managers**—view "deterministic chaos, demand amplification, and parallel interactions" a chaotic forces within the supply chain. Accounting for this uncertainty through improved computer modeling has allowed some companies "to reduce the carrying costs of holding extra inventory by 60-80% (Cook, 2001, p. 29).

- **Delivery companies**—Federal Express re-organized their fleet services based on the idea of self-organization, radically changing package delivery worldwide (Jelenik & Litterer, 1999; Wilding, 1998).

- **Banking**—opening the system to decentralized strategies and targeted marketing has transformed the banking industry through responsive

service to ever-changing environments and consumer markets (Kurtyka, 1999).

- **Credit industry**—Visa International's worldwide success has been attributed to "chaordic principles," an organizational philosophy harmoniously blending chaos and order, competition and cooperation (Hock, 1999).

- **Personal investing**—individual investors have begun to make investments based on complex patterns found in stock market data once considered completely disorderly (Bass, 1999; Peters, 1994; Peters, 1996; Williams, 1995).

- **Public relations**—concepts such as punctuated equilibria, strange attractors, and emergence have been used to analyze and predict changes in public opinion during times of national conflict (Murphy, 2001).

- **Medicine**—new understandings of the immune system based on complex systems theory and new interpretations of test results based on chaos theory are improving diagnoses (The Economist, 1999; Gleick, 1987).

Evidence of the complexity sciences paradigm's influence in other fields, such as telecommunications, nursing, and social work, is growing as well (The Economist 1999).

The Complexity Sciences and Higher Education

Despite the growing influences of the complexity sciences in many fields, education, particularly higher education, seems to be largely uninfluenced by this new way of thinking. "Scholars of the New Science Movement have generally not considered the implications drawn from the paradigm for educational thought" (Walz-Michaels, 1995, p. 8). More often than not, chaos is considered something

"to be managed" or eliminated in the classroom (Abedi, 1991). At the organizational level, much of the change management literature in higher education focuses on "vision and strategic planning, site-based management, strong leadership, accountability and assessment schemes, collegiality and consensus," leadership and management concepts that undergird the old paradigm (Fullan, 1993, p. vii).

The limited scholarship linking the complexity sciences to higher education focuses narrowly on chaos theory in school systems or classroom settings (Braggert 1992; Griffins, Hart, & Blair, 1991; Hunter & Reason, 1997; McPherson, 1995; Newman & Wessinger, 1993; Sawada & Caley, 1985; Sungulia, 1990). Caine and Caine (1997) provide examples of how holistic, brain-based teaching can unleash possibilities for learning at the elementary level. Fullan (1993, 1999, 2001) outlines why a new mindset is needed for contending with the real complexity of dynamic and continuous change at the secondary school level.

Two notable exceptions are Shippengrover (1996) and Cutright (1996-7; 1999; 2001), both of whom explore the relevance of chaos theory (one aspect of the complexity sciences) to planning in higher education (one activity of the organization). To date, the question of if and how the complexity sciences might influence organizational paradigms in higher education has been left largely unexplored.

Purpose

The purpose of this study was to explore if and how the complexity sciences might influence new organizational paradigm(s) in higher education. This study approached the research problem from the perspective of executive managers and senior faculty at one major university in the Mid-west. Two grand-tour research questions were posed.

Research Questions

According to executive managers and senior faculty,

- Are the complexity sciences current influencing a new organizational paradigm in higher education?
- How might the complexity sciences influence future organizational paradigms in higher education?

Because higher education may be "in between stories," the exploratory research questions focused on both the present and the future—on what may already be happening and what might possibly happen in the future.

Definitions

The following definitions were used consistently throughout this study:

- **The Complexity Sciences**–refers to a coalescing collection of theories (relativity, quantum physics, chaos theory, neo-evolutionary theory, and complexity theory) that form a new paradigm. The complexity sciences rest on the assumption that living systems (natural and human) are complex, adaptive, interconnected networks that function in relationship to one another (Stacey, 1996). The phrase *the complexity sciences* was used to refer to this perspective even though other phrases, such as new sciences, quantum paradigm, and new physics, commonly appear in the literature as well.

- **Higher Education**—refers to U.S. institutions offering two-year, four-year degrees, and graduate degrees, regardless of their Carnegie classification.

- **Organization**—is an institution that enables society to pursue goals that could not be achieved by individuals acting alone (Ivancevich & Matteson, 1993, p. 769). In this study, the organization was an institution of higher education, and all of the institution's activities (teaching, research, outreach, operations) were considered.

- **Paradigm**—are the fundamental beliefs, axioms, and assumptions that order and provide coherence to our perception of what is and how it works (Schwartz & Ogilvy, 1983, p. 172).

- **Paradigm shifts**—occur when the dominant paradigm gives way to an emerging paradigm in a momentous transformation. Paradigm shifts create a dramatic change in our collective view of reality, forcing the redefinition of boundaries, expectations, and acceptable norms for practice (Kuhn, 1996).

Significance

This study contributes to three significant areas of scholarship. First it deepens and broadens our perspective, providing a new way of looking at organizations, organizational paradigms, and possible future paradigm shifts. Second, it adds to the scholarship interpreting the complexity sciences in organizational contexts. Third, it suggests what the complexity sciences might mean for higher education. In addition to scholarly contributions, the study provides change management practitioners with insights about using the complexity sciences to lead and manage organizational change in higher education.

Assumptions

Clarifying assumptions at the outset of an inquiry narrows the study's scope and focuses the reader's attention on the research problem. This study rested on the following assumptions:

- **All fields or disciplines experience paradigm shifts from time to time**. This study assumed the existence of paradigms and did not seek to prove if paradigms exist and if paradigm shifts occur. Instead, the study concentrated on exploring the possibility of an emerging organizational paradigm in higher education, one influenced by the complexity sciences.

- **Ideas from one field often trigger the emergence of a new paradigm in another field**. This inquiry did not seek to prove that higher education either leads or follows other fields in adopting the complexity sciences as an organizational paradigm. This study assumed that ideas flow from one field to another.

- **Executive managers anticipate the future in their fields of practice**. This inquiry presumed individuals are forward-looking, naturally anticipating and contemplating possible futures. This study did not seek to prove that the participants were indeed forward-looking. Instead, it sought to explore what they "see" when they look into the future of higher education.

- **The evidence suggests that a paradigm influenced by the complexity sciences is not the dominant organizational paradigm in higher education today**. This study makes no judgment about the current paradigm in higher education; nor does it assert what the current paradigm is. Instead, this inquiry asked participants to speculate about what an organizational paradigm influenced by the complexity sciences might look like for higher education.

- **The results of exploratory research reveal initial understandings of phenomena**. This study did not seek to provide a comprehensive overview of the complexity sciences in higher education; nor were the data expected to reach the saturation point required for theory-building. Instead, this inquiry was designed to uncover preliminary interpretations and understandings that may be used to set the direction for future research about the complexity sciences and organizational paradigms.

Qualitative Approach to Research

Because little is know about the influence of the complexity sciences on organizational paradigms in higher education, this study was an exploratory one. By definition, exploratory research seeks to uncover elemental understandings of the unknown. "The very nature of qualitative inquiry makes it possible to get into the field quickly to study emerging phenomena and assess quickly developing situations in a world of rapid change" (Patton, 1990, p. 135). Qualitative approaches to research are appropriate for exploratory research, especially when "variables cannot be easily identified, theories are not available" (Creswell, 1998, p. 17). In this study, qualitative research is defined as:

> a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible....qualitative research involves an interpretive, naturalistic approach to the world....studying things in their natural settings, attempting to make sense of them, or to interpret phenomena in terms of the meanings people bring to them (Denzin & Lincoln, 2000, p. 3).

Naturalistic

This qualitative study was a naturalistic study, where the researcher studied "things in their natural setting, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them: (Denzin & Lincoln, 2000, p. 3). Studying individuals in their natural settings required the researcher to enter the setting, gain access to the participants, and gather material from the participants as authentically as possible (Creswell, 1998, p. 17).

Interpretive

This study was also an interpretive study. The researcher's central concern was appreciating the phenomena from the participants' perspectives and understanding the meanings they bring to their everyday lives. The researcher explored the "life world" of the participants, a common focus in interpretive inquiry. In particular, the researcher sought to understand the "organizational life world" of executive managers and senior faculty at one major university.

Through interpretive research in a naturalistic setting, the qualitative researcher sought to "builds a complex, holistic picture...[filled with] detailed views of informants" (Creswell, 1998, p. 15). This study was characterized by the eight hallmarks of qualitative inquiry: 1) natural setting, 2) exploratory nature; 3) interpretive character; 4) purposive sampling; 5) self as instrument; 6) inductive data analysis; 7) use of expressive language; and 8) criteria for judging success (Creswell, 1998; Eisner, 1998; Lincoln & Guba, 1985). Chapter Three provides details for each of the hallmarks, while the remainder of Chapter One briefly overviews the research design and methodology;

Methodology

Purposive Sampling

Purposive sampling was used to identify executive managers and senior faculty who were knowledgeable about organizational paradigms and change in higher education (Patton, 1990). Dissertation committee members selected two

individuals who were known to have a broad view of the institution and its members. These two individuals served as the pilot study participants, and at the end of the pilot interviews, they were asked to recommend others at the institution who might comment "thoughtfully on the complexity sciences paradigm and the future of higher education." Using a snowball sampling procedure, additional participants were identified and interviewed. Interviews continued until the data became repetitive and no new major insights were gained (Glasser & Strauss, 1967).

Ensuring Familiarity with the Complexity Sciences

The study required participants to be familiar with both organizational issues in higher education and with complexity science concepts. While the purposive sampling guaranteed participants who were familiar with organizational issues in the academy, another step was required to ensure their familiarity with complexity science concepts. Each participant received a free copy of Danah Zohar's book, *ReWiring the Corporate Brain: Using the New Science to Rethink How We Structure and Lead Organizations* and a copy of the Harvard Business Review's book review of *ReWiring*. These two pieces acquainted the participants with basic complexity science concepts. To allow adequate reading time, the book was furnished to participants at least two weeks prior to their interview. In two instances, the interviews were rescheduled to permit participants adequate reading time.

Participants

In the end, seven men and seven women were interviewed at the institution. Participants selected a location for the interview: 11 were interviewed in their offices, 2 were interviewed elsewhere on campus, and 1 was interviewed at a local restaurant. According to the institution's *2001-2002 Faculty Salary List*, the participants' responsibilities in the organization varied: 6 executive management; 4 student affairs; 2 operations; 1 senior faculty, and 1 external consultant. Three of the executive managers had moved up through the faculty ranks into their current executive management positions within the past two years. Their responses often reflected both a senior faculty and an executive management perspective. The participants were typically 45 to 65 years in age, although two of the participants were younger (30-40 range).

Data Collection

Data from the Participants

The majority of the data was collected through one-on-one interviews with executive managers and senior faculty at the research site. In-depth interviews, lasting between one hour and two hours were organized as semi-structured, open-ended interactions. A non-standard interview format was used to elicit participants' perspectives (Loftland, 1971, p. 76). The interview protocol listed a "sequence of themes" to be covered, as well as suggested questions. At the same time, there was an "openness to changes of the sequence and forms of

questions in order to follow-up the answers given and the stories told" by the participants (Kvale, 1996, p. 124). This flexible format allowed for a dialogue to emerge between the participants and the researcher; it also provided a soft structure for making sure the interview stayed on track. The research questions, interview questions, prompts and probes were organized in the Interview Protocol.

Data from Documents

During some of the interviews, participants shared documents (journal articles, powerpoint presentations, organizational charts, conference papers, etc.) to help illustrate their points. These documents were considered rich sources of data and were included in the data analysis and interpretation.

Data from the Researcher

While much of the data came from the one-on-one interviews, additional data was generated by the researcher and recorded in a reflexive journal. The reflexive journal included different types of entries: reflexive and introspective notations, biases, anticipation of what might happen next, hypotheses, useful questions to ask, and personal frustrations and anxieties (Lincoln & Guba, 1985, p. 281). Decisions about the research design were also recorded, as were evolving interpretations of the data in the form of memos (Miles & Huberman, 1994). Memos noted the emerging themes and provided a place "to think on paper," as the ideas from past readings, theoretical perspectives, participants'

comments merged together. As a result, the analysis and interpretation notes captured in the reflexive journal figured prominently as a source of data.

Data Analysis and Interpretation

Data from the interviews, reflexive journal, and documents were systematically explored to identify themes and uncover meanings. Analysis and interpretation were part of an on-going, iterative process that began while data collection was still underway:

> After completing each interview and then again after finishing a larger group of interviews, you examine the data you have heard, pull out the concepts and themes that describe the world of the interviewees, and decide which areas should be examined in more detail (Rubin & Rubin, 1985, p. 226).

After the interviews were completed, a more detailed analysis was initiated. A thematic code was developed by organizing the data into categories of similar ideas, concepts, or themes (Rubin & Rubin, 1985, p. 238). This code was used inductively to identify patterns in the data, which were subsequently developed into themes corresponding to the research questions.

Reporting the Results

The research findings were reported in thick, rich detail (Geertz, 1973), synthesized from the interview data, the reflexive journal, and the documents. Expressive language was used to "show and not tell" the meanings revealed by the data (Eisner, 1998). Finally, the research results were situated in the context of broader theory and scholarship (Rubin & Rubin, 1985, p. 256).

Establishing Credibility

In this study, credibility was verified from three perspectives: the researcher, the research community, and the participants' community. Reflexive journaling allowed the researcher to clarify her biases at the beginning of the study and to consider the study's trustworthiness as an on-going matter for reflection (Patton, 1990, p. 477). Peer debriefers, two members of the research community, reviewed the data and the research processes at key points during the study. An external reviewer, a prominent figure in the field, examined the study's narrative to attest to its authenticity.

Three criteria for credibility were used in this study: coherence, consensus, and instrumental utility. *Coherence* refers to the consistency and internal logic of the account (Kvale, 1996, p. 238) or to the "tightness of the argument" presented (Eisner, 1998, p. 53). *Consensus* occurs when "there is agreement by competent others that the description, interpretation, evaluation, and thematics...are right" (Eisner, 1998, p. 112). *Instrumental utility* refers to the study's usefulness. To have instrumental utility, a qualitative research must include

> the expansion of perception and the enlargement of understanding...so that others can see and comprehend...if [the research] does not illuminate its subject matter, if it does not bring about more complex and sensitive human perception and understanding, it fails its primary aim (Eisner, 1998, p. 113).

The researcher endeavored to make the conclusions and interpretations as credible as possible within the framework chosen (Eisner, 1994, p. 56). Readers are free to make their own judgments about the quality of the study's craftsmanship (Kvale, 1996).

Delimitations

Organizational Setting

Because this was an exploratory study, one research site was selected. The site was a major university in the Midwest. In the 1998 publication, *On Change I: En Route to Transformation*, The American Council on Education recognized the selected institution as a national leader in organizational change. Recent campus activities focusing on leadership and change have included: a Provost's Summit on Innovation (promoting transformational practices campus-wide), summer workshops on cooperative learning (strengthening undergraduate education), on-going faculty development series (supporting promising junior faculty), and annual retreats (informing executive managers of innovative leadership and management practices).

Scope

The study was further delimited by its scope. Interviews were confined to executive managers and senior faculty only, even though others at the institution (i.e., faculty in higher education administration, faculty studying organizational change, graduate students seeking future careers in higher education, etc.,) may

have had important perspectives on the research problem. This design decision was made to prevent the study from becoming too broad, too quickly.

Focus

This study was designed to explore if and how complexity science concepts might influence organizational paradigms in higher education. This research was not expected to establish boundaries of an emerging organizational paradigm in higher education; nor was it designed to develop or test an organizational change model based on complexity science concepts.

Limitations

Despite methodologically sound research designs and careful execution of the research process, studies are bound by exceptions, reservations, and qualifications (Castetter & Heiseler, 1997). Such limitations refer to the study's potentially inherent weaknesses (Creswell, 1994, p. 110). As is custom, researchers acknowledge potential limitations and employ strategies to minimize them. This study may have been limited by the researcher's background in the social sciences, by the lack of a shared vocabulary for talking about complexity science concepts, and by the participants' elite status at the institution.

Researcher's Background in the Social Sciences

The researcher is a scholar of organizational development and not a biologist, physicist, or neuroscientist. Some warn against social scientists' borrowing ideas from the physical and biological disciplines to explain social

phenomena. They believe the complexity sciences cannot be rigorously applied to the study of social systems, particularly when used metaphorically (Johnson & Burton, 1994, p. 320). However, like others, the researcher believes that

> The problem of incommensurability...cannot be the issue, since research across the borders into other natural and social science has been done (Walz-Michaels, 1995, p. 8).

Lack of a Shared Complexity Science Language

Because naturalistic inquiry relies on interviews with participants, interview data and subsequent interpretations may be limited by the participants' abilities to express themselves linguistically with relative awareness; to convey their feelings without shame or inhibition; and to have an interest in the experience or phenomenon under investigation (van Kaam, 1969). Since the complexity sciences paradigm is not the dominant paradigm in higher education, executive managers and senior faculty may be unfamiliar with the vocabulary or concepts associated with it. They may be hesitant to refer to complexity science concepts during the interview. To reassure participants, I began each interview mindful of their comfort. I employed affirming non-verbal gestures and encouraged participants to respond "using their own words" to minimize any limitations caused by the lack of a shared language for the complexity sciences.

Participants' Elite Status at the Institution

Taking into account who "the other is" is an essential part of qualitative interviewing. In instances where power and hierarchy are defining features of the interview situation, the quality of the interview may be affected by

> the particular position of individual elite subjects, what they have to lose/gain from exposure to questioning, the importance of reputation and so on...determines the extent to which they will "bias," restrict or conceal their "true" selves, thoughts, feelings, and beliefs from the blandishments of the interviewer (Ross, 2000, p. 324).

Throughout the interviews, the researcher worked to elicit "nuanced descriptions that are precise and stringent in meaning and interpretation" (Kvale, 1983). Making use of probes and prompts, I sought additional clarification when needed to assure high quality interview data from the institution's elites (Hammond & Royal, 1998; Patton, 1990).

Organization of the Study

Following this introductory chapter, Chapter Two provides an overview of the complexity science literature, emphasizing scholarship in the organizational sciences. Chapter Three details the research design and methods, including the research questions, pilot study results, data collection methods, data analysis and interpretation techniques, and verification procedures. Chapter Four reports the data by theme and summarizes them by research question. Chapter Five situates the findings in appropriate literature and relevant theory and concludes with suggested directions for further inquiry. Research materials, such as interview protocols, coding samples, peer debriefing and external audit reports, appear in the Appendices for easy reference.

CHAPTER TWO

THE COMPLEXITY SCIENCES: AN INTERPRETATION

> Science is often the harbinger of great changes that overtake human thinking. It draws its inspiration from often vague and tentative, but wider cultural shifts and transmutes them into highly focused, rigorous, clear language, and into powerful images and metaphors...These new scientific ideas can fire the imagination to become powerful new models for thinking in many areas of our personal, intellectual, artistic, and business lives (Marshall & Zohar, 1997. pp. xvii-xviii).

The aim of this literature review is to introduce the fundamental ideas of the complexity sciences. This literature review does not chronicle the history of the complexity sciences, provide a comprehensive overview of its competing theories, or settle the scholarly debates within this emerging field. This literature review does, however, explain the contributions of relativity, quantum physics, chaos theory, biology and neo-evolutionary theories, and complexity theories to our understanding of the complexity sciences. It starts with an overview of the complexity sciences and continues with detailed treatment of each of the five theories contributing to the complexity sciences. The chapter ends with a consideration of what The New Story, based on the complexity sciences, might mean for organizations.

The Complexity Sciences

Over the past decade, a substantial literature has introduced different aspects of the complexity sciences to the general reading public (Gell-Mann,

1994; Gleick, 1987; Holland, 1995; Kaufmann, 1993, 1995; Lewin, 1992; Nicolis & Prigogine, 1989; & Waldrop, 1992). In everyday language, the word *complexity* refers to something intricate or complicated; however, in a scientific context, complexity has a more specific meaning. Complexity refers to interactive, dynamic, or synergistic circumstances. Complexity is generally associated with "broad-based inquiry into the common properties of all living things—beehives and bond traders, ant colonies and enterprises, ecologies and economies, you and me" (Pascale, Millemann, & Gioja, 2000, p. 5).

Our understanding of the complexity sciences is informed by the "new" sciences of the twentieth century—relativity, quantum physics, neo-evolutionary theory, chaos theory, and complexity. Despite their different foci, all of these new scientific theories share common features—they are based on a more holistic, dynamic, relational view of nature. They change the rules of the game the same way; they form a new paradigm. The following sections, explaining different aspects of the complexity sciences, draw heavily from the summative works of Capra (1975, 1983, 1991, 1996, 2002), Hawking (1987), King (2000), Morgan (1997), Sanders (1998) and Talbot (1985).

Relativity

In the early part of this century, French scientist Marquis Pierre-Simon LaPlace promoted the perspective called *scientific determinism*, which is based on the belief that "through mathematics, it is possible to predict everything that will happen by just knowing the existing conditions at an earlier point in time and projecting those into the future" (Hawking, 1987, p. 53). Prediction was possible

because conditions were linearly related to one another, in a uni-dimensional manner. In a universe thought to be static and mechanical, this perspective seemed to make sense (Sanders, 1998, p. 56).

Even before LaPlace, however, distinguished scientists, such as Descartes and Newton, advocated a mechanical model of the universe. From the Newtonian perspective, two fundamental and related propositions described this clock-like universe:

> the whole is nothing more than the sum of its parts, and each part is a discrete phenomenon being isolable from the whole and being a fundamental constitutive element of the system (King, 2000, p. 41).

In the early part of the twentieth century, the atomistic, mechanical view of the universe promoted by LaPlace and others began to give way to another view, when in 1915, Einstein proposed his theory of *general relativity*. Relativity provided a new understanding of gravity, based on the idea that space-time is not flat, but curved. In his theory, both space and time are not static, but dynamic—affecting and being affected by everything that happens in the universe (Hawking, 1987, pp. 29-33). This view of the universe was a dramatic departure from the atomistic, mechanical perspectives supported by Newton, Decartes, and LaPlace. Einstein's theory helped to pave the way for a more relational, dynamic view of the universe.

In summary, relativity theory provides two key insights. First, the whole is greater than the sum of its parts. Second, all parts of the universe exist in dynamic relationship to one another (dynamical relationships).

Quantum Physics

In 1958, Werner Heisenberg's Uncertainty Principle led to the reformulation of mechanics, known as quantum mechanics or *quantum physics.* In quantum physics, the smallest particles at the subatomic level are not solid, static, lifeless bits of matter, as once thought. Instead, they are pulsating bundles of energy known as *quanta*, whose behavior is impossible to measure or predict with absolute certainty (Sanders, 1998, p. 61). This uncertainty is because they exist and interact in a quantum or energetic state that has a number of potential outcomes (Hawking, 1987). This quantum existence and interaction, as Niels Bohr (1958) later wrote, means that "isolated material particles are abstractions, their properties being definable and observable only through their interaction with other systems" (cited in Capra, 1983, p. 80). In other words, "particles come into being ephemerally, through interactions with other energy sources (Wheatley, 1994, p. 32).

It is impossible to study anything separate from ourselves, in this relational universe. This is because our act of observation brings forth manifestations of what we are observing. For example,

> If a scientist structures experiments to study wave properties, the matter behaves as a wave. If the experiment is to examine particles, matter shows up in particle form. The act of observation causes the potentiality of the wave to "collapse" into one aspect. Thus, one potential becomes enacted, while the others instantly disappear (Wheatley, 1994, pp. 35-36).

The objective stance of Newtonian science is simply not possible in a quantum world, where the mere act of observation changes the nature of what is observed. Wheeler calls this the "ethereal act of observer-participantcy" (cited in

Zohar, 1990, p. 45). The universe, therefore, is a participatory one. To be clear, "we do not...*create* reality, but we are essential to its coming forth. We *evoke a potential* that is already present" (Wheatley, 1994, p. 36). The idea of scientific objectivity disappears, in quantum physics, because things cannot exist as observable phenomena without us.

According to Heisenberg, matter possesses two very different manifestations. "Matter can be particles, localized points in space; or it can be waves, energy dispersed over a finite volume. Matter's total identity (known as the wave packet) includes potentiality for both forms—waves and particles" (Wheatley, 1994, p.35). This wave/particle duality is known as the Principle of Complementarity. The two manifestations of matter cannot be studied simultaneously.

As Heisenberg's Uncertainty Principle states, "we can measure position, and thus get a fix on the particle aspect; or we can study momentum and observe the wave" (Wheatley, 1994, p. 35). But we can never measure both at the same time. "While we can measure wave properties, or particle properties, the exact properties of duality must always elude any measurement we might hope to make. The most we can hope to know about any given wave packet is a fuzzy reading of its position and an equally fuzzy reading of its momentum (Zohar, 1990, p. 27).

Central to the quantum world is the idea that "unobserved phenomena are radically different than observed ones (Zohar, 1990, p. 41). Schroedinger's cat,

the classic thought problem, demonstrates the difficult dynamics of measurement in quantum physics.

> A live cat is placed in a box. The box has solid walls, so no one outside the box can see into it. This is a crucial factor, since the problem centers on the role of the observer evoking reality. A device will trigger the release of either poison or food; the probability of either occurrence is 50/50. Time passes. The trigger goes off. The cat meets its fate (Wheatley, 1994, p. 59).

What happened to the cat? Schroedinger argues that the cat is both dead and alive until the moment we observe it. Inside the box, the cat exists as a probability wave. Using Schroedinger's wave function, it is possible to calculate all of the cat's possible states. It is not possible, however, to determine if the cat is dead or alive—that is, until we observe it. When we open to box to look at the cat, we cause the cat's wave function to collapse. Our act of observation makes the cat dead or alive. Before we look in the box, the cat exists as probabilities. After we look in, its fate is determined (Wheatley, 1994, pp. 59-60).

These two principles—and observer/participantcy and wave/particle duality—fundamentally change our relationship to measurement and observation. Quantum physics, therefore, had to be based on a type of mathematics that helps scientists identify probabilities or potential outcomes that arise from the *dynamics of the whole*.

Honoring the dynamics of the whole, quantum physics recognizes that "the fundamental structure of the universe is dynamic behavior expressed as a whole, through its interconnections and relationships..." (Sanders, 1998, p. 62).

This quantum-holographic, relational ontology rejects atomism in favor of holism and posits that

> Everything in the cosmos is made out of the seamless, holographic fabric of the implicate order...it is as meaningless to view the universe as composed of "parts" as it is to view the different geysers in a fountain as separate from the water out of which they flow (Talbot, 1991, p. 48).

According to Bohm's theory of *wholeness and the implicate order*, the universe can be best understood as "a flowing and unbroken wholeness." He views "process, flux, and change as fundamental, arguing that the state of the universe at any given point in time reflects a more basic reality" (Morgan, 1997, pp. 251-252). This reality is called the *implicate* (or enfolded) order and is distinguished from the *explicate* (or unfolded) order manifested in the world around us (Bohm, 1980). Bohm argues that "the explicate order realizes and expresses potentialities existing in the implicate order" (Morgan, 1997, p. 252). That is to say,

> an electron is not an "elementary particle." It is just a name given to a certain aspect of the holomovement...Despite the apparent separateness of things at the explicate level, everything is a seamless extension of everything else, and ultimately, even the implicate and explicate orders blend into each other (Talbot, 1991, p. 48).

Quantum physics replaced the atomistic, deterministic, objective view of the universe as with a view of the universe as energetic, interconnected, and filled with creative potential. The linear, clock-work view of the world of Newton, Decartes, and LaPlace was transformed by recognition that, at the most fundamental level, the universe is an energetic field of connections, relationships, and patterns of interaction. These discoveries associated with general relativity

and quantum physics raised a whole new set of questions: "if, at the most basic level, the world is made out of particles whose structure is actually expressed as a web of energetic relationships and patterns of interaction, what are the implications for how we view life at the macro level?" (Sanders, 1998, p. 62).

In summary, quantum physics provides several key insights. First, when we interfere with a quantum system, we change it (observer/participantcy). Second, when we focus on one aspect of a situation, we abstract that aspect out of the whole and we lose its associated possibilities (wave/particle duality). The questions we ask determine the answers we receive (measurement paradox). Potentiality requires both-and thinking, in place of either-or thinking (dualism). Finally, individual parts are reflections of the whole (implicate/explicate order).

Neo-Evolutionary Theories

As the fields of physics and astronomy moved to embrace a more holistic, dynamic view of the universe, important breakthroughs were being made in other fields as well. In the biological sciences, for example, scientists were beginning to move away from a dualistic view of nature to a more holistic understanding of the complex interrelationships between populations and environments. The classic "nature" versus "nurture" debate was beginning to give way to a more dialectical understanding of the "interactive, interconnecting, not mutually exclusive" relationship between environment and genetics (King, 2000, p. 61). With this more dynamic view of nature, the creative forces inherent in all living systems came to take a more prominent role in scientific theory. To understand neo-

evolutionary theory, one must first understand its predecessors—Darwinian theory and Mendelian genetics.

In 1859, Charles Darwin published his biological theory of evolution in his classic, *The Origin of the Species* and followed it in 1871 with *The Descent of Man*. According to Darwin, all evolutionary variation results from chance variation (later called random mutation) followed by natural selection" (Capra, 1996, pp. 224-225). All organisms evolved from one common ancestor, and over time chance variations in genetic material led to individual differences. More variations come into existence than could survive over time. In a natural process of weeding out, certain individual variations were not passed along. At the same time, others were passed along prodigiously. This natural selection, based on competition and fit, forms the basis of Darwin's well-known evolutionary mechanism—survival of the fittest.

Darwin's theory was based on elementary understandings of how genetic variations are inherited. In his theory, biological characteristics from the parents are passed down to the offspring in roughly a 50-50 split. Genetic variations blended in such 50-50 splits would be diluted over time—a serious flaw in the theory that Darwin himself even recognized. Gregor Mendel, one of Darwin's contemporaries, arrived at the solution through his research on inheritance with peas. Mendel discovered *units of heredity* called genes. Genes did not blend in the process of reproduction, as Darwin thought, but were transmitted from generation to generation without changing their identity. "With this discovery, it could be assumed that random mutations of genes would not disappear within a

few generations but would be preserved, to be either reinforced or eliminated by natural selection" (Capra, 1996, p. 224). Mendel's work laid the foundation of much of modern genetics.

Together, Darwin's theory (gradual changes over time) and Mendel's theory (genetic stability) form the foundations of popular contemporary biology, which posits that "all evolutionary variation results from random mutation—that is, from random genetic changes—followed by natural selection" (Capra, 1996, pp. 224-225). Contemporary geneticists, following in Darwin's and Mendel's traditions, describe the genome as a linear array of independent genes, each corresponding to a single biological trait. For example, if an animal species needs to grow thick fur to survive in a cold climate, it will not respond by growing thicker fur. Instead, random genetic mutations will take place, and those animals whose changes result in thicker fur will survive to produce more offspring (Capra, 1996, p. 225). This perspective can best be summed up by geneticist Jacques Monod, "chance alone is at the source of every innovation, of all creation in the biosphere" (cited in Capra, 1992, p. 114).

Neo-evolutionary theories stand in marked contrast to the perspective of Darwin, Mendel, and many contemporary geneticists. Neo-evolutionary scientists take a systems approach to genetics, focusing not on single genes, but on the dynamics of the entire genome. Neo-evolutionary biologists believe that "a single gene may affect a wide range of traits and that, conversely, many separate genes often combine to produce a single trait" (Capra, 1996, p. 225). To them, the coordinating and integrating activities of the whole genome are importance—

not the traits related to single genes. From the neo-evolutionary perspective, "the genome of an organism is a highly interwoven network, understood through a systemic perspective" (Capra, 1996, p. 226).

Neo-evolutionary theory sheds a different light on evolutionary time, as well. The Darwinian tradition holds that evolution is a *gradual* process of random mutations and natural selection. This means that species will gradually adapt to their environments and reach of point of fit, where they can successfully reproduce and survive. In contrast, neo-evolutionary theory posits that periods of stability coupled with sudden transitions are the mechanisms for evolution. This stability-change pattern is known as *punctuated equilibrium.* In other words, neo-evolutionists believe

> [S]peciation...tends to happen *in punctuate* rather than gradual fashion, and it is likely to occur in very small populations at the periphery of the main population, so that genetic changes [and therefore innovative adaptability] are rapidly transmitted through the population (Gould, 1980, p. 56ff, see also Cronin, 1991, p. 88).

Punctuated equilibrium points to the importance of two other neo-evolutionary concepts—the importance of peripheries and the innovative value of "errors," both sources of life's creativity.

In neo-evolutionary theory, all areas of the system are not considered to be equal in their ability to generate evolutionary leaps forward.

> Although [adaptability and innovation] are indeed quite central to the process of evolutionary development itself, they are certainly not always characteristics that emerge from a system's or species "center," by which I mean its mainstream or orthodox components or processes...[they] tend...to emanate from the "peripheries" of a system, from its "minorities" (King, 2000, p. 65).

The peripheries are privileged over the centers or cores for their inherent innovative or creative properties. For example, the peripheries of ecosystems, especially where two come together, often host a wide ranges of species with special adaptive characteristics. This is true in brackish areas where fresh water and salt water ecosystems meet and in transition areas where urban and rural ecosystems meet.

In these peripheries, special adaptations or efficiencies develop in order to ensure survival. "Intriguingly enough, survival in a complex environment depends upon in part, 'a optimal value of error'" (Nicolis & Prigogine, 1989, p. 236). For what seems like an "error" or "inefficiency" in the center, often becomes the adaptation required for survival in the periphery. A living system not only supports difference and diversity, it thrives because of it. In other words, "error tolerance is the hallmark of natural ecological communities, free markets, and open societies" (Dyson, 1998, p. 92).

Neo-evolutionary theory has recast biological evolution as an avenue of creativity. "The driving force of evolution...is to be found not in the chance events of random mutations, but in life's inherent tendency to create novelty, in the spontaneous emergence of increasing complexity and order" (Capra, 1996, p. 227-228). The insights from neo-evolutionary theory raised a whole new set of questions: How does nature create novelty? What are the processes that support the spontaneous emergence of increasing complexity and order? Chaos and complexity theories help to answer those questions.

In summary, neo-evolutionary theory suggests several new understandings. First, over time, populations evolve to fit specific niches. Environmental limits constrain evolutionary opportunities. Differentiation leads to greater diversity. Second, periods of stability followed by sudden transitions followed again by periods of stability are called punctuated equilibrium. Third, adaptability and innovation are more likely to occur at the edges or peripheries of systems. Fourth, errors or inefficiencies sometimes lead to important adaptations or evolutions that ensure survival (risk-taking, error-tolerance).

Chaos Theory

> Twentieth century science will be remembered for just three things: relativity, quantum mechanics, and chaos. Chaos, they contend, has become the century's third great revolution in the physical sciences. Like the first two revolutions, chaos cuts away at the tenets of Newton's physics.
>
> As one physical scientist put it, "relativity eliminated the Newtonian illusion of absolute space and time; quantum theory eliminated the Newtonian dream of a controllable measurement process; and chaos eliminates the LaPlacian fallacy of deterministic probability: (Gleick, 1987, p. 6).

The word *chaos* in plain language is used to describe conditions that appear to be highly disorganized, turbulent, or volatile. It's a word that implies changeability and movement (Sanders, 1998, p. 65). In science, however, chaos has a more specific meaning. Chaos refers to *dynamical systems* or *nonlinear systems*. Nonlinear dynamical systems are systems that, like the weather, move, grown or change. Because the variables are interacting and changing constantly in response to each other, it is difficult to predict the outcome or future state of a

nonlinear system. As it turns out, most of the world is made up of nonlinear systems (Sanders, 1998, p. 65).

Over the past three decades, many scientists have contributed to our understanding of nonlinear, dynamical systems (Gleick, 1987, Mandlebrot, 1982a, 1982b; Stewart, 1989). In 1986, the Conference on the Royal Society of London defined chaos as "stoachastic behavior occurring in a deterministic system" (cited in Stewart, 1989, p. 17). This definition is inherently paradoxical, as it means that lawless or unpredictable behavior follows certain rules. Stated another way

> We are beginning to discover that systems obeying immutable and precise laws do not always act in predictable ways. Simple laws may not produce simple behavior. Deterministic laws can produce behavior that appears random. Order can breed its own kind of chaos (Stewart, 1989, p. 2).

Despite its paradoxical nature, chaos theorists have identified key concepts associated with nonlinear, dynamical systems. They include: chaos and order, attractors (predictable and strange), edge of chaos, bifurcation points, sensitive dependence on initial conditions, creative potential, perturbations, and far-from-equilibrium states.

Beneath the seemingly chaotic behavior of a nonlinear system, there is order. The word order is not used in the common everyday way to mean quiet, good, or calm. Instead, *order* refers to a "type of self-organizing pattern, shape, or structure created by the attraction or active relationship of the variables making up the system" (Sanders, 1998, p. 66). *Attractors* and *attraction* are important to understand. In its purest sense, attraction is the end state or final

behavior toward which a dynamical system moves. The end state can be either predictable or unpredictable. Chaos theorists have noted that complex systems can fall under the influence of different kinds of attractors. A *predictable attractor* is the end, equilibrium state into which a system naturally settles. For example, if you pick up and shake a snow globe, the snowflakes will eventually come to rest on the globe's floor. The globe's floor is the predictable attractor, for regardless of the snowflakes' random trajectories, they will always come to rest on the globe's floor.

Chaotic systems that never settle into predictable or steady states are said to have strange attractors. The term *strange attractor* describes the behavior of the force or forces that hold the system variables in place. The strange attractor coalesces the energy and creates the system boundaries. At the same time, it allows dynamic activity within those boundaries. For example, hurricanes are held together by strange attractors, as are dust devils and waterspouts:

> No external container or funnel gives [it] its unique form. The dynamic, coherent, and focused system with a recognizable shape is created by the interaction of the variables making [it] up...The attraction and the force of the variables hold the system together and move it along its path (Sanders, 1998, p. 67).

Beneath what is seemingly disorderly, there is an inherent, though sometimes not obvious, order. Chaos theory focuses on these patterns of order and disorder and explains the behavior of chaotic nonlinear systems and their strange attractors (and not on predictable attractors) (Sanders, 1998, p. 66).

When a chaotic system is pushed far from its equilibrium towards the edge of chaos, it encounters a bifurcation point. Bifurcation points are rather like "forks

in the road leading to different futures (Morgan, 1997, p. 265). At bifurcation points, the energy in a system can self-organize through unpredictable leaps into different system states. This is possible when a new set of influences or attractors gains the upper hand and attracts the system's energies into a new configuration. If, on the other hand, the old or dominant attractor can dissipate the new energy, potential changes get dissolved. As a result, the system reverts back to its former state. (Morgan, 1997, p. 265).

Nonlinear systems are teeming with creative potential. Bifurcation points, and their associated attractors, exist as latent potentials within any complex nonlinear system. They represent "choice nodes of creative possibility and creative unpredictability; they feed upon the 'virtual degrees of freedom'" (Briggs & Peat, 1989, p. 143; Gleick, 1987, p. 136). Latent potentials, also called adjacent possibilities, are dynamic, changing over time. Some "adjacent possibilities never existed until a previous possibility had been realized" (Sherman & Schultz, 1998, p. 23). This dynamic latent potential means that change can be introduced at almost any point, and the possibilities for creativity and innovation are infinite (Sanders, 1998, p. 68).

All deterministic description breaks down as a chaotic system crosses the bifurcation point (Capra, 1996, p. 191). "The idea of prediction...is pretty much a nonstarter at all levels of non-linear analysis, even though there is a strong element of *a posteriori* determinism" (King, 2000, p. 52). Chaos theory rejects "the reversibility of time's arrow, and therefore emphasizes historical contingency

and the uniqueness of historical trajectory" (King, 2000, p. 56). We can never truly know a system's history, because

> at each bifurcation point...a flux [occurs] in which many futures [exist]...[One is] chosen and the other[s]...[vanish] forever. Thus, our bifurcation points continue a map of irreversibility of time's arrow (Briggs & Peat, 1989, pp. 144-147; Ruelle, 1991, p. 82).

For the same reason, we can also never predict a system's future. Bifurcation points make it impossible reveal a system's precise future, because its history and minute fluctuations in the environment (sometimes called "noise") influence which branch the system will follow to reach its new state. Prigogine calls this "order through fluctuation" (Prigogine & Stengers, 1984, p. 176).

Chaotic systems are nonlinear systems that display extreme sensitivity to initial conditions. In the early 1960s, Edward Lorenz discovered that "minute changes in the system's initial state will lead over time to large-scale consequences" (Capra, 1996, p. 134). As a meteorologist, he experimented with weather models based on three nonlinear equations and found that "the solutions to his equations were extremely sensitive to initial conditions. From virtually the same starting point, two trajectories developed in completely different ways—making any long-term prediction impossible" (Gleick, 1987, p. 11). Lorenz half-jokingly called this *Butterfly Effect*, referring to the image of a butterfly flapping its wings in Peking having influence on the weather over the Gulf of Mexico (Capra, 1996, pp. 134-135). To be clear,

> The butterfly in China doesn't cause a new weather pattern. That's the old linear logic at work. The significance of the butterfly is that it triggers a small change, that perhaps triggers another small change, and another, that by chance proves to be a significant random element catalyzing

> changes that ultimately shift a system from the influence of one attractor pattern to another (Morgan, 1997, p. 265).

The Butterfly Effect helps to explain nonlinearity, nonlocality, and unpredictability in chaotic systems. Through the Butterfly Effect, small changes multiply rapidly upward, expanding into larger and larger systems, changing conditions all along the way, eventually causing unexpected consequences at a broader level sometime in the future. In other words, small changes do not add up to larger ones in any linear, local fashion. Instead, small changes can lead to qualitatively different states. Or as one science writer asserts, "in complex, nonlinear systems, 2 + 2 = apples." (Kelly, 1994).

Understanding the dynamics of chaotic systems led scientists to other questions: How do changes, such as evolution, fluctuations, and extinction occur? What other dynamics are involved? How do order and structure arise in the midst of constant change? These questions brought them the next level of understanding and, ultimately, the concept of *complex adaptive systems*.

In summary, chaos theory provides several new insights. First, beneath seemingly disorder, there is an inherent order. Lawless or unpredictable behavior follows certain rules. Second, systems that never settle into predictable or steady states are said to have strange attractors. Third, when a chaotic system is pushed far from equilibrium, towards the edge of chaos, it encounters a bifurcation point. At bifurcation points, the system may self-organize into a new state, as the system shifts from one strange attractor to another (self-organization). Fourth, bifurcation pints and associated attractors exist as latent

potentials within any nonlinear system (adjacent possibilities, potentiality). Fifth, all deterministic description breaks down as a chaotic system crosses the bifurcation point. Sixth, chaotic systems display extreme sensitivity to initial conditions (butterfly effect, nonlocality). As a result, long-term predictability is impossible (irreversibility of times arrows), and small changes can multiply quickly into large, systems effects (tipping point).

Complexity Theory

Complex adaptive systems are open, nonlinear, evolutionary systems...that are constantly processing and incorporating new information. Complexity theory describes how the process of adaptation is set in motion by new information, making it impossible to know all of the initial conditions at any point in time (Sanders, 1998, pp. 68-69).

Complexity theory focuses on complex adaptive systems, systems poised at the edge of chaos and order. Complex adaptive systems to do not settle into predictable states (like snowflakes in the snow globe), nor do they dissipate like dust devils or tidal waves as chaotic systems do. Instead, complex adaptive systems change or adapt in response to their own shifting internal and external environments. As such, some complexity scholars believe that complex systems operate in a manner that constitutes learning (Stacey, 1996, p. 11).

Complex adaptive systems are influenced by on-going flows of new information (Sanders, 1998, p. 69). For example, consider a coastal ecosystem off the shore of North Carolina. The water just off of the coast is teeming with a

variety of aquatic plants and invertebrate life. Water fowl and other coastal creatures are part of the ecosystem's fabric—using resources for their own survival and contributing other resources back to the system. The coastal ecosystem remains in this state of dynamic equilibrium until new information enters the system, until something happens to disturb it. Now, imagine a multi-million dollar condominium development along the coastline, complete with a cleared view of the ocean and storm water runoff systems that empty into the sea. The coastal ecosystem is pushed into a period of instability.

Flash forward about ten years and examine the coastal ecosystem. You will find that adaptation has occurred and that a new state of equilibrium has been reached. Some of the plants and animals are gone, but others are thriving and new species or hybrids have emerged. The coastal ecosystem has adapted to the edge of chaos and is poised for new information (Sanders, 1998, p. 69).

In complex adaptive systems, dramatic changes can tip the balance, for a short time, until new adaptation can occur. If the system is sensitive to the new information, it goes through a period of adaptation, out of which a new pattern or shape emerges. And, sometimes the changes are dramatic enough to be recognized as transformative—the system before the change is vastly different than the system after the change.

Complex adaptive systems use the flow of energy and new information to structure and re-structure themselves over time. This process of adaptation is dynamical, relational, and inherently non-linear. It is based both on the system's

history and on its latent potential. Cillers characterizes complex adaptive systems as having these nine core features:

- Complex systems consist of a large number of elements, such that their interactional behavior defies description and understanding by differential equations.

- In order to constitute a complex system, the elements have to interact and this interaction must be dynamic...[over time]. The interactions do not have to be physical; they can also be thought of as the transference of information.

- The interaction is fairly rich, i.e. any element in the system influences, and is influenced by, quite a few others.

- The interactions are non-linear...small causes can have large results, and vise versa. It is a precondition for complexity.

- The interactions usually have a fairly short range, i.e. information is received primarily from immediate neighbors...[but] this does not preclude wide-ranging influence.

- There are loops in interactions...positive...or negative...Both kinds are necessary. The technical term for this aspect of a complex system is *recurrency*.

- Complex systems operate under conditions far from equilibrium....Equilibrium is another word for death.

- Complex systems have a history. Not only do they evolve through time, but their past is co-responsible for their present behavior. Any analysis of a complex system that ignores the dimensions of time is incomplete, or at most a synchronic snapshot of a diachronic process.

- Each element in the system is ignorant of the behavior of the system as a whole, it responds only to information that is available to it locally...our focus shifts from the individual element in the system to the complex structure of the system. The complexity emerges as a result of the patterns of interaction between the elements (Cillers, 1998, pp.3-5).

Complex adaptive systems are holistic, dynamic, and relational. Their meaning emerges from the "relationship between the structural components of the system itself" (Cillers, 1998, pp. 11, 37, & 39).

In this sense, complex adaptive systems can be thought of as self-referential, that is, they are "organizationally closed, autonomous systems of interaction that make reference only to themselves" (Maturana & Varela,1980). These two Chilean scientists base their argument on the idea that living systems are characterized by three principal features: autonomy, circularity, and self-reference. These features lend them the ability to self-create and self-renew (Morgan, 1997, p. 253). They have coined the term *autopoiesis* to refer to this capacity for self reproduction through a closed system of relationships (Maturana & Varela, 1980). *Auto* meaning self refers to the autonomy of self-organizing systems and *poiesis*, sharing a common root with the word poetry, refers to making. *Autopoiesis*, therefore means, self-making (Capra, 1996, p. 97). Autopoiesis is the process by which a system develops its complex structure (Cillers, 1998, p. 90).

While complex adaptive systems are self-referential, they are also enlivened by difference, contradiction, and conflict. Despite the dynamical, relational aspects of the complexity sciences,

> relationalism does not always or even necessarily assume or depend upon cooperation or friction-free mutuality between system elements. In fact difference or "conflict" or contradiction can often help make complex systems more "efficient" as a whole" (King, 2000, p. 78).

Similar to the "tolerance of errors" advocated in neo-evolutionary theory, difference in one part of the system, may, in fact, fuel an adaptation or evolution that moves the entire system forward. As a result, complexity theorists are "not horrified by contradictions and opposites but rather turn them into the forces that vitalize the system (Cillers, 1998, p. 107). From this perspective, it is difference, "relationally articulated, that provides not only meaning, etc., but also the leverage necessary for creative adaptation and adaptability to occur" (King, 2000, p. 79).

This is similar, in fact, to the Marxian dialectic notions of the "unity of opposites" or "the law of contradiction." These dialectic perspectives imply that any phenomenon defines and generates its opposite. For example,

> day and night, hot, and cold, good and evil, life and death, positive and negative are pairs of self-defining opposites. In each case, the existence of one side depends on the existence of the other. We cannot know what is cold without knowing what is hot. We cannot conceive of day without knowing night. Good defines evil, and life defines death. Opposites are intertwined in a state of tension that also defined a state of harmony and wholeness (Morgan, 1997, p. 283).

The complexity sciences, in part, rest in our ability to overcome the either/or reductionist mentality in order to honor the dialectic tensions of parts and wholes, implicate and explicate order, chaos and order, change and continuity, etc.

> Our habit of 'thinking in lines' tends to hamper our ability to think dialectically. We thus fail to appreciate how the seeds of the future are always enfolded in the oppositions shaping the present. A dialectical imagination invites us to embrace contradiction and flux as defining features of reality (Morgan, 1997, p. 419).

In summary, complexity theory provides several key points. First, complex, adaptive systems are open, nonlinear systems that are constantly processing and incorporating new information (adaptation, learning, evolution). Second, they are systems poised at the edge of chaos and order (dialectic tension). Third, complex adaptive systems are influenced by on-going flows of new information. Forth, dramatic changes can tip the balance, shifting the equilibrium for a short time until a new adaptation can occur. Fifth, complex adaptive systems are self-referential (autopoeisis). Finally, complex adaptive systems are enlivened by difference and contradiction (generative tension).

The Old Story

The Newtonian, Cartesian, LaPlacian worldview shaped Western culture and defined modernity for the rest of the world as well. The Old Story consists of a number of deeply rooted beliefs, including:

- The view of the universe as a clock-like machine, composed of separate parts, each functioning individually
- The belief that the past and the future are linearly related to the present and knowable as long as a starting point is defined
- The value of predictability, control, and certainty
- An emphasis on reduction and analysis of smaller and smaller, objectively knowable parts
- An emphasis on hierarchical, centralized authority, power and decision-making
- A belief that there is one, objectively knowable, right way or viewpoint
- A view that efficiency is the ultimate goal (Zohar, 1997).

All of these assumptions have been fatefully challenged by recent events. And, indeed, a radical revision of them is now occurring (Capra, 1996, p. 6).

The New Story

The New Story, based on a different set of assumptions about reality, is becoming clearer. The emerging paradigm can be characterized by the following statements:

- We do not live in a static, linear cause-effect world. We live in a world made up of nonlinear dynamical systems. Our world is full of motion, change, and emerging states.
- The world may appear to be disorderly. But beneath the apparent disorder, there is order. The term "order" does not refer to characteristics such as quiet, calm or good, but instead to a self-organizing pattern, shape, or structure.
- The patterns or shapes are created by the attraction or active relationship of the elements or components of a system.
- We may experience disorder, but we need to ask ourselves, What is beneath the surface? What connections, relationships, and patterns of interaction create the structure beneath the visible activity?
- Because nonlinear systems display a sensitive dependence on initial conditions, a small event in one system can cause tremendous turbulence in another through the Butterfly Effect.
- In complex, adaptive systems, which have the ability to process and incorporate new information, change occurs through a process of adaptation. Through this process a new self-organizing pattern or shape emerges (Sanders, 1998, p. 70).

The new sciences—relativity, quantum physics, chaos, neo-evolutionary theory, and complexity—together form the foundation of the complexity sciences paradigm. They represent an entirely different way of seeing, interpreting, and,

ultimately, organizing in a world of uncertainty, ambiguity, and turbulence. "Understanding the mysteries of life [in this new way] will alter how we think about organizations, management, and social change" (Pascale, Millemann, & Gioja, 2000, p. 3).

While the complexity sciences challenge our current thinking about the physical and biological world, they also raise questions about our understanding of the social world as well. The complexity sciences paradigm raises important new questions about the nature of organizational life, including structure and boundaries, planning and budgeting, and leadership and management. Little research, to date, has explored what the complexity sciences might mean for organizations. What influence are the complexity sciences having on contemporary organizations? How might they influence future organizational paradigms? This study began to explore those questions in the context of higher education.

The study participants were introduced to complexity sciences concepts through Zohar's *ReWiring the Corporate Brain: Using the New Science to Rethink How we Structure and Lead Organizations* (Zohar, 1997). This book was selected because of its comprehensive view of the complexity sciences and for its readability. According to Zohar, the complexity sciences (or new science) can be understood as a series of shifts from the Newtonian-Cartesian perspective to a complex adaptive systems perspective. Those shifts are:

- Atomism to Holism
- Determinism to Indeterminism
- Reductionism to Emergent, Self-Organization
- Either/Or to Both/And

- Absolute space and time to Uncertainty and Relativity
- Actuality to Potentiality
- Subject/Object dualism to participatory universality
- Being to Becoming

After reading the book, they were interviewed about their perspectives on emerging (or potentially emerging) organizational paradigm in higher education. Chapter Three outlines the specific procedures and techniques used in exploring their perspectives.

Summary of Main Points

Relativity Theory Key Points

- The whole is greater than the sum of its parts (holism).
- All parts of the universe exist in dynamic relationship to one another (dynamical relationships).

Quantum Physics Key Points

- Observer/participantcy—when we interfere with a quantum system, we change it (participatory).
- Wave/particular duality—when we focus on one aspect of a situation, we abstract that aspect out of the whole, and we lose its associated possibilities.
    - Dualistic either-or thinking is replaced by holistic both-and thinking (potentiality).
    - The questions we ask determine what we see.
    - Qualitative-quantitative dialectic.
- Implicate/explicate order—individual parts reflect the whole (systems).

Neo-Evolutionary Theory Key Points

- Individuals and populations evolve to fit specific ecological niches.
    - Differentiation leads to diversity.
    - Environmental limits constrain organisms' evolution.
- Punctuated equilibrium means that periods of stability coupled with sudden transitions (disequilibrium, punctuated equilibrium).
- Adaptabilty and innovation are more likely to occur on the edges or peripheries of systems and/or emanate from its minorities (edges, peripheries).

- Errors and inefficiencies, sometimes lead to important adaptations and ensure survival (tolerance of errors).

Chaos Theory Key Points

- Lawless or unpredictable behavior follows certain rules.
    - Beneath seemingly chaotic behavior, there is order (chaos).
- Chaotic systems that never settle into predictable or steady states are said to have strange attractors.
- When a chaotic system is pushed far from equilibrium, toward the edge of chaos, it encounters a bifurcation point.
- At bifurcation points, the system may self-organize into a new state (with the system shifting from one strange attractor to another) (self-organization, emergence).
- Bifurcation points and associated attractors exist as latent potentials within any nonlinear system. Nonlinear systems are teeming with latent, creative potential (potentiality).
- All deterministic description breaks down as a chaotic system crosses the bifurcation point (nonlinearity).
- Chaotic systems display extreme sensitivity to initial conditions (Butterfly effect, nonlocality).
    - Long-term predictability is impossible (unpredictability, irreversibility of the arrows of time).
    - Small changes multiply into large, systemic effects (tipping point).

Complexity Theory Key Points

- Complex adaptive systems are open, nonlinear systems that are constantly processing and incorporating new information.
- They are poised at the edge of chaos and order (dialectic).
- They are influenced by on-going flows of new information.
- Dramatic changes can tip the balance or equilibrium for a short time until new adaptation can occur (learning, evolution).
- Complex adaptive systems are self-referential (autopoeisis).
- They are enlivened by difference, contradiction, and conflict (generative tensions).

CHAPTER THREE

THE EXPLORATORY DESIGN

This study explored if and how the complexity science might influence new organizational paradigm(s) in higher education. A qualitative research design was used to understand the research problem from the perspective of executive managers and senior faculty at one major university. Data collection was guided by naturalistic, interpretivist traditions, and data analysis followed an inductive, iterative process. The findings were reported using "thick, rich" description.

Various aspects of the research design are described in full detail in this chapter. Topics covered include the qualitative research design (pilot study, post-pilot design decisions, snowball sampling), data collection (interviews, documents, research journal), data analysis (constant comparative method, memoing, developing the storyline), criteria for validity (coherence, consensus, and instrumental utility), and verification procedures (reflexivity, peer debriefing, and external review).

The Qualitative Research Design

Need for Understanding

The goal of qualitative research is to arrive at an understanding of "the complex interrelationships among all that exists" (Stake, 1995, p. 37). Qualitative researchers pay a lot of attention to the uniqueness and consider contexts critical for deeper understanding (Stake, 1995). The qualitative approach leaves

everything open and allows the researcher to examine the entire unbounded system of the individual perspectives to arrive at a more thorough understanding. Such an approach is especially appropriate for this study because of so little is know about if and how the complexity sciences might influence higher education.

Naturalistic Inquiry

This qualitative study was a naturalistic study, where the researcher studied "things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them" (Denzin & Lincoln, 2000, p. 3). Studying individuals in their natural settings requires the researcher to enter the setting, gain access, and gather material from the participants, as authentically as possible (Creswell, 1998, p. 17).

Through personal experience (working at the institution for seven years), the researcher was generally familiar with the participants' organizational setting. To gain a deeper appreciation for the perspectives of executive managers, the researcher attended a special retreat in January 2002. Organized by the Provost's office, the retreat introduced the institution's executive managers to strategies required to lead and manage their units in times of uncertainty. At this two-day retreat, the researcher informally met several of the study's participants and gained an understanding of the leadership/management climate of the upper levels of the institution.

Interpretive Inquiry

In interpretivist research, the researcher is concerned with gaining an appreciation for participants' perspectives and with understanding the meanings they assign to their actions. The interpretivist stance assumes that human action, is by definition, meaningful; it also requires the researcher to respect and honor the "life world" of the participants (Schwandt, 2000). Instead of focusing on the personal life worlds of the participants, this study examined their organizational life world. The aim was to understand how the participants viewed the organizational context in which their professional lives unfold.

Role of Researcher

In qualitative inquiry, the fundamental role of the researcher is one of interpreter, requiring a different relationship with the study's participants and necessitating a different relationship with the study's readers. Instead of remaining separate from the research, the qualitative researcher needs to be "in immediate touch with developing events and ongoing revelations, partly to redirect observations and to pursue emerging issues (Stake, 1995, pp. 41-42). In other words, the qualitative researcher is actively engaged in telling the story from the participants' point of view, rather than acting as an expert (Creswell, 1998, p.18). In qualitative research, the researcher's relationship with the reader is different as well. The researcher's aim is the "stimulation of further reflection, optimizing readers' opportunity to learn," which is accomplished in the "ongoing interpretive role of the researcher" (Stake, 1995, 42-43). The researcher's initial

bracketing (setting aside of the researcher's thoughts about the phenomenon before the study begins) is included in Appendix A.

Because interpretation is subjective, it is important for the researcher to clarify biases, state background, and explicate values and judgments that may influence the research. Being aware of the researcher's stance allows readers to take the researcher's perspective into consideration when judging the validity of the research (Creswell, 1994). The researcher's personal beliefs and assumptions shaping the selection of the research problem, the design of the study, and its subsequent interpretations and conclusions are outlined below.

Pilot Study

Lincoln and Guba (1985) suggest that a pilot study with key participants can assist the researcher in focusing on, and testing, certain questions[1]. In May 2001, the dissertation committee also suggested a pilot study for this research project. This pilot study was designed to serve three distinct purposes: 1) to test the interview format and questions, 2) to gain experience with the approach for the interviews, and 3) to identify study participants through a snowball sampling technique.

Two key informants were identified for pilot study interviews. These well-situated, senior administrators, recommended by the chair of the dissertation

[1] The Institutional Review Board (IRB) reviewed the research prior to the pilot study interviews. On July 31,2001, the IRB approved the study, the interview protocol, and the consent form. Because the study spanned more than one year, renewed approval was sought and obtained on June 25, 2002. The original approval letter and the renewed approval letter appear in Appendix B. The approved consent forms and interview protocol appear as Appendices C and D respectively.

committee, were known for their long-standing interest in leadership and management issues in higher education. They were also chosen for their familiarity with a broad spectrum of the institution's individuals and for the substantial length of time they had been at the institution.

In early fall, each pilot study participant was contacted by email to inquire about their interest in being part of the study. The email provided details about the study, including its purpose and the interview questions. Once they expressed an interest, the researcher sent a copy of Zohar's book and a copy of the consent form to them by regular mail. The researcher also contacted support staff to schedule the interview. From the time of initial contact to the interview, between four and six weeks elapsed—allowing sufficient time for the pilot participants to read *ReWiring* and to prepare for the interview.

Both pilot study interviews were held in November 2001. As each interview began, the researcher gave a brief introduction to the study and reviewed the elements of consent—making sure that the participants understood the purpose of the study and their rights in the research process. The researcher also explained how their identities would be held in confidence during data collection, analysis, and reporting. Two copies of the consent form were signed—one for the participant to keep and one for the researcher's records.

The first interview took place in the university's library. The second interview was held in the participant's office. Both interviews lasted approximately an hour and half. During the interview, the researcher took notes by hand and paused when necessary to ask for further detail or to allow time to "catch up" with

the note-taking. At the end of each interview, the informants were asked the snowball question*: Who are others (administrators, faculty, change agents), here at the institution, whom you believe would comment thoughtfully on the complexity sciences paradigm and the future of higher education?* Suggested names, department affiliations, and rationales (if given) were written down in the interview notes.

Immediately following the interview, the researcher completed an Interview Debriefing Form, a set of 6 questions designed to capture immediate impressions about the interview. After completing the debriefing form, the researcher turned to the interview notes to complete passages and to add comments in the margins. The last steps of data collection were to transcribe the hand-written notes into a transcript of the interview and to organize the interview materials in the Data Binder. Immediately following the interview, the researcher also sent a thank you note to each of the participants.

Post-Pilot Design Decisions

First and foremost, the pilot interviews indicated that the area of research—the complexity sciences and emerging organizational paradigms in higher education—was of interest to others thinking about change in higher education. Both participants had plenty to say about the complexity sciences, organizational paradigms, and the future of higher education. Both seemed to have enjoyed the interview and were comfortable sharing their perspectives with the researcher. Their reactions were an important confirmation of the study's relevance and significance.

The pilot study was also an important step in refining the research design. As a result of the pilot interviews, four modifications were made to strengthen the design and methods. They were changed wording of first interview question; added questions on the debriefing form; reviewed literature on interviewing "elites," and most significantly, modified criteria for the selecting the sample. The changes are discussed in detail below.

In the pilot interviews, the lead question was: *What are your overall impressions of the complexity sciences in Zohar's book?* The question was a general one, designed to open up the interview and to allow participants to share their views on the complexity sciences. The intended focus was to be on complexity science ideas. Instead, the first interview question prompted a critical response to the book itself—not the ideas presented in the book. In one instance, the participant gave a thorough page-by-page critique of Zohar's treatment of the ideas. The lead question needed to be re-written so that the emphasis was on the ideas and not the book. As a result, the lead question was changed to: *What ideas did you take away from Zohar's book?* In posing the question, the researcher emphasized the word *ideas* with her voice to further reinforce the question's focus.

To serve as a stronger instrument of reflection, the Interview Debriefing From was expanded from the original 6 questions to 11 questions. In the revised version, the first six questions were designed to capture reflections about the content of the interview. They focused on the essence, visual representations, items of interest, surprises, connections, etc. The remaining six questions were

intended to focus on the process of the interview. They included questions about what went well, what should have been follow-up, what is understood differently, etc. The revised Interview Debriefing Form appears in Appendix E.

To some extent, the participants in both pilot interviews seemed to shift their perspectives—sometimes answering from a personal point of view and other times giving a more official sounding answer. In one instance, a participant paused mid-sentence, collected her thoughts, and changed the nature of her answer significantly. This perspective-shifting indicated that something more might be going on under the surface of the pilot interviews. In response, the researcher turned to the literature on qualitative interviews to learn more about issues related to interviewing an institution's officials.

"Taking into account who the other is" is an essential part of qualitative interviewing (Barker, 1982, p. 109). Where issues of power and hierarchy are a defining feature of the interview situation, the quality of the interview may be affected by the elite status of the participants[2].

At the conclusion of the pilot interviews, 20 individuals had been suggested for the first round of the snowball sample. While the number of

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[2] In the elite interviewing literature, the researcher was alerted to watch for "habitual repackaging of words or ideas," common with elites whose professions revolve around "information commodities" (Gamson, 1995, p. 87). Elites are also known to mentally "'rewind the tape' in search of an appropriate phrase or monologue from past speeches" and for the tendency to "repackage" ideas into more politically correct or suitable phrases (Thomas, 1995, p. 11). The elite interviewing literature listed several techniques for diminishing the effects of status and for mitigating "spin" and for avoiding "the party line" responses often offered by elites (Becker, 1995; Davies, 2001; Gamson, 1995; Hertz & Imber, 1995; Ostrander, 1995; Pierce, 1995; Thomas, 1995; Useem, 1995). Techniques, such as "clarifying the persona of interest" at the outset of the interview, were used to obtain useful information from the participants. Throughout the interviews, the researcher paid attention to obtaining "nuanced descriptions that are precise and stringent in meaning and interpretation" (Kvale, 1983). With the use of appropriate probes and prompts, the research sought additional clarification to ensure high quality data (Patton, 1990). Finally, the dynamics of elite interviewing was a point of emphasis for reflection during data analysis.

suggested participants was clearly sufficient, the nature of their appointment at the university raised an unsettled issue in the study's design. On one hand, a simple snowball strategy was deemed to be the best method for identifying participants at this large institution. On the other hand, having multiple perspectives weigh in on the research problem would undoubtedly strengthen the study's exploratory findings.

The researcher had hoped that the careful phrasing of the snowball question would prompt the informants to suggest individuals from across the full spectrum of the university, or at least from three areas in particular—executive management, faculty involved in research on organizational change, or individuals leading change on campus. The pilot study participants, however, even when prompted (and in one case, when strongly pressed), suggested 15 individuals regarded as executive managers and 5 senior faculty, only one of whom was involved in research about higher education and change.

The design dilemma then became: should the researcher retain the simple snowball sampling strategy, even though it concentrated on executive mangers? Or should she shift to a stratified sampling strategy to ensure participation from the three perspectives? This unresolved sampling question—stay true to the original design or modify the design to ensure multiple perspectives—became an issue for further consideration by the researcher, her dissertation adviser, and ultimately for the full dissertation committee. Deliberations about this design dilemma continued through February and March 2002 (see Appendix F for Chronology of Research Activities).

In the end, and with the dissertation committee's support, the researcher retained the original snowball sampling design. The original design still allowed for the possibility of faculty studying organizational change and/or individuals leading change on campus to be suggested in subsequent rounds of the snowball sample. If these individuals were not suggested in the snowball sample, their perspectives could be explored in a follow-up study.

Participant Selection and Sampling

Sampling in qualitative research focuses on selecting information-rich cases for study in depth. "Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research, thus, the term purposeful sampling" (Patton, 1990, p. 169). With a range of purposeful sampling strategies from which to chose, it is important that "the strategy be selected to fit the purpose of the study, the resources available, the questions being asked, and the constraints being faced" (Patton, 1990, pp. 169-193). For this study, the researcher chose to use a snowball (sometimes known as network or chain) sampling strategy. In a snowball sample, each successive participant is named by a preceding participant. The researcher collects a selection of participants based on referrals. "This strategy is useful in situations where the individuals investigated are scattered throughout populations and form no naturally bounded common groups" (LeCompte, Preissle, & Tesch, 1993, p. 74).

In this study, the snowball sample started with suggestions from the two well-situated individuals in the pilot study. Of 20 individuals suggested, 10

responded with interest in participating in the study (5 either did not respond or were not interested in participating & 5 were not contacted)[3]. At the end of these 10 interviews, the participants were asked for suggestions of other participants. As an element of the research design, the researcher, in consultation with the dissertation chair, decided that additional participants would need to be suggested twice before they were contacted for an interview. This decision was made prior to the 10 interviews. The 10 interviews netted 80 suggestions for individuals to interview. Three of the suggestions were nominated twice. Two were contacted and interviewed; the third one left the institution to take a job elsewhere. Interestingly enough, 12 of the 80 suggestions were for individuals who were already part of the study.

Sample Size and Redundancy

The validity, meaningfulness, and insights generated in qualitative research have more to do with the information-rich cases selected and the observational and analytical skills of the researcher than with the sample size (Patton, 1990, p. 185). In other words, "in purposeful sampling, the size of the sample is determined by informational considerations...procedures...depend on the ...information as the study is carried out rather than on a priori considerations" like pre-determined sample sizes or statistical confidence levels (Lincoln & Guba, 1985, pp. 201-202).

> Sample may be large or small, but it is sufficient when the amount of new information provided per unit of added resource expenditure has reached

[3] Of the five who were not contacted, one was a dissertation committee member, two were the key informants, and two were on sabbatical, away from the university.

> the point of diminishing returns (that is, it would not be profitable to add even on more sample element) (Lincoln & Guba, 1985, p. 234).

Purposeful sampling continues until "redundancy with respect to the information is reached, at which point the sampling is terminated (Lincoln & Guba, 1985, p. 233-234). Redundancy is the "point in field research at which the data becomes repetitive and no major new insights are gained (Glasser & Strauss, 1967). In this study, the snowball sample terminated after the fourteenth interview, when no new ideas were forthcoming.

In early May 2002, 20 participants suggested by the two pilot study participants were contacted by email to ascertain their interest in being part of the study. Once they expressed an interest, the researcher sent a second email providing more of the study's details, including its purpose and the interview questions. At the same time, the researcher also sent a copy of *ReWiring*, a copy of the Harvard Business Review of *ReWiring*, and a copy of the consent form to them by regular mail. In addition, the researcher contacted the appropriate staff to schedule the interview. From the time of initial contact to the interview, between four and six weeks elapsed—allowing sufficient time for the participants to read *ReWiring* and to prepare for the interview. Four of the twelve interviews were rescheduled to allow for additional reading time and to accommodate unforeseen schedule conflict.

Data Collection

Interviews—Data from the Participants

Interviews were the primary way data was collected. The summer 2002 interviews clustered into three groups according to the timing of the participants' second nomination in the snowball sample, the time they needed to read *ReWiring*, and their availability given work commitments and summer vacations. All of the participants selected the location for their interviews: eleven were interviewed in their offices, two were interviewed in common areas on campus (library and union), and one was interviewed at a local restaurant. These interviews took place in settings, familiar and comfortable for the participants.

Interviews naturally sorted themselves into clusters. The first cluster included participants suggested by the two pilot study participants. It consisted of seven interviews, scheduled from June 5, 2002 to June 25, 2002. The second cluster was determined by the two pilot study participants and by participants in the first cluster of interviews. It consisted of three interviews, scheduled between July 5, 2002 and July 12, 2002. The final cluster was established by participants in the first and second clusters. It consisted of two interviews, schedule between July 17, 2002 and August 5, 2002. At that point, only one potential participant (nominated twice in the snowball sample) remained to be interviewed. Unfortunately, he had accepted a position at another university with a start date of August 15, 2002, and was unavailable for an interview. More importantly, however, the data had reached the point of redundancy, making the collection of additional data unnecessary.

In the end, the participants comprised an even gender split—seven men and seven women. The participants' ages varied significantly. Two of the participants were between 30 and 45 years old. Seven of the participants were between 45 and 55 years old. Three of the participants were between 55 and 65 years old. Finally, two of the participants were older than 65 years old.

It is important to note that the snowball sample did not generate an evenly distributed sample across appointment types and institutional roles. Six of the participants were executive managers (senior administrators, such as deans and vice provosts). Two of these six had been promoted from the rank of senior faculty within the year. As a result, their responses included comments from the faculty point of view and the administrative one. Five of the participants worked in areas related to student life and student affairs. Two of the participants worked in the institution's operations. Finally, one of the participants was a full time, tenured faculty member.

The qualitative interview

The very essence of a qualitative interview is the "establishment of a human-to-human relationship with the respondent and the desire to understand rather than explain" (Fontana & Frey, 2000, p. 654). In the qualitative interview, "the phenomenological ideal of listening without prejudice" creates an atmosphere of understanding, so that the participant might relate description of their experiences without interruptions of the interviewer (Kvale, 1996, p. 135). Phenomenological listening or deep listening requires the researcher to be

attentive to "principles of composition, form, sequence, and metaphor" revealed in the participant's speech (Lawrence-Lightfoot & Davis, 1997, p. 12).

In addition to phenomenological listening, the researcher must also be open to the constructivist aspects of the interview interaction. The interview itself is an act of creation, where "knowledge is created *inter* the points of view of the interviewer and the interviewee" (Kvale, 1996, p. 124). This constructivist stance differs from more objective or detached approaches to qualitative interviewing, where the researcher "waits to absorb the information and does little to give it shape and form" (Lawrence-Lightfoot & Davis, 1997, p. 12). Researchers following a constructivist approach acknowledge the influence of the relationship between the interviewer and the interviewee as an intrinsic part of the interview:

> When we talk about the world we live in, we engage in the activity of giving it a particular character. Inevitably, we assign features and phenomena to it and make it out to work in a particular way.
>
> When we talk with someone else about the world, we take into account who the other is, what that other person could be presumed to know, 'where' that other is in relation to ourself in the work we talk about (Barker, 1982, p. 109).

The constructivist interview, then, is shaped the researcher's "personal history, biography, gender, social class, race, and ethnicity and by those of the people in the setting" (Denzin & Lincoln, 2000, p. 6).

The interview questions

In this study, a nonstandard interview format was used to elicit rich, detailed responses, the essence of qualitative inquiry (Loftland, 1971, p. 76).

Semi-structured interviews were organized around "a sequence of themes to be covered" as well as suggested questions. The interview questions (with certain words emphasized vocally) were:

1. Zohar's book is about the complexity sciences. What ideas did you take away from it?
2. Have you seen any complexity science concepts in practice in higher education?
3. What do you think of the complexity sciences as an organizational paradigm in higher education?
4. If the complexity sciences were to influence higher education, what might those influences be?
5. Imagine the complexity sciences as the dominant organizational paradigm in higher education. What would that look like?

An Interview Guide with these questions and the corresponding prompts was used for each interview. At the same time, there was an "openness to changes of the sequence and form of the questions in order to follow up the answers given and the stories told" by the participants (Kvale, 1996, p. 124). This flexible format allowed a natural dialogue to emerge between the researcher and the participant; and at the same time, the interview guide provided sufficient structure to make sure the interview stayed on track.

Probes, follow-up questions, and non-verbal gestures were also used to ensure that the qualitative interviews elicited useful information. "Probes are used to deepen the response to a question, to increase the richness of the data, and to give cues to the interviewee about the level of responsiveness that is desired" (Patton, 1990, p. 324). Probes may be detail-oriented questions (when, who,

where, what and how) or simply be a "list of things to be sure to ask about," or they may emerge spontaneously in the conversation (Fielding, 1993, p. 144). "Because the purpose of open-ended interviewing is not to put something in someone else's mind, but to access the perspective" that is already there, probes and follow-up questions must be carefully constructed so as not to be leading (Patton, 1990, p. 278). In this study, the researcher composed a series of topical probes which were expanded and refined over the course of the interviews. Spontaneous probes were noted in the account of the interview. The Interview Guide, which includes the study's research questions, the interview questions, and the probes, appears in Appendix D.

The interviews were recorded in handwritten notes during the interview. The decision to take notes by hand instead of tape-recording the interviews rested on three key points. First, the researcher wanted the participants to speak freely, without feeling any inhibitions that what they said might be played back for others to hear, even accidentally. This was a concern since several of the participants were senior administrators (vice-provosts). Second, the absence of a tape recorder and tapes made it easier to establish a dialogue with the participants. After a few exchanges, it was possible to slip out of the formality of interviewing and into a scholarly exchange of ideas.

The researcher believes that "there is not a one-to-one correspondence between conversational events that unfold during human interaction and what a researcher transcribes from audio or video-tape recordings" (Lapadat & Lindsay, 1999, p. 72). Salient details—social, temporal, and spatial contextual

information—that are part of interview are largely absent from transcripts; yet, these details are an important record of the interaction, often conveying meanings not transmited through language. In this study, the process of creating transcripts from the handwritten notes can be considered both interpretive and constructive (Cook, 1990; Denzin, 1995; Edwards, 1991; Kvale, 1991; Lapadat & Lindsay, 1999; Mishler, 1991; Ochs, 1979; Poland 1995).

The researcher reviewed the handwritten interview notes immediately following each interview "to make certain that they make sense, to uncover areas of ambiguity or uncertainty, and to review the quality of the information received" from the participant (Patton, 1990, p. 352). These expanded notes were typed into word processing software and saved as a computer file and as a printed paper copies. One printed paper copy served as the official record of the interview and was not marked with any additional notes. A printed copy, with the text appearing on left half of the page only, was used as a working copy for data analysis. Interpretive notes were made in the right margin in different colors of ink, depending on the iteration. A second printed copy, with text appearing on the left side of the page only, was cut apart to make 5x8 data cards to use in the analysis.

The debriefing form

While reviewing the interview accounts, it is important to note other data including non-verbal data that would be helpful in establishing the "a context for making sense out of the interview" (Patton, 1990, p. 353). Because "the

interviewee's lived meanings may be immediately accessible in the situation, communicated not only by words, but by tone of voice, expression, and gestures in the natural flow of conversation," an interview debriefing form was used to capture the non-verbal aspects of the interview (Kvale, 1990, p. 125). A special interview debriefing form was created to focus the researcher's attention on the important non-verbal dimensions of the interview.

The interview debriefing form used in this study started with the interview number, date, and location. Based on the qualitative interviewing literature (Hammond & Royal, 1998; Kvale, 1990; Patton, 1990; Rubin & Rubin, 1995) and upon what was learned in the pilot study, the Interview Debriefing Form included the following eleven questions:

1. Describe the tone of voice, expressions, gestures, and other non-verbal communications that occurred during this interview.
2. How would you capture the essence of the interview in 12 words or less?
3. How would you depict these impressions graphically?
4. When you think over the interview, what was the most interesting thing you learned?
5. What surprised you?
6. What connections or resonances do you so?
7. What am I learning about conducting the interview?
8. What went well? Why? Is there a way to incorporate this into future interviews?
9. What ideas, themes, or unclear statements should have been/should still be follow-up on?

10. Are there things that were said that you understand differently now?

11. What else?

A copy of the interview debriefing form in included as Appendix E. From time to time, the researcher needed extra space for expanded reflections. In these instances, additional pages were appended to the interview debriefing forms to accommodate lengthy impressions, reflections, and questions. Other times, certain questions on the interview debriefing form were left unanswered because they did not apply to the interview. Completed interview debriefing forms were kept in the Data Binder, interfiled with the corresponding interview. Because the debriefing sheets convey insights in the participants' perspectives, the data recorded on them was incorporated into the study during data analysis.

Documents—Additional Data from the Participants

Over the course of the interviews, participants furnished the researcher with a variety of documents to illustrate their points. These documents included websites, draft journal articles, power point presentations, organizational charts, unit vision statements, conference papers, case studies, and, in one case, an entire book. In addition, several participants referred to recent articles published in the *Chronicle of Higher Education*. A complete list of the documents (both furnished and referenced) appears in Appendix G.

While wholly unexpected, these documents were welcome additions to the research record for four reasons. First, the documents were tangible evidence that complexity science ideas resonated with the participants. Not only were the

participants interested in talking about the complexity science ideas during the interview, they were prepared to share concrete examples of the new ideas in action. Their interest in "showing, not just telling" the influence of the complexity science in higher education added a deeper layer to the research data.

Second, the act of giving the documents was a sign that the researcher had established a collegial atmosphere during the interview. Open-ended, phenomenological interviews rely on the openness of the exchange for richness. Their quality rests on the researcher's ability to move beyond the formal interview situation, where an outsider asks a series of pre-determined questions to create a more informal exchange or conversation among peers (Kvale, 1996; Patton, 1990; Rubin & Rubin, 1995). The sharing of the documents was one indication that a certain level of collegiality had been attained.

Third, because more than half of the documents included examples from other institutions of higher education, they served as evidence that the participants' responses went beyond the specific institutional context in which they currently worked. In other words, the documents showed that the participants were considering the interview questions in the context of higher education in general. (Similarly, thirteen of the fourteen participants shared anecdotes or experiences at institutions other than the study site).

Finally, from a methodological point of view, documents contributed to the "stability of information, contextual relevance, richness of information, natural language of the setting" to the research (Lincoln & Guba, 1995). They added an additional texture and layer of meaning, complimenting the interview data. The

documents were kept in the Data Binder, interfiled with the corresponding interview. The documents, like the interview date, were incorporated into the study during data analysis.

The Research Journal—Data from the Researcher

While the majority of this study's data came from the interviews and the documents, additional data was generated by the researcher herself. This data was recorded in a research journal, sometimes known as a field note journal. While each researcher develops a unique way of organizing files and field notes, the field note journal typically includes condensed accounts, expanded accounts, a field work journal, and analysis and interpretation (Spradley, 1979, pp. 75-76). In this study, the researcher compiled five types of records in the research journal, including: 1) accounts of the interview and related records; 2) reflexive (or cathartic) journal entries; 3) methodological discussions and decisions; 4) notes from peer debriefing and dissertation advisor meetings, and 5) preliminary analysis and interpretation. The researcher organized the materials into three, four-inch binders—the data binder, the analysis binder, and the writing binder.

The Data Binder contained condensed and expanded accounts of the interviews, the corresponding Interview Debriefing Forms, and documents furnished or referenced by the participants. The materials were kept in chronological order, with the interview reference number and date clearly marked.

Personal reflections about the research process and about new insights about the research topic were recorded as separate, dated entries and organized

chronologically throughout Data Analysis and Writing binders. The research journal served as a record of experiences, ideas, fears, mistakes, confusions, breakthroughs, and problems that arise during the fieldwork (Spradley, 1979, p. 76). It is "a kind of diary in which the investigator on a daily basis, or as needed, records a variety of information about the self (hence the term reflexive) and method" (Lincoln & Guba, 1985, p. 327).

The research journal also provided "information about the methodological decisions made and the reasons for making them—the information also of great importance" to external reviewers (Lincoln & Guba, 1985, p. 327). As the research evolved, the researcher noted shifts in the research's progress and documented possible reasons for them. The researcher also included reflections on the design and methodology that might be used to improve any follow-up studies. Several times during the course of the data collection and analysis, the researcher met with peer debriefers and with her dissertation advisor to discuss the research design and methodology, as it unfolded. Notes from these conversations were also included chronologically in the Data Analysis and Writing binders.

Finally, the research journal served an important role in the analysis and interpretation of the data. It contained notes representing a "kind of brainstorming," where ideas from past reading, theoretical perspectives, participant comments merge together to form a place to "think on paper" about the content under consideration (Spradley, 1979, p. 76). At this stage, field notes took on a "liminality," possessing the quality of being "betwixt and between,"

conveying the researcher's status of "being in the field, but not of the field" (Jackson, 1990, p. 10). This is where the tensions of "research via living and doing and research via writing" were played out (Jackson, 1990, p. 38). Evidence of how the researcher returned to the data over and over again, considering and re-considering possible themes and ways of representing filled more than half of the Data Analysis and Writing binders.

Data Analysis

The analysis was built upon the naturalistic, interpretive foundations described earlier. The goal was to understand what executive managers and senior faculty think about the complexity sciences as an influence on organizational paradigms in higher education. It was important to distinguish between influences the participants see today and influences that they might anticipate in the future. The researcher used constant comparative analysis, inductive coding, and memoing in the iterative process of analyzing the qualitative data.

Categorical Aggregation and Search for Patterns

The process of categorical aggregation and search for patterns involves "winnowing the data, reducing them to a small, manageable set of themes" (Creswell, 1998, p. 144). The researcher used an inductive, iterative process throughout the data analysis. The researcher read and reread the interview transcripts and documents several times to get a general sense of their content.

Preliminary notes were made on the margins of the transcripts to indicate places where the participants made specific comments on complexity science concepts and on key aspects of organizational paradigms in higher education. The researcher also made logs of images and metaphors, sketches and drawings; references to other institutions, and particularly vibrant quotes. At this point, the analysis process moved in many directions, with much recycling of the data taking place.

At the same time, the data from the interview transcripts was unitized; that is, it was broken into smaller bits and pasted onto 5x8 index cards. The researcher paid close attention to breaking the data into *meaningful* fragments that could stand on their own. In some cases, notes were added to the index cards to relate the broader context in which the data had been generated. On the back of the data cards, the origin of the data was noted (see Appendix H for codes).

Constant Comparative Analysis

The researcher continually coded and analyzed the data using a constant comparative method to identify emerging themes, to understand their relationships to one another, and to interpret and connect the themes holistically (Strauss, 1987). As key words, themes, or patterns began to appear in the text of one interview, the researcher would reread the other interviews to looking for those keywords, themes, and patterns. As the process was repeated, a list of themes and codes emerged from the data over time.

In general, "data-driven codes are constructed inductively from the raw information. They appear with the words and the syntax of the raw information" (Boyatzis, 1998, p. 30). In some cases, however, different participants used different words to refer to the same concept. The researcher kept the participant's original wording on the transcript margin and then noted the wording that was developing in the code along side of it. The wording in the code was closely matched to words used by other participants.

At the same time, the researcher also worked with the data cards sorting them into categories using the constant comparative method. The researcher sorted and re-sorted the data cards, grouping them into broad categories. The categories shifted considerably during the sorting process, as some broad categories were broken into small, more specific categories and as small categories were clustered with broader ones.

Developing the code

Rules for sorting and coding the data emerged. These rules included what should be included in a category (rules for inclusion) and what would disqualify data from being included (rules for exclusion) (Boyatzis, 1998, pp. 41-53). Towards the end of the sifting and sorting process, elements of a "good code" had been developed. They included a label; a definition of what the theme concerns; a description of how to know when the theme occurred (rules for inclusion); a description for any qualification or exclusion to the identification of

the theme (rules for exclusion); and examples, both positive and negative, to eliminate possible confusion (Boyatzis, 1998, pp. x-xi).

Memoing

An important step in the development of themes was memoing. Memoing refers to notes written by the researcher about the process of data collection and analysis. Memos serve as a way to make the researcher's "continual internal dialogue" explicit.

> Memos are an essential part of those dialogues, a running record of insights, hunches, hypotheses, discussions about the implications of codes, additional thoughts, and whatnot. Cumulatively, the memos add up to and feed into the final integrative statements and writing for publications" (Strauss, 1987, p. 110).

In this study, memos were kept separate from the original data and were stored in the Data Analysis binder. When an idea occurred during analysis, the researcher interrupted work with the data and the codes to write a memo. These memos were called "time out" memos and were interfiled in the data analysis notes. Other times, memos were written at the conclusion of working with the data. They, too, were interfiled with the data analysis notes. Memos also contributed to the final integrative analysis.

Search for Patterns & Development of Themes

The search for patterns is to look for "consistency within conditions." Important meanings may emerge from single instances, but more often they will come from "reappearance over and over" (Stake, 1995, p. 78). During this phase

of the analysis, the researcher carefully worked back and forth between the transcripts, margin notes on the transcripts, the data cards, the data card clusters, memos, and other notes in the research journal. The researcher focused on themes that appeared over and over again and looked for single instances representative of patterns. In reducing the data, the researcher organized the patterns and themes into classifications.

> Classification involves identifying five or six general themes. These themes, in turn, I view as a "family" of themes with children or subthemes, and grandchildren represented by segments of data (Creswell, 1998, p. 144).

Some of the data was set aside because it was not part of the "family of themes." For examples, the "set aside" data were repetitious or did not address the research questions.

Reporting Format for the Data

Once the themes were developed, a narrative text emerged mingling together the participants' stories, voices, and metaphors, the researcher's personal perspective, and ideas in the literature. In reporting the data, the researcher's goal was to "capture meaningful portraits of human experience rather than accurately and precisely define the experience" (Husband and Foster, 1987, p. 56).

Themes emerging from the data were written using "think, rich description" (Geertz, 1973). The purpose of such detailed description is to create verisimilitude—writing that produces the feeling that the readers have experienced, or could have experienced, the events being described in the study

(Creswell & Miller, 2000, p. 128). A well-crafted narrative is also a sign of quality research. It enables the readers to determine independently if the information in the narrative could be transferred to other situations because of the apparent and clear characteristics reflected in the writing (Erlandson, Harris, Skipper & Allen, 1993, p. 32). In the end,

> The quality of craftsmanship results in products with knowledge claims that are so powerful and convincing in their own right that they, so to say, carry the validation with them, like a strong piece of art. In such cases, the research procedures would be transparent and the results evident, and the conclusions of the study intrinsically convincing as true, beautiful, and good. Appeals to external certification, or official validity stamps of approval, then become secondary. Valid research would in this sense be research that makes questions of validity superfluous (Kvale, 1996, p. 252).

Standards of Quality and Verification

Just as quantitative researchers verify the validity and reliability of their studies, qualitative researchers ask "Did I get it right?" (Stake, 1995, p. 107) and employ procedures for determining if their study is believable, accurate, or "right" (Creswell, 1998, p. 193). "Getting it right" in qualitative research is often a matter of conveying new understandings, authentic or "deep...knowledge that come from visiting personally with participants, spending extensive time in the field, and probing to obtain detailed meanings" (Creswell, 1998, p. 193).

While quality craftsmanship may speak for itself, other ways of ascertaining the quality of a study are also necessary. The quality of a study relies upon both the criteria of quality and the process for verification:

> verification is a *process* that occurs throughout the data collection, analysis, and report writing of a study, and standards as *criteria* imposed by the researcher and others after the study is completed (Creswell, 1998, p. 194).

Qualitative researchers often rely upon the "views of people who conduct, participate in, or read and review the study" to establish credibility (Creswell & Miller, 2000, p. 125). Considered to be different "communities of validation," the interviewed subject, the general public, and the research community respond to questions of credibility from their respective perspectives (Kvale, 1996, p. 217). Correspondingly, credibility in qualitative research may be established through different lenses, those of the researcher, the participants, and individuals external to the study, including the lenses of the general public and the theoretical community (Creswell & Miller, 2000; Kvale, 1996).

In this study, credibility was established through three lenses—those of the researcher, individuals external to the study, and the theoretical community. The verification procedures, which included reflexivity, peer debriefing, and external review, permitted the different "communities of validation" to consider the study's credibility from their perspective. The criteria for quality, including coherence, consensus, and instrumental utility, were chosen for their alignment with the study's purpose, design, and methodology. The different communities of validation, the criteria for quality, and the verification procedures are discussed in greater detail below.

Criteria for Quality

Coherence

Coherence refers to the consistency and internal logic (Kvale, 1996, p. 238) or the tightness of the argument presented in the research (Eisner, 1998, p. 53). A coherent study emerges from "the confluence of multiple sources of evidence," supporting each other, as the picture, like the image in a puzzle, becomes more distinct with the addition of each new piece (Eisner, 1986; Eisner, 1998, p. 56). In this study, the multiple sources of data included interview data, research journal, documents furnished by the participants, and ideas presented in the literature. These pieces were woven together as themes in Chapter 4 to create a coherent credible picture of the participants' view on organizational paradigms.

Consensus

Consensus can be defined as "agreement among competent others that the description, interpretation, evaluation, and themes of the study are right" (Eisner, 1998, p. 112). In reaching consensus, one might ask: Are the findings and interpretations reported by the researcher consistent with experience? Are the findings and interpretations consistent with the evidence presented? Consensus is a thorny criterion for quality, "as different critics might attend to different dimensions or be sensitive to different aspects of the work" (Eisner, 1998, p. 113). In addition, the findings of exploratory research may not be found

to be consistent with the views of the academy. In those situations, not finding consensus may, in a paradoxical sense, be an indication of the study's value. In this study, peer debriefers and the external reviewer served as the "competent others" assessing the "rightness" of the findings and interpretations.

Instrumental Utility

Instrumental utility refers to the most important test of any qualitative study—its usefulness (Eisner, 1998, p. 58). Qualitative studies may be deemed useful in two senses—they may shed light on current phenomena or they may reveal insights into future situations. In both cases,

> the major function [of qualitative research]....is expansion of perception and the enlargement of understanding. [Researchers] speak so others can see and comprehend...If [research] does not illuminate its subject matter, if it does not bring about more complex and sensitive human perception and understanding, it fails its primary aim (Eisner, 1998, p. 113).

Understanding is possible when a researcher is able to "identify critical elements and write plausible interpretations from them" (Wolcott, 1994, p. 366). Whether those critical elements and interpretations are conveyed as a realist's tales, confessionist's tales, or impressionist's tales (Van Maanen, 1988, p. 7), good qualitative studies reveal "situations that would otherwise be enigmatic or confusing" (Eisner, 1998, p. 58). Good qualitative studies are also useful in anticipating the future. Qualitative studies may be deemed useful if they serve as guides to the future, calling attention to aspects of a situation or place that we might have otherwise missed.

> If the guide is useful...we may understand more than we would have without the benefit if the guide. The good guide deepens and broadens

> our experience and helps us understand what we are looking at (Eisner, 1998, p. 59).

This study's instrumental utility was shown in the way in which it reveals a deeper understanding of the participants' current perspectives on organizational paradigms and in the way in which it uncovers and conveys nuanced descriptions of the future.

Verification Procedures

Reflexivity

Reflexivity was achieved in two distinct ways. At the outset of the study, the researcher clarified her position, outlining biases, values, or assumptions that may impact that inquiry (Hammersley & Atkinson, 1995; Merriam, 1998). This initial full written account of the researcher's experience was documented in the research journal. A shorter version appears in Appendix A. These bracketed reflections served as the starting place for the researcher to record her unfolding understandings throughout the data collection and analysis processes.

The study's credibility was also an on-going matter for reflection. As the study unfolded, the researcher returned to these data "over and over again to see if the constructs, categories, explanations, and interpretations make sense" (Patton, 1990, p. 477). This process of iterative, reflexive interaction between the researcher, the topic, and the sense-making process may be referred to as "validity-as-reflexive accounting" (Altheide & Johnson, 1994, p. 489). The

interview debriefing forms and research journal served as a record of "reflexive accounts."

Peer Debriefing

Peer debriefing is the review of the data and research processes by someone who is external to the study, yet familiar with the research or the phenomenon being studies (Creswell & Miller, 2000, p. 126). The peer debriefer serves as a "devil's advocate," an individual who keeps the researcher honest, asks hard questions about the methods, meanings, and interpretations; and provides the researcher with an opportunity for catharsis by sympathetically listening to the researcher's opinions (Creswell, 1998, p. 202; Lincoln & Guba, 1985, pp. 308-309).

Two peer debriefers assisted with this study. One was chosen for her expertise in qualitative research methods; the other for her familiarity with community and organizational development. The researcher met with the peer debriefers three times during data collection and analysis. Written accounts of these meetings were kept in the field note journal.

As the final research report took shape, the peer debriefers reviewed a draft of the dissertation to comment on the quality of this study. Both peer debriefers commented on the researcher's openness to learning from the participants, her commitment to staying grounded in the data, and her dedication to surfacing new insights through reflection. One peer debriefer suggested the addition of a short "postscript (similar to Appendix A) where the researcher talks

about her joys, frustrations, and complications" associated with the research. In response, the researcher wrote a Reflective Afterword which follows Chapter Five. The peer debriefers' full comments appear as separate reports in Appendix I.

External Review

External reviews are used to determine a qualitative study's credibility through the lens of an individual external to the study (Lincoln & Guba 1985; Merriam, 1998). External consultants may be brought in to formally examine both the product and the process of the research account, assessing accuracy through a complete examination of the audit trail (Creswell, 1998, p. 203). External reviewers may also be readers who examine the narrative account and attest to its credibility (Creswell & Miller, 2000, p. 126). In this study, one external reviewer was asked to read the final research report and comment on whether the findings and interpretations are "consistent with his own experience." The external reviewer was chosen for his prominence in the field. The letter soliciting his review and his review appear in Appendix J.

CHAPTER FOUR

INTERPRETATIONS

This chapter reports the findings of this study. It is organized into three main sections—General Observations, Exploration of Themes, and Interpretations and Findings. General Observations provide broad brushstroke interpretations of the participants' views on the nature of change in higher education. While the general observations do not directly answer this study's research questions, the researcher believes they are essential, nevertheless, as they help to set the context for interpreting the study's data and findings. Exploration of Themes reports the themes that emerged from the data including the participants' interpretations, the complexity sciences organizational literature, and the researcher's reflections. The final section, Interpretations and Findings, situates the study's findings in the context of the research questions and the literature summarized in Chapter Two.

Throughout this chapter, the data and findings are a blend of interpretations made by the participants, found in the literature, and made by the researcher. It is important to note that the findings in this study are not findings of fact; rather, they are interpretations, the appropriate results of the naturalistic, interpretive study, as outlined in Chapter Three.

General Observations

The general observations convey the researcher's "broad brushstroke" interpretations of the data. Unless otherwise noted, they are drawn from the interpretations of all of the participants.

First, participants expressed wariness and weariness about organizational change in higher education in general. They were skeptical of change initiatives, because they had experience with many change programs that used "new" language for the same practices or that had made temporary improvements only to drift back to the same practices in a very short time. To them, true organizational transformations (or paradigm shifts) are rare.

Second, while all of the participants shared interpretations of current complexity science concepts in practice and speculated about the possible influence of the complexity sciences in the future, none of the participants believed that the complexity sciences are or will become the dominant organizational paradigm in higher education. At most, one participant believed that a complexity sciences paradigm may co-exist with the current dominant paradigm. She did not believe, however, that the complexity sciences would ever become the dominant paradigm in higher education.

Third, the participants shared examples where complexity sciences concepts are or would be considered to be influential. The participants also shared examples where the complexity science concepts are not now, nor are they anticipated, to influence organizational paradigms in higher education. This both-and interpretation echoes Zohar's belief that "the new science *incorporates* the old. Quantum physics does not invalidate Newtonian physics. It just shows that Newton's laws are restricted to one band of reality. But they are still necessary and useful (Zohar, 1997, p. 6). These participants believe that the dominant organizational paradigm and the complexity sciences paradigm co-exist in higher

education. They believe the two paradigms complement one another, not compete with one another, because they have influence over different aspects of the organization.

Fourth, the participants recognized that the complexity sciences paradigm is a paradigm of perpetual change. From their perspectives, managing the human dimensions of perpetual change (coping with loss, making transitions, re-forming identities) is a major area of concern for participants. None of them felt that Zohar's treatment of the emotional or human dimensions of perpetual change was adequate.

Finally, by and large, the participants felt Zohar provided inaccurate and/or insufficient details about leadership and management in the complexity sciences paradigm. They recognized that individuals leading from the complexity sciences paradigm would need a different set of "leadership tools" and were disappointed when she provided only a cursory treatment of dialogue and servant leadership. Much of what they shared reflected their own ideas about what "the new sciences" leadership and management would look like.

Exploration of Themes

This section begins with an overview of the themes that emerged during data analysis. The remainder of the section is an exploration of those themes, arranged by dimension of organizational life—structure and boundaries; planning and budgeting; leadership and management—that emerged inductively from the data.

Presentation of the Data

Each of the themes is described using the participants' own words, blended with quotations from the complexity sciences organizational literature and with the researcher's reflections. The participants' words appear as single-spaced, indented quotes followed by the interview number in parentheses. Some identifying information has been included with each quote, though proper names and complete identifying information have been purposefully removed from the participants' accounts in order to ensure their anonymity and to minimize consequences (positive or negative) of their interpretations.

Quotes from documents submitted by the participants and quotes from the literature appear in the data section as well. Woven in and out of the participants' accounts, document and literature quotes are single-spaced, indented, and include a standard bibliographic citation including page numbers. Finally, the researcher's voice appears as double-spaced text throughout the data section.

Overview of Themes

Several themes emerged from the data during data analysis. They are related to three dimensions of organizational life: structure and boundaries; planning and budgets; and leadership and management. The dimensions of organizational life with the corresponding themes from the data are listed below. A synopsis of the theme is listed as well.

Structure and Boundaries

It's a network model—it's centralized and decentralized at the same time describes instances where the organization's internal structure is both highly centralized and decentralized at the same time.

There's an energy at the edges points out the critical role edges play in an organization's ability to innovate, exchange new ideas, and revitalize itself.

An amoeba, a web, a network, and a matrix is a speculation about what higher education's future organizational structures may look like.

The boundaries are shifting spells out several ways in which internal (within the organization) and external (between the organization and the environment) boundaries are becoming blurred through partnerships, arrangements, and collaborations.

Planning and Budgets

It came. It went. Nothing is forever anymore characterizes the ephemeral nature of organizational activities and honors the cyclical demise of a good idea whose time has come to end.

...even if it's not in our annual report points out the shortcomings inherent in long-range planning in unpredictable times and questions if it's possible "to plan" our way to the common good.

Somewhere there's "a middle" advocates a middle ground between relying on centralized, pre-determined plans and completely trusting emergence to guide our activities.

There's the problem with the metric is a chorus of shortcomings associated with the current system of measuring and evaluating performance, with little speculation about what the future holds.

Leadership and Management

You must constantly regain your balance discusses how a world of permanent whitewater changes the conception of good work and outlines the challenge of helping others learn to navigate to constant change.

The bodies are weak, the spirits are strong details the emotional or spiritual toll perpetual change causes and describes the emotional intelligence leaders and managers need to encourage others to adapt to changing times.

There has to be room for the rogues talks about the importance of mavericks or deviants in any organization, the ways in which a counter-culture is a benefit, and what leaders/managers must be aware of to help them both thrive.

A part of one, apart of one another emphasized the importance of difference, diversity, and conflict as sources of generative tension and skills leaders/managers need to have to turn negatives into positives.

A bunch of condescending mumbo, jumbo characterize a central critique of the complexity sciences—the difficulty in translating them for broad audiences.

Structure and Boundaries

The image of an organization is closely associated with its organizational structure. Structure refers to "the formal pattern of how people and jobs are grouped in an organization" (Ivancevich & Matteson, 1993, p. 769) and to the "established patterns of interacting and of coordinating the technology and human assets of the organization" (Ivancevich & Matteson, 1993, p. 771). Mintzberg identifies five common organizational structures or configurations: the machine bureaucracy, the divisionalized form, the professional bureaucracy, the simple structure, and the adhocrasy (Mintzberg, 1979). The machine bureaucracy and the divisionalized form are highly centralized. They are effective when the task and the environment are simple and stable and when they are

"product driven" or "efficiency driven" rather than "market driven" or "environment driven" (Morgan, 1997, p. 51).

The professional bureaucracy, though still centralized, affords greater autonomy to staff. It is an appropriate structure when the environment is stable and the tasks are fairly complicated. The professional bureaucracy has proven to be effective for "universities, hospital, and other professional organizations where people with key skills and abilities need a large measure of autonomy and discretion to be effective in their work" (Morgan, 1997, p. 51). Professional bureaucracies are often challenged, however, by rapid changes in the external environment.

The simple structure organization and adhocrasies work well in unstable environments where speedy, flexible decision-making creates a competitive advantage. Simple structures are well suited for entrepreneurial organizations, where tasks are typically not complex. Adhocrasies are organizations, often temporary by design, suited to perform complex, uncertain tasks in turbulent environments. "They involve project teams that come together to perform a task and then disappear when the task is over, with members re-grouping in other teams devoted to other projects" (Morgan, 1997, p. 52).

Mintzberg's five organizational structures vary according to the degree of centralized authority, the nature of the environment, the complexity of the task, the measure of autonomy and discretion afforded to staff, and the organization's "drivers." Additional dimensions of organizational structure include division of labor (degree of specialization), departmentalization (homogeneous,

heterogeneous), and span of control (few, many) (Ivancevich & Matteson, 1993, p. 502). Typologies of organizational structure and the variables that help define them give the impression that organizations can be identified as discrete types. Morgan notes, however, that "organizational characteristics are often distributed in a more continuous way. One form tends to blend with another, producing organizations that hybrid patterns" (Morgan, 1997, p. 55). This blending of organizational structure is related to the crispness of organizational boundaries.

A boundary is "the interface between different elements of an organization. Boundaries exist between different work groups or departments within an organization and between the organization and its environment" (Morgan, 1997, p. 181). Internal (within) organizational boundaries and external (with the environment) organizational "boundaries help create a sense of identity, because they make it possible to know the difference between one thing and another" (Wheatley, 1994, p. 28). Structure and boundaries give our organizations well-defined edges where it is possible to tell where one department or activity stops and the other begins. Structure and boundaries also communicate a formal sense of organization, identifying where the leadership is centered, codifying predictable paths of communication, and defining appropriate levels of participation (Pascale, Millemann, & Gioja, 2000, p. 13).

The complexity sciences challenge our conventional understanding of organizational structures and boundaries. Relativity theory and quantum physics question the fundamental premise of "separateness, constituent parts, and their influence on each other across their separateness" (Zohar, 1990, p. 69).

Reflecting a new interpretation of living systems, neo-evolutionary theories suggest a world composed of dynamic, inter-related networks—where the parts affect the whole, as the whole affects the parts and where specialized niches enable adaptation to occur. Chaos and complexity theories identify informal, non-linear, non-local forces as significant forces at work in living systems.

Participants in this study shared their interpretations of how the complexity sciences might influence the structure and boundaries of organizational life in higher education. They identified contemporary examples of networked structures and discussed the critical role of organizational peripheries. Participants also speculated about possible future structures for higher education and considered ways in which higher education's boundaries may shift to adapt to new internal and external forces. Their ideas on structure and boundaries coalesced into four themes:

- **It's a network model—it's centralized and decentralized at the same time**
- **There's an energy at the edges**
- **An amoeba, a web, a network, and a matrix**
- **The boundaries are shifting**

It's a network model—it's centralized and decentralized at the same time.

After years of a highly centralized, bureaucratic structure, career services changed its operating philosophy and reconfigured its services, space, and staff accordingly. The new approach relies upon a network philosophy and structure. "Networks are comprised of two main ingredients: nodes and connections" (Pascale, Millemann, & Gioja, 2000, p. 126). In the case of career services,

nodes are places or spaces where individuals meet with career services staff, and connections are ways of bringing people into relationship with one another more conveniently. One participant, early in his career, explained how the newly re-configured career services unit used a network model. He shared:

> *Career Services and Placement wouldn't be centralized, like it had been in the past. It wouldn't be decentralized either. In the new model, there would kind of be a hub and some network nodes. Leer would be one hub and serve the business field—not just the business school—but the whole field. The current career services building would be the hub for human services, public service, health, and nonprofits. A third hub, which has yet to be built, would serve science, technology, and media. It's a network model—it's centralized and decentralized at the same time (I-14).*

In addition to creating more nodes, the reconfigured career services office placed its staff "out in the field," assigning individual staff members to specific disciplinary clusters and requiring them to spend part of their week circulating among students, staff, and faculty in their assigned fields. The field agents are responsible for strengthening the connections between the clients and career services.

A brochure documenting a similar transformation (from a hierarchical model to a network model) was shared by the participant to illustrate his point even further. The re-structuring of careers services took place at Syracuse University, where the career services network was formed with each college hosting its own hub for all undergraduate and graduate students, alumni, faculty and staff, employers, and graduate/professional schools (Syracuse University Career Services Network Brochure, n.d.). He concluded:

> *In the end, the new [SU] configuration allowed for collaboration and flexibility of this alignment enables college offices to serve their own*

> *constituents with services and resources specific to their needs, and yet capitalize on services, resources, and campus-wide initiatives that are best provided in a centrally administered fashion (I-14).*

Because they recognize variations in local identities and needs and are able to tap into the global resources of the entire system, networks are often able to "generate better solutions than a central authority" (Capra, 2002, p. 151; Pascale, Millemann, & Gioga, 2000, p. 127). The network structure for career services, at both institutions, marks a movement away from mechanistic bureaucracies toward more decentralized, networked organizational structures.

There is an energy at the edges

As participants considered the complexity sciences, they described the importance of edges to the organization as a whole and to the disciplines. They pointed out the critical role edges play in an organization's ability to innovate, exchange new ideas, and revitalize itself. Key organizational theorists concur that edges are opportune places for innovation to occur within an organization. John Seeley Brown, of Xerox's Palo Alto Research Center, believes that large organizations "have more chances to learn to improve on the periphery, where the renegades are." One participant who professional home is in residence life echoed these ideas about edge. She shared:

> *At the edges, you can play more, do more, before what you are up to gets back to the center. There is an inertia at the center....The edges are more loose and fluid; they aren't as tight (I-8).*

Edges or peripheries are also the direct contact points to an organization's adjacent possibilities (Sherman & Schulz, 1998, p. 102). Adjacent possibilities

are the unrealized potentials latent in the system. They are possibilities which never existed until a previous possibility is realized (Kauffman, 1996). The potentiality of edges was pointed out by one participant who said:

> *One of the other images is of the potentiality of the edge. Units and places on the edge are more likely to bump into other edges. New ideas can be transmitted very easily (I-8).*

Certain disciplines or fields actualize the adjacent possibilities inherent in the traditional disciplinary structure. Often interdisciplinary in focus, they operate as edges themselves, bringing different disciplines together to shed light on particularly complex human problems. A recently promoted executive manager provided an example of an "edge discipline," when he spoke of epidemiology.

> *Take epidemiology. No one majors in epidemiology as an undergraduate. They all come to this multidisciplinary field from other disciplinary backgrounds. To be good [at epidemiology], you need a little biology, clinical practice (understanding the ways the disease presents itself), operation of social-psychological forces, and a bit of mathematics (statistics and probability) to understand the technical aspects. You don't have to be a bona fide scholar in each of these areas, but you need to have a good understanding of them (I-12).*

As this participant looked to the future, he anticipated more "edge" disciplines, because new ways of looking at knowledge or new ways of framing problems are sure to emerge. He speculated about the future of "edge disciplines":

> *I think there will be more fields like ours, not conventional ones, more fields that tend to take parts of different disciplines and bring them together to create entirely new disciplines. Take biochemistry, for example. It isn't biology plus chemistry. It's that, and much, much more (I-12).*

When viewed over time, the organizing and re-organizing of academic disciplines takes on the natural rhythm of ebb and flow, as edge fields from and then disappear over time, only to be replaced by more relevant edge fields. An assistant provost noted:

> *One hundred and forty years ago, we had fewer disciplines. Fields like psychology, sociology, anthropology, and speech pathology were invented quite recently. Immunology and public heath have come on line in the past couple of decades. These types of changes are bound to keep happening...Take environmental ecology, for example. It's different than it was 50 years ago, and that difference has changed other fields (I-6).*

He continued, however, hypothesizing that not all fields would be created by the coming together of different disciplines, as a previous participant speculated. In contrast, his view of the future included the belief that some new fields might be created by the separating of disciplines into sub-specialties.

> *In the future, new disciplines will be defined. Neuroscience is composed of 10 or 12 disciplines right now. Will those separate disciplines continue to exist? I bet not. I bet psychology doesn't exist. It'll become separate disciplines—social psychology, cognitive science, clinical psychology, as those ways of approaching the problems evolve and change (I-6).*

The shifting patterns of disciplines over time—those newly coalescing and those breaking into specialties—can be interpreted as being remarkably similar to the pattern underpinning chaos theory. According to chaos theory, when a strange attractor emerges, it organizes the energy around it and ultimately reshapes the entire system, for a time. As the strength of the strange attractor wanes, the energy dissipates, allowing the shape to break apart again.

In the parallel manner, a new problem or new approach to a problem brings together the expertise found in multiple disciplines. If the problem is

difficult enough or important enough, these disciplines will form a new field of study. This field will continue as long as the problem remains unsolved and important. Or in the language of chaos, the field will continue until a new set of influences or attractors gains the upper hand and attracts the system's energies into a new configuration.

Another participant, a mid-career professional who consults with mid-level executives on strategic change, saw value in linking disciplines and edges. She advocated a change in the future direction and focus of faculty work. For her, work on edges of the disciplines might be the key to revitalizing higher education's future.

> *There is energy on the edges—in the collaborative, interdisciplinary, multi-disciplinary programs—where the need to maintain the homeostasis demanded by the disciplines is not as strong. It's on the edges where we vitalize higher education. Even in order for the disciplines to be vital, you need to have edges within them. Faculty need to know the basics of their discipline and to have mastered these areas. But, they should spend only part of their academic lives focused on the core concepts of their fields. The rest of their life's work should be focused on the edges, the new frontiers in their own disciplines. If we set up faculty work, promotion and tenure like this, we'd be able to revitalize the disciplines (I-3).*

An amoeba, a network, a web, and a matrix

The concept of edges was important enough to be the response to the question: imagine the complexity sciences as the dominant paradigm in higher education. What would that look like?

> *It would have an organizational structure that maximizes the edges. It would have fewer straight lines and more curvilinear ones. It would look like an amoeba, with lots more edges, more surface area to create those creative, innovative moments (I-1).*

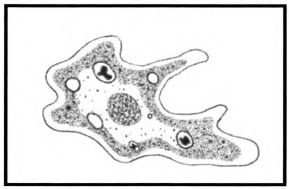

Figure 1: Amoeba

> *As an amoeba, it would dynamically interact with things around it, always changing, with great fluidity—even where an edge is, the edge could disappear or change (I-1).*

The amoeba was the first image given by this senior level executive, because it illustrated the importance of edges in a participatory universe. In the Newtonian-Cartesian worldview, subjects and objects are considered to be divided and separate; similarly, organizations are thought of as independent or detached from their environments (Zohar, 1997, p. 66). In contrast, the complexity sciences paradigm is participatory one, where there is no "out there" there. There are no separations, only connections. An amoeba structure embodies this idea, as it participates readily with its environment through its permeable cell wall. Its fluidity allows it to change shape and adapt to its environment with ease. Finally, its plentiful surface area enables broad participation with the world around it.

The web and the network are two other images or metaphors the participant used to describe what higher education might look like if the complexity sciences were to become the dominant paradigm.

> *The future higher education organization would optimize its shape. It would also have some structure, a hybrid between a spider web and a*

network. The spider web would have a center focused simultaneously on the public and the individual good, the good of the collective and the individuals (I-1).

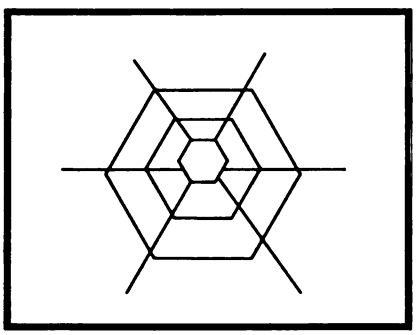

Figure 2: A Web

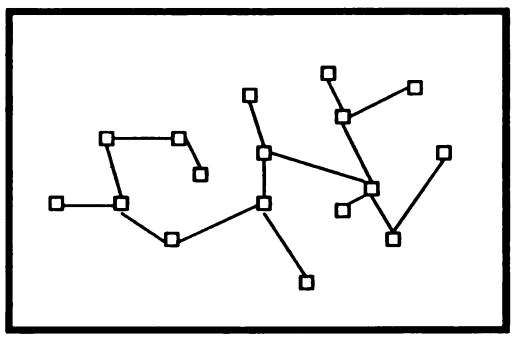

Figure 3: A Network

Such "webs of inclusions" are often associated with female approaches to organization, where the hierarchy gives way to more empathic, intuitive, organic forms of behavior (see Helgesen (1990), Iannello (1992), Marshall (1984, 1993, 1994), Roddick (1991), Rosener (1990), and Sheppard (1992)). The managerial competencies associated with archetypically female organizations—webs of inclusion or networks—require the ability to "cope with the uncertainty and turbulence of modern environments" (Morgan, 1997, p. 136). Centralization, a

feature of the web image, does not lend itself towards flexibility. In response to this limitation, the participant revised the web image with an additional image:

> *The network is the spider web idea without the center. It would be a network of non-linear nodes (I-1).*

Another participant also used the image of a network to describe an aspect of the informal organization at work in large institutions. This student affairs veteran noted:

> *In large institutions, there are lots of special networks. There is an understanding and a willingness to do work, richly fueled by tapping into the "whole" of the organization (I-3).*

"As icons of self-organization, networks interact with no architect. No one is in charge; there are no formal rule makers or police" (Pascale, Millemann & Gioja, 2000, p. 126). The recognition that power in a healthy [networked] system is non-local and spread throughout the system will be a challenging shift for many organizations (Youngblood, 1997, p. 44). And, yet, in many organizations, networked groups without formal power wield great influence. Called communities of practice, these informal teams have "no beginning or end. They come together and work and through time, they begin to construct their own language" (Sherman & Schultz, 1998, p. 102; Wenger, 1998). They develop norms, practices, and short cuts. A strong sense of membership and community creates a sense of belonging. New members must learn to become a member of these guild-like groups. John Seeley Brown notes that communities of practice are a "confluence of people climbing over authorized structures to get the [real] work done" (Sherman & Schultz, 1998, p. 102).

While amoebas, webs, and networks seem to minimize formal structure, structure was not abandoned entirely in the participants' interpretations of the future. Several proposed something different. They thought that the future might look like a matrix. A student affairs professional early in his career summed it up best:

> *Right now there is lots of rigidity. [In the future] there would be coupling of functions, and the coupling would make institutions look different. There would be an incredible amount of cross-unit collaboration. It would look like a matrix (I-13).*

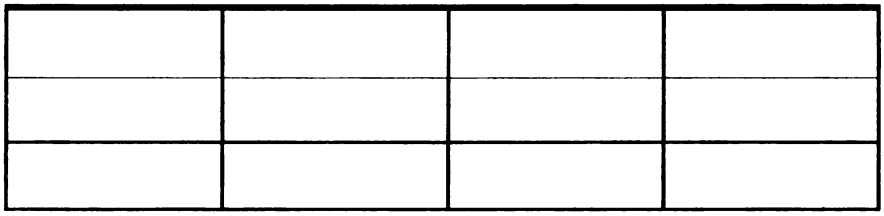

Figure 4: A Matrix

The matrix organization refers to organizations that "systematically attempt to combine the kind of functional or departmental structure of organization found in a bureaucracy with a project-team structure" (Morgan, 1997, pp. 52-53). Functions are in the columns of the matrix, while the teams in the rows. The fully developed matrix organization is team-driven, not function driven, with the end product being the major goal. The matrix structure encourages flexible, innovative, and adaptive behavior (Morgan, 1997, p. 53). In higher education, matrix structures already work well for periodic activities that involve multiple campus units, such as fall orientation. Matrix structures are also common ways to organize interdisciplinary, academic initiatives, such as learning communities or area studies.

One participant was eager to emphasize that the future organization of higher education would not be limited to one type of organizational structure, but instead would be a nimble combination of all four images—the amoeba, the web, the network, and the matrix. She noted:

> *In the future, there would be multiple ways of thinking about [organizational] paradigms—how to organize and how to be self-organizing .Simultaneously, higher education would understand how to be an amoeba, a spider web, a matrix, and a network. Do we look like this now? No, but we are beginning to. Think about how the faculty are like a network. They are changing over time to become more fluid (I-1).*

The boundaries are shifting

> Healthy systems demonstrate a high degree of openness to the free flow of [information, diversity, and interaction]. Like blood, information must continually flow if it is to keep its vitality and serve the system...Living systems learn as a whole system, so individual agents must be free to mix and mingle in an infinite variety of ways. In the creative process, agents engage in a constant, reciprocal exchange and cross-fertilization of information in a nonlinear and unpredictable way (Youngblood, 1997, p. 59).

To keep the lifeblood of organization flowing, closed boundaries must become more flexible; their boundaries must open up to the world around them. Some boundaries may even disappear completely. New organizational partnerships, collaborations, and inter-institutional arrangements lend credence to the opening up of the organization's boundaries. As participants shared their interpretations, the theme of disappearing boundaries emerged. They spoke of more permeable boundaries, forged through new partnerships between the university-community, university-businesses, and university-other universities. The changing political priorities also call into question the long-held covenant between the public and

higher education and raise the question about the impact of the shifting boundaries in the funding arena.

Relationships between the university and the communities it serves are being re-conceptualized using system thinking and system theory. Interactions are recast in a more flexible light, knowing that "you need to be reasonably flexible and adaptive" when you work with communities. A seasoned faculty member recently appointed to the level of executive manager in university outreach shared some recent organizational change work he was leading on campus:

> *Here's what our organizational chart typically looks like, showing 100% administrative lines.*

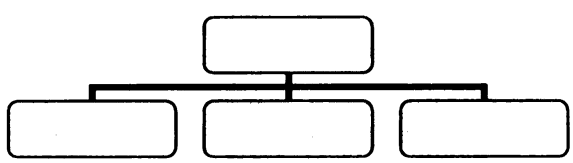

Figure 5: Standard Organizational Chart

> *Here is what we've been mapping. It shows the systemic relationships for our each of our program areas and extensions models. We've captured how various segments have to relate to enhance each other. We've been working on these for the county, state, private investment, individual, staff, as way of capturing what nature is like—that's all that systems is trying to do, to show what nature does automatically. Nature is one big correlation. The quantum part here is that the observer is part of the relationship.*

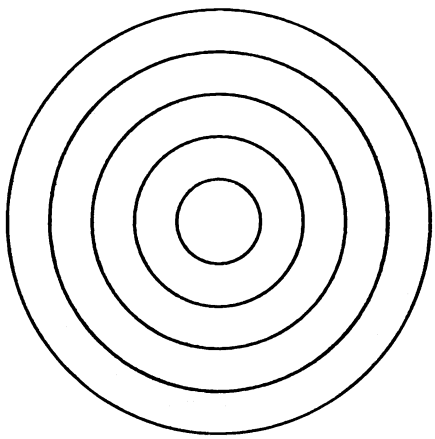

Figure 6: Systems Chart of Outreach

> *Well, really this should be 3-dimensional. Most of us are only able to think in two dimensions, ebb and flow, circles and arrows, opposed to charts in one direction. The circles and arrows are supposed to capture the recursive dimension and capture the flow of relationship. In places where the arrows only go one direction, there is a blockage. If it is non-recursive, we know we have a barrier we need to identify and remove (I-6).*

While university outreach is purposefully re-casting its work to reflect the dynamic relationships between the university and communities, other models for university relationships are beginning to take shape as well. As they shared their interpretations of the complexity sciences, some participants reported on current university-business agreements and speculated about future potential of such arrangements that would blur the boundary between public and private.

> *In the future, I'm willing to bet that there will be different units strengthening the relationship between business and the university. These new partnerships are not going to stop with the development of the [new conference center on campus] built with university funds in partnership with a national conference hotel chain (I-6).*

University-business partnerships may be necessary for other types of infrastructure (re)development. The residence hall system and classroom buildings are prime examples where the responsibility for future maintenance and re-development may be contracted out to other organizations or businesses. The traditional boundaries of the campus and its facilities may be disappearing. One participant involved in the university operations speculated that:

> *We are going to have to develop new partnerships to assist with infrastructure redevelopment. We need dollars to reshape facilities, to better meet the needs and wants of the students. They want to interact and learn in good facilities, but we simply don't have the dollars to maintain our buildings. We are self-operating. We can't pass on 10-12% increases in fees to pay for maintenance and upgrading. So, maybe we look at some land-lease options; maybe some buildings will have user fees. Maybe we will look at other options (I-7).*

Similar university-business partnerships may emerge in other service areas as well. Participants mentioned other potential examples, including custodial services, grounds, public safety, residence life, and student affairs. Such potential changes were not universally thought of as positive. One participant spoke of a sense of loss that would accompany such new partnerships.

> *[On one hand, contracting out such services] would decrease our expenses in terms of labor and benefits, and the real costs are in the benefits. On the other hand, with a change like that, you would lose loyalty and a sense of pride in taking care of the place (I-7).*

In the future, participants believe that new partnerships will extend beyond outreach activities and facilities to include key aspects of the institution's core mission. Academic offerings (with impacts on faculty and students) may change in response to inter-institutional arrangements, i.e. university-university

collaborations. A seasoned executive manager commented on the future of university-university alignments that might change academic offerings:

> *[In the future,] higher education, including community colleges, may segment the education market more efficiently. We do not have to be everything to everyone. It'll be a tough habit to break, but we've got to make that shift. For example, what about the lesser taught languages? Does each institution have to teach all of the languages? What about Portuguese? What happens when you only have one faculty member who teaches Portuguese in a department? Who are their colleagues? Who do they collaborate with? It's better to have three faculty members, but we can't have three faculty members for every lesser taught language. Wouldn't it make more sense to have a Center for Language Study in one or two main languages, with other institutions having similar centers for the languages we don't offer? (I-9).*

In the future, lesser known languages and other specialties may be offered on a regional basis, increasing the inter-institutional arrangements that allow students to enroll in one institution and earn credits at another. According to one participant, such inter-institutional arrangements are sure to proliferate.

Such coordinated course offerings may not be limited to the lesser known languages or specialties. One seasoned executive manager speculated that common undergraduate courses may be offered by institutional consortia instead of by individual institutions. His prediction was based on the work of a recent winner of the Presidential Faculty Fellow at the institution who used his award to revamp the introduction to physics course to make it available as an on-line course.

> *Unlike many profs who simply put their syllabi on the web, he changed his whole pedagogy. It had to be completely revamped. He learned some important things in the process. Putting together an on-line course that is helpful to undergraduates is very resource intensive. Undergraduates typically need help with their homework at all hours of the day. So, he has 24 hour access to graduate assistants on-line. That way, if students have*

questions in the middle of the night, there will be someone to help them out. (The research showed that most undergraduates worked on their physics homework at 2 a.m.).

Now, think of this in the context of the Big-Ten. They are all teaching intro physics to undergraduates. What if you simply needed five graduate assistants at one school to cover the entire teaching load of intro physics at all of the Big Ten schools? That's something to think about (I-11).

Inter-institutional partnerships or arrangements may not be limited to academic offerings. Higher education's future may also include inter-institutional partnerships in research as well. A senior executive manager speculated:

Because the allocations the state makes for higher education are not going to increase, it's likely that institutions of higher education will collaborate more with one another in the future. Instead of competing with the school down the road, we may find ourselves working with them to get more bang for the buck. This type of collaboration is resource driven. It's also conceptually driven. We may move farther ahead collaborating with one another, than competing with one another (I-6).

Increased competition for state funding was acknowledged as one external driver changing the shape of institutional boundaries. This seasoned executive referenced a recent *Chronicle of Higher Education* article written by Selingo, "Mission Creep? (May 31, 2002) as a confirmation of increased within-state competition for funding.

Changes at the federal level were cited as another change force. One participant linked these changes directly to an evolving understanding of the natural world and the increasing complexity associated with solving environmental problems.

The silos of higher education are changing slowly over time. It's starting to change gradually as pressures in society change. More federal dollars are being allocated in larger chunks for interdisciplinary programs or centers

and not for independent projects. Some of the dollars are for applied work; some isn't. Nature is not intrinsically defined by the disciplines of the university. For example, right now, National Science Foundation is funding bio-complexity, a mixture of ecology, biology, crop and soil science, animal science, and weather to understand how global climate change is affecting air, water, and soil. We can then understand a much bigger view of natural systems and predict effects on growing seasons, for example (I-11).

This participant referenced a recent *Chronicle of Higher Education* article, titled "U.S. Agencies look to interdisciplinary science" (June 14, 2002) to support his point.

Participants in this study projected that collaboration, efficiency, and cost-effectiveness may force some of the institution's traditional boundaries to disappear. In the wake of such change forces, different institutional collaborations and partnerships may emerge to offer new facilities, improved service, and expanded curricular choices. Shifts in funding priority may also create incentives for boundary spanning research initiatives.

Not everyone believes that the boundaries are disappearing. One participant noted that one of the strongest forces of change affecting higher education's boundaries may come from changes in the political climate. According to his point of view, politics are creating stronger boundaries.

The political aspects of higher education are already, and are going to be, incredible. The boundaries are disappearing, not all at once, but they are disappearing. Universities, once seen as the Ivory Tower, are going to have to be seen as much more relevant, much more involved in solving society's problems. We have to start being involved in industry's or local government's problems. We have to start solving short-term problems, not just developing knowledge, but extending it better.

Higher education is no longer being viewed as a public good. It's now no different from other institutions competing for federal [or state] dollars. We

> *are seen as just another interest group, right in the funding competition along with roads and bridges....Through lobbying and the forces of competition, funding of science, of research, is now affected by pork barrel politics. I can see this only getting worse over time. It's going to change the future of higher education. It's going to change universities (I-11).*

This participant believes that the covenant between the public and higher education is shifting—that a new boundary is taking shape where one did not exist before. In the future, higher education may not been seen as automatically deserving federal or state allocations of funding. According to this view, institutions of higher education will need to have to compete with other interest groups for their share of funding. Brainard's September 27, 2002 article—"Another Record Year for Pork"— in the Chronicle of Higher Education supports this view of heightened competition. If these speculations prove to be true, then the political dimensions of funding may indeed turn out to be an increasingly powerful boundary in the future of higher education.

Planning and Budgets

While the image of an organization may be closely associated with its organizational structure, it is the planning and budgeting processes that define the organization by guiding day-to-day operations. By reinforcing organization's operating principles, planning and budgeting often serve a centralized coordinating function. "The planning function includes defining the ends to be achieved and determining appropriate means to achieve the defined ends" (Ivancevich & Matteson, 1993, p. 38). Often planning is linked to departmental

rewards, as successful achievement of goals one year may lead to increased funding the next.

Planning functions vary; they may be complex or simple, implicit or explicit, impersonal or personal," but the intended outcomes of planning activities are mutual understandings about what the members or the organization should be attempting to achieve (Ivancevich & Matteson, 1993, p. 38). Planning and budgeting processes also parallel the flow of information within the system. They may control the flow of information up and down the formal hierarchy and standardize outcomes, actions, and behavior (Bolman & Deal, 1991, p. 61). This traditional planning and budgeting perspective on organizations assumes foresight, predictability, and linear cause-and-effect. This perspective also assumes straightforward and clear communication.

The complexity sciences paradigm challenges our traditional views of planning and budgeting. Relativity theory rests on the dynamic nature of relationships. It also claims weak cause-and-effect links. Heisenburg's uncertainty principle, part of quantum theory, defines a relationship between how we measure and what we see; that is, we can focus on the position or the momentum of a particle, but not on both. This means that the questions we ask in the planning and budgeting (and the associated performance evaluations) determine the answers that we receive. Measurement, from this perspective, is non-objective or scientifically neutral. According to neo-evolutionary theories, diversity, specialization, and differentiation are of value. Yet, valuing such difference often stands in contrast to centralized, one-size-fits-all planning and

budgeting processes. Punctuated equilibrium, another idea from neo-evolutionary theory, puts forward the idea that change is not incremental, but happens in fits and starts. Most traditional planning and budgeting rests, in contrast, on the concept of constant progress forward. Chaos and complexity theory introduce an understanding of flux, flow, and emergence into organizations. As a result, planning and budgeting require flexibility, responsiveness, and continuous change, instead of the traditional predictability, control, and certainty.

Participants in this study shared their interpretations of the complexity sciences in higher education. In their interpretations, several themes related to planning and budgeting emerged. Participants commented on the ephemeral nature of their unit's activities and questioned if it were possible to "plan our way to the common good." Other participants pointed out the shortcomings of linear, cause-and-effect planning in times of great uncertainty. One participant speculated that the future might include a middle ground in planning, something between steadfast predictions and complete emergence. Finally, many of the participants criticized that the current metric for evaluation does not fit the complexity sciences paradigm. Together, the participants' ideas about planning and budgeting are organized into three themes, which are:

- **It came. It went. Nothing is forever anymore**
- **...even if it's not in our annual report**
- **And, there's the problem with the metric**

It came. It went. Nothing is forever anymore.

"Effective strategic planning [in the complexity sciences paradigm] must be based on assumptions of unpredictability, weak cause-and-effect links, irregular patterns, ill-structured problems and opportunities, and continuing contention" (Stacey, 1002, p. 100). Creative, dynamic systems require powerful new ways of thinking, acting, and being prepared to act strategically, without knowing exactly what one might be called to do. This type of thinking differs from the commonly accepted views which are based on "problem solving, predictability, close cause-and-effect links, regular patterns, and continuing harmony and consensus" (Stacey, 1992, p. 100).

One effective tool for planning in uncertain and ambiguous times is to create a vision, a picture for the future. To be clear, this is not a vision for action, one that "forms a vision of the future state we desire to achieve, persuades others to believe in it as well, and then if we get our facts right, we will be able to realize it" (Stacey, 1992, p. 125). Instead, this vision relies on people interacting in an organization and rests on the belief that they will be self-organizing, if given a context that allows them to discover and learn. In a creative system, influenced by the complexity sciences, a vision has six properties:

A vision must be specific and unique
A vision must be anchored in reality
A vision must be linked to action
A vision must be overarching and comprehensive
A vision must be shared by all
A vision must be stable over time (Stacey, 1992, pp. 127-132)

One of the participants shared a story about how the student affairs unit formed a mission statement and then relied upon it for guidance through an unpredictable, but important time on campus. The crafting of this mission statement was guided by the participant's understanding of chaos and complexity theory. Her story reflects her understanding through its language.

> *When I came to the Department of Student Life, I knew we had to rebuild our mission. We had to find a re-alignment that corresponded to the greater good. We needed to get rid of our silo mentality. We needed to act like a quantum place. Our first year's goal was to build our mission and values. We built it by consensus. Everyone voted on every word—unpacking the mess and re-packing our bag for the future. We wanted to be at a new millennial place. That place was about ambiguity. We needed to be ready for it. We worked our outcomes for the first year. Our mission statement reads:*
>
> The Department of Student Life, within the Division of Student Affairs and Services, is a partner in the educational processes and mission of [the institution].
>
> Student Life
> - Engages students in active learning and encourages scholarship
> - Prepares students for leadership roles within the University and future work/community settings
> - Enhances the educational environment by promoting, educating, and facilitating campus-wide understanding of students' rights, responsibilities, and freedoms
> - Conducts research studies to further knowledge of current and future college students for dissemination through outreach relationships.
>
> Student Life creates opportunities for students to clarify and challenge their values, potentials, roles, and relationships within the University, the greater community, and the global society (from the Student Life brochure furnished by the participant, n.d.).

The mission statement was completed in early fall 2001, with full participation from and approval of the staff of Student Life. The mission was built on an enhancing mindset; that is, it acknowledged the unit's unique responsibility to

make a contribution to other units within the organization, recognizing its dynamic relationship with them. This stance reflected a systems understanding of the unit's position within the greater institutional systems.

> *We finished the new mission statement on September 5th and talked about it in our staff meeting on September 10th. We talked about the different type of goals we had. We talked about our interdependence with other campus units. We reaffirmed that our success can't come at others' cost. We talked about how we needed to be interfaced without taking on or stealing their territory. Our mission was absolutely enhancing.*
>
> *And, then September 11th happened.*
>
> *It just takes my breath away. We have 40,000 students on campus. The brand new students do not yet have support networks. The international students are scared in this context. We asked ourselves: Who Are We? What is our core, right now? And, what does that mean in a time like this? Then, we got up and thought very differently. We got up and hit a home run.*
>
> *We went to work. We created a communications email to students, staff, and faculty expressing our care. We communicated very concisely about the services available. As new partners came forward, we included their information. Everyone on campus started sending us their stuff to put in the update email. People wanted to be a part of what we were doing...Some folks were disappointed when their announcements didn't make the deadlines. That was quite an affirmation (I-5).*

Working from their newly crafted mission statement, the staff coordinated efforts with other campus units. They were collaborators with others, not competitors. In addition to communication emails, this unit hosted campus-wide dialogues. Another senior-level administrator commented on how these dialogues helped to foster a sense of community and a feeling of interdependence, during contention times.

> *Take MSU's conversations post September 11th, we placed a value and an importance on understanding multiple paradigms at the same time, especially in light of such catastrophic events....September 11th gave us*

an opportunity to see the interplay between the individual and the group (I-1).

Student Life's September 11th response slowed down as the staff sensed less and less support was needed by the campus community. They did not hold on to their success or try to re-engineer it into another success. Instead, they let their presence disappear.

> *But, we also allowed the email [and other activities] to disappear. When we felt it wasn't needed anymore, we let it go. It came and it went. Nothing is forever anymore. There are always changes in information, in context (I-5).*

Periods of stability, interrupted by periods of sudden transition or perturbations, followed again by periods of stability is the pattern described as punctuated equilibrium in neo-evolutionary theory. Chaos theory also provides insight into Student Life's response to September 11th. Their actions were not pre-determined; they emerged in response to the need for accurate information and for community dialogues. As these needs lessened, the unit's response diminished as well. According to chaos theory, as the strange attractor lost its power, the efforts diminished as well.

An assistant provost noted that this "allowing it to disappear" is relatively rare in higher education. His interpretation was that few of higher education's activities come and go when they are no longer relevant.

> *We have to be very careful about centers and institutes. They often have broad missions—enhance research, generate training grants, and improve undergraduate education. In reality, though, they are only focusing on one or two priorities. Some of them are even worse—they are clubhouses. People put them on their c.v.'s even when they haven't done anything at all…Higher education doesn't have good exit strategies (I-9).*

...even if it's not in our annual report

A senior administrator in central administration noted:

> *In a truly quantum universe, you'll never know where it will go (I-2).*

A student affairs executive manager echoed her sentiments.

> *We are in uncharted territory. We need to be ready to go where we are needed to go next, even if we do not know where that place is [today]. We need to be prepared for the ultimate challenge—even if it is not in our annual report (I-5).*

A number of participants noted the inherent conflict between the university's annual planning and budgeting process and between what actually happens in units. As they talked about the planning and budgeting process, the participants characterized their organizational life as ambiguous, uncertain, and unpredictable.

Their concerns were based on the inadequacies of foresight and the human inability to predict with certainty what will be needed and what will happen in the coming year. They shared frustrations about a process that asks them to make advance commitments based on these predictions, when they know that the predictions are likely to be unfulfilled. One mid-career student affairs executive said:

> *Organizationally, you have to have a plan, as part of the [university's planning and budgeting] process. You have to be accountable to final goals. The structure lends itself to advance commitments, to pursuing what will work and having to go there, even if it turns out not to be such a good place. Even if you know in advance, that it isn't going to be the best thing, you choose it because you know it's achievable and will go according to the plan (I-3).*

She added that setting smaller goals that you are guaranteed to reach is one way to approach planning. It is certainly not the most creative way.

Another participant noted that the innovation or creativity inherent in the complexity sciences paradigm does not influence the planning and budgeting process. Instead, from her perspective, the current system is grounded in the dualism of the mechanistic paradigm.

> *The [university's] planning and budgeting process does not promote creative change. It tends to be yes/no dualistic. You cut or you don't cut. It does not promote the creative use of resources (I-3).*

Along those lines, she criticized the current planning and budgeting process as being fixed on what is here and now and not promoting investing in potentiality. For example, she wondered what planning and budgeting might look like in a future influenced by the complexity sciences. She speculated:

> *What if we took the Marks & Spencer model of hiring brave, young talent and enthusiasm and investing in them. What would happen if the Provost said to the Vice Provost for [her unit]*—you have a great team of folks with wonderful ideas. I have all of the confidence in the world that they'll do a great job this year. Here's your budget, just go ahead and do what you think is best. *What would happen would be totally alien (I-3).*

These frustrations with the mechanistic nature of the planning and budgeting process did not seem to be based on complaints about the bureaucratic nature of the process. Instead, many of them were of a more philosophic nature. According to the participants' interpretations, the current system did not recognize or reward their unit or the university's contributions to the greater public good. In other words, the current system fails to acknowledge the bigger picture; it does not

adequately capture the meaning of our work. A seasoned student affairs executive urged:

> *We can't limit ourselves to small, planned achievable goals and believe we are working towards a greater good. We need a way of recognizing our efforts to reach that greater good (I-5).*

According to Zohar, "the need for meaning is primary" (Zohar, 1997, p. 18). She notes that Western science has given a false impression by fragmenting human needs into separate physical, personal, social, and spiritual need. We have also separated personal needs, including the need for meaning, from organizational needs. "Human beings are more holistic than that. So, too, would be organizations that can use full human potential to thrive on chaos and complexity" (Zohar, 1997, p. 18).

In contrast to the views of other participants, one participant, who once served as an educational consultant, suggested an approach that was "somewhere in the middle" between the current system's centralized, planning predictions and the suggestions for creative, decentralized, potentiality-driven planning and budgeting process. She suggested that future planning might include both approaches:

> *Somewhere there's a middle...between the road being completely built before you walk on it and between paving it as you go along... you build and pave* just a bit *of the road, and then you start walking on it and building it as you go. It's all about the notion of possibility and potential. It's not really much of what we do in the Western culture (I-4).*

...and, there is the difficulty with the metric

The participants considered the "difficulty of the metric" to be a current and future challenge in a complexity sciences organizational paradigm. They were concerned about assigning credit for collaborative work, recognizing the investment of time that collaborative relationships require, valuing risk-taking and failure, appreciating the contributions of those who create social capital, and evaluating the maverick or rogue element in your unit. "Innovation assets are considered as 'soft' assets and new ideas are considered 'fuzzy.' There's a whole lot of uncertainty involved, definitions are ethereal, substance is conceptual, and people can't wrap their arms around many of the things they need to consider when evaluating their work (White, 2002, p. 110). For example, a student affairs professional early in his career posed:

> *What happens when you behave like you are quantum in a Newtonian world? What happens when collaboration isn't rewarded? The university says it wants collaboration, but when it comes to the budgeting and planning process, they ask—what was your event. You have to have something to write on that form as being yours (I-13).*

Because the complexity sciences require a different way of working together, success needs to be redefined accordingly. Efficiency must take into consideration the time required for participation, relationship building, and collaboration. A seasoned upper level executive felt that a future organizational paradigm influenced by the complexity sciences would have to work on a longer time scale. He felt that.

> *mean that efficiency has to be defined differently. These types of collaborative relationships take time (I-11)*

A student affairs executive also commented on "time" in relationship to the metric. She advocated for a more episodic performance metric.

> *[there must be a willingness] to rely on a different kind of performance indicator, one that is more episodic (I-5).*

A senior administrator pointed out the linear cause-and-effect nature of our current measures. In his view, a complexity sciences influenced organizational paradigm would have to value collaboration and acknowledge the non-linearity. He said:

> *There is also the difficulty of the metric, the measurement system we use to count success. It suggests cause and effect, which isn't necessarily straightforward in the more collaborative way of working (I-11).*

Weak cause-and-effect links (i.e. nonlinearity, indeterminism) were not the only aspect of the complexity sciences that the participants interpreted as conflicting with the current approach to evaluation. Emergence and innovation were viewed as being equally difficult to measure or quantify. In a complexity sciences paradigm, experimentation, risk-taking, and innovation are to be expected. Risk-taking leads to creative breakthroughs; it may also lead to failure. "Failure is not to be feared. It is from failure that most growth comes; provided that one can recognize it, admit it, learn from it, rise above it, and try again" (Hock, 1999, p. 279). The relationship between the metric and failure needs to be re-negotiated in the complexity sciences paradigm. A seasoned professional in residential life noted:

> *Within organizations, we need to get better at rewarding failure and valuing wild, creative ideas. There is a huge value there (I-8).*

In a complexity sciences paradigm, individuals in the organization may be evaluated for making unique contributions. Unlike the Newtonian paradigm, which uses a more standardized approach to evaluation, a complexity approach would accommodate contributions to the process of academic work as well as the products or bottom line. A tenured faculty member noted that:

> *Some firms realize this. They are realizing that some of their employees don't make big contributions to the physical bottom line, but that they contribute greatly to the socio-emotional collective good. These employees are protected; they aren't measured by the same metric (I-10).*

Another example of the misalignment between innovative individuals and the evaluation metric used in contemporary organizations comes from Cheverton's book, *The Maverick Way*.

> "I don't think you can [evaluate Mavericks] in the classic sense...because evaluations tend to be structured, measured against the norms, measured against expectations. But a maverick has no norms and the only expectation is that he is bringing back something different. If it's different, you can't measure it. So, you have to look for surrogates—how many people are finding value in what he's bringing back."
>
> "In a way...to protect a maverick, you have to *become* a maverick. When Human Resources comes around with an evaluation form, as the maverick's protector, you've got to be willing to say it doesn't work" (Cheverton, 2000, p. 154).

In this example, Cheverton suggests that the maverick's protector or mentor needs to interface with the rest of the organization in a protective way. The mentor must negotiate a space for the maverick to operate in—in this case, a different rules for evaluation within the institution. The next set of themes illustrates other rules leaders and managers rely upon to make different choices grounded in the ethos of the complexity sciences paradigm.

Leadership and Management

> Although in many ways, Newtonian thinking unwittingly inspired organizational design, science was brought deliberately into management theory and credited with giving it more validity in the era of "scientific management" in the early years of this century (Wheatley, 1994, p. 140).

The classical management model was developed to organize and coordinate the efficient work of large numbers of workers; to harness the productive potential of new technologies; and to respond effectively to new challenges in a complex and globally interdependent environment (Youngblood, 1997, p. 20). In response to these challenges, Max Weber developed a model for the bureaucratic organization, based almost entirely on the machine model. Its technical superiority relied on six key elements: a clear cut division of labor; a hierarchy of authority; recruitment of managers based on specialized expertise; explicit set of rules for making decisions; a strict separation of business and personal concerns; and the establishment of career employment (Youngblood, 1997, p. 21).

At the turn of the century, large scale manufacturing operations required new methods of managing employees. Frederick Taylor, along with Frank and Lillian Gilbreth, delivered new methods based on management science, the idea:

> That observation, measurement, classification, and the principles derived from these empirical studies should be applied to all managerial problems; that the methods by which work was accomplished should be determined by management through the same kind of investigation; and that workers should be 'scientifically' selected, trained, and developed. (Fraser, 1994).

Taylor was not the first to promulgate these ideas. Adam Smith proposed the idea of "division of labor" in Wealth of Nations. Division of labor is a reductionist

approach to production, where tasks are broken down into increments and assigned to individual workers to complete. Through his "time and motion studies" in the early 1800s, Charles Babbage improved the efficiencies gained by the division of labor. In the studies, tasks were timed with a stop-watch and then re-ordered to create the most efficient flow of work products through the manufacturing plants.

This scientific approach to management was based on Newtonian-Cartesian ideals. Tasks were fragmented into the smallest units possible and then assigned to workers, who rarely performed more than one or two tasks. With each worker assigned to small units of production, managers became essential supervisors who could see how all of the small units fit together; they could see the big picture. Authority, information, and access to resources were centralized with management (Youngblood, 1997, p. 23).

Scientific management may have been an appropriate approach for managing during the industrial revolution, but its bureaucratic, fragmented, management-intensive ways do not offer direction in the complex, fast-paced, high-tech world of this century.

> Though we have left behind some of the rigid, fragmented structures created during that time, we have not in any way abandoned science as the source of most of our operating principles. Planning, measurement, motivation theory, organizational design—each of these and more bears the recognizable influence of science (Wheatley, 1994, p. 140).

In a complexity sciences paradigm, leadership and management requires a different set of skills and competencies. Participants commented on the importance of understanding the human dimensions of change, of tolerating

questions, of making room for the deviant, of honoring diversity and conflict, and of managing the internal boundaries and expectations, including communications. Leading and managing in the complexity sciences paradigm does not just happen through emergence or spontaneous self-organization. An upper level executive manager made this point:

> *Facilitating self-organization is important. It's a myth that out of chaos and anarchy comes organization. People forget about strange attractors. Even the rain needs dust to organize and collect around (I-2).*

The participants in this study considered how the complexity sciences paradigm might influence leadership and management in higher education. Their ideas formed the following six themes:

- **You must constantly regain your balance**
- **The bodies are weak, the spirits are strong**
- **The narrow path between love and fear**
- **There has to be room for the rogues**
- **A part of one, apart of one another**
- **A bunch of condescending mumbo, jumbo**

You must constantly regain your balance

A seasoned professional in operations said

> *Now, we spend our time venturing in whitewater. The image is of you being in a raft in the water going through the rapids. Depending on where you sit, you either fall off or you survive. You must constantly regain your balance, judge how to respond, and do so quickly, over and over again (I-7).*

This turbulence, the permanent white water of modern organizations creates an environment of continual newness and requires people to become extremely effective learners (Vaill, 1996, p. xiv, 20). People must become effective at learning how to adapt to the increasing pace of change, shifting forces of change, and the human dimensions of change. The operations staff member continued:

> *Change is a constant part of the work that I do. The pace of change is increasing. Pointing to a big stack of papers and folders, she said, "that is my permanent whitewater" (I-7).*

The stack included a working draft of a new campus master plan, a report from two recently merged units about the challenges of the merger, compliance issues related to a construction project, a draft article on the university's change initiatives, and a thick file of notes from an ad-hoc cross-university committee developing a policy for support animals in residence halls. Some of these issues were anticipated, but many of them just appeared requiring immediate attention. She paused and said, "Even the forces of change are changing."

> *Even if things are going well in the old status-quo way, they are also changing. Things will change, and we will have to change too (I-7).*

For some, this permanent white water state creates a sense of possibility, a sense of opportunity. The whitewater is seething with potential.

> *In the past, we led things to maintain the status quo, but now, there really isn't a status quo anymore. Everything is changing. If we change our perspective, we can help determine the future as it is happening. That is different than the past (I-7).*

For others, however, constant change is not viewed as automatically positive. While permanent white water conditions create new possibilities, the never-

ending pace of chance also creates a sense of loss. Several of the participants commented on the human dimensions of continuous change. A seasoned profession in student affairs spoke eloquently about this:

> *We were letting go of something we cared for. But, it wasn't because we were doing a poor job; not because it was something bad. It was because times had changed and it was simply time for us to do something different (I-8).*

Another mid-career student affairs professional pointed out that perpetual whitewater conditions require a different type of leader, one capable of dealing with the emotions of change.

> *A different kind of academic leadership is required—in terms of understanding what people are and how people approach their discipline and on-going learning. Leading this change is an emotional time, as you need to move people from the fundamentals, basics, to a place where they can spring forth and find the edges and mature in thought, instead of blaming the entrenched system (I-3).*

Even with "good" changes, there are transitions that begin with having to let go of something. Four participants referenced Bridge's book *Managing Transitions* (1991) as a good guide to understanding the emotional aspects of change and leading others through the transitions associated with doing or becoming something new. "There are endings...The failure to identify and be ready for the endings and losses that change produces is the largest single problem organizations in transition face" (Bridges, 1991, p. 5). Leaders need to be able to assist with the transition steps of letting go, the neutral zone, and new beginnings. The neutral zone is "the no man's land between the old reality and the new. It's the limbo between the old sense of identity and the new. It's a time

when the old way is gone and the new way doesn't feel comfortable yet" (Bridges, 1991, p. 5). Drawing upon Bridges' work, a recently appointed assistant provost added:

> *At any given time in an organization, people are at different spots in transition. Phases are not always clear cut. This causes drag in the management process (I-9).*

Leaders and managers working from a complexity sciences perspective need to be perceptive in realizing the phases their co-workers are experiencing and adept at managing different employees in different phases, at the same time.

The spirit is strong but the bodies are weak

Permanent white water is not just about the increasing pace of change or the shifting factors that influence change. "Permanent white water is [also about] the *meaning* we as system members attach to our experiences. We experience both surprising, novel, messy, costly, recurring, and unpreventable events *and* feelings of lack of direction, absence of coherence, and loss of meaning" (Vaill, 1996, pp. 15-16). "What of our capacity to restore and sustain a sense of meaning in these new chaotic environments? Can we indeed learn to "thrive on chaos," as Tom Peters (1987) suggestions?" (Vaill, 1996, p. 17).

Thriving on chaos requires "deep transformation, [which] is not easy. It often hurts and it is usually terribly slow. It requires that people who experience it feel uncomfortable, even perhaps they may feel pain" (Zohar, 1997, p. 3). An executive manager who frames and leads organizational change within the institution noted:

> *If you are going to embrace uncertainty, you need to know about and understand the loss that's associated with it. You need to validate the reconstruction work, and that pushes against the bias we have in this culture towards efficiency, cost-effectiveness, moving everything along. We need to develop a reflective, learning culture (I-3).*

"Change is situational: the new site, the new boss, the new team roles, the new policy. Transition is the psychological process people go through to come to terms with the new situation. Change is external. Transition is internal" (Bridges, 1991, p.3). We live in a time of transition, especially in the application of complexity science ideas. Letting go is disruptive, while new models are just coming into our awareness and emerging as our way of knowing. We are in transition. An executive manager underscored the importance of the emotional work that accompanies change.

> [In *Managing Transitions*], *Bridges reminds us that it isn't necessarily the change that is difficult. It's the losses [associated with the change] that are challenging. Rewiring to put it into lived culture and human experience is a challenge. This isn't to say that we should despair over the process. It's simply to remind us to respect the work we are doing (I-3).*

Another seasoned executive manager, whose unit has experienced several significant changes, added more:

> [We need to realize that] *some of our people are exhausted from the flux, although they are getting good at it...it's accurate to say that the spirit is strong, but the bodies are weak (I-8).*

According to the participants, leading and managing in the complexity sciences paradigm requires leaders to be sensitive to the effects of flux and to find ways of helping others negotiate the neutral zone to find meaning and identity in their new work.

The narrow path between fear and love

What would institutions of higher education look like if organizational decisions were guided by stewardship, work for the greater good, and potentiality were the driving forces? What if fear, power, and control were not in play in contemporary organizations? To imagine what organizations are like when they function with potentiality at the fore, White suggests this "thought exercise:"

> What if you didn't know what to be afraid of? What if nobody told you, "You can't?" What if nobody told you how it should be done? What if you couldn't see an established path? You can't become naïve. But, you can pretend that you don't know what you know. You can "forget" who you are for a moment. You can pretend that you don't care. You can pretend to forge ahead with your visions with a devil-may-care toss of your hand. You can pretend for five minute or for five months—however much time you want to slice out of your life's pie (White, 2002, p. 47).

Several participants shared their interpretations of the meaning behind the work that they do and behind the bigger picture in higher education. These ideas were directly linked to their understandings of leadership and management in the complexity sciences paradigm. A senior executive in central administration believed, for example,

> *Because we exist for a purpose other than ourselves, the organizational concept of stewardship is important. We are acting out of something other than individual passions. We are servant leaders too (I-1).*

Her sentiments are echoed in the words of another executive from the operations:

> *What we do, even in our individual jobs, is bigger than each of us as an individual. What if we were to start the day with a ritual to remind us that*

we are all in this together, like the some of the Japanese companies do? (I-7).

In contrast, not everyone, however, thinks organizations automatically work in service to the greater good. "I have a belief that the two primary emotions are fear and love and everything is interpolation between the two. The path we're struggling to reveal here is love...In my experience the fear path is the dominant mode of behavior in organizations and love is not given a great deal of credibility" (Cheverton, 2000, pp. 119-120).

Fear sometimes plays out in organizational cultures dominated by power, politics, and mistrust. An executive in central administration addressed the issue of power and mistrust.

> *What would it be like if the university were one of the top 100 places to work for? How would we get ranked?...The Great Place to Work Institute defines a great place to work as "one in which you 'trust the people you work for, have pride in what you do, and enjoy the people you work with.'"*
>
> *Two-thirds of the ranking comes from a survey of the company's administrators, which the Institute randomly surveys. Their survey defines trust as "the essential ingredient for the primary workplace relationship between the employer and employee."*
>
> *According to their model, trust is composed of three dimensions: credibility, respect, and fairness. The other two Great Place to Work dimensions are related to workplace relationships between employees and their jobs/company (pride) and between the employees and other employees (camaraderie). All five of these dimensions—credibility, respect, fairness, pride, and camaraderie—are the antithesis of political power.*

An executive administrator commented:

I would say this institution works on political power, and not collegiality (I-2).

Another executive in central administration noted the political nature of leadership at the institution.

At this institution, the [institution's leaders] are good at politics. They have an innate understanding of how to work things (I-9).

Other participants shared concerns about ethical leadership. They noted that complexity sciences concepts are neutral. The ideas are not inherently good or evil. For example, a senior level administrator noted

Self-organization is not always good. Self-organization can be completely done in self-interest. Passion to organize and seek and find meaning and value can also happen around political, power, or money issues (I-2).

Another participant working in student affairs expanded on this idea,

If you were a Lex Luther (superman's arch enemy), you could take these [complexity science] ideas and organize around the diabolical. It would take us right down. These are very powerful ideas. They have great potentiality—they can do great good or great harm (I-5).

Leading and managing in the complexity sciences paradigm are normative in nature, according to the participants in this study. This stands in contrast to the mechanistic, bureaucratic models of leadership and management, which were lauded for their efficiency and scientific neutrality. As noted by an executive manager in student affairs, in the complexity sciences paradigm,

Organizational decision-making has to walk a fine line (I-5) between fear and love, between evil and good, between the common good and self-interest.

Our collective thought creates everything

In the complexity sciences paradigm, we are inextricably linked to one another and to the universe through the implicate order. Because we exist in dynamic relationship to one another, we must ensure that we walk the fine line responsibly. One participant with a student affairs background explained this interconnectedness:

> *Every person, when we come together, creates what the world is. Our collective thought creates everything—the past, the present, the future. What we do today will affect tomorrow (I-5).*

A seasoned executive administrator mused about what higher education would be like if we were able to engage all of higher education's constituents in collective thought.

> *Think about the impact if we were able to grow the capacity of <u>all</u> individuals working in the organization!...an empowered culture actively solicits creativity as a way of doing business. It allows for initiative to manifest itself and to permeate throughout (I-11).*

With this end in mind, one executive manager new to his position described how he is employing an inclusive, participatory approach to leadership and management in his unit right now.

> *I'm using a new leadership style that relies a great deal more on shared leadership and a different management style. For example, [before I came on board,] the management meetings used to include 3 people. Now, under me, they include 10 people. We have all-staff meetings with 30 people included, including undergraduates. We have all parts of the system represented. We are a unit. All parts have potential to impact the bottom-line (I-6).*

The institution was not characterized as participatory and empowering by all of the participants. In fact, the participatory nature of the quantum universe surfaces unevenly in higher education. Some participants, particularly from the institution's operations and student affairs units, interpreted their experience in higher education as something less than interconnected and inclusive. An executive manager in student affairs stated:

> *This is still a classist organization. I think the quantum organization is less classist [and more egalitarian]. There is a sense of trust and collegiality in the faculty culture. But for the other categories—the staff—it falls short or is limited. Letting them go and be in control is much more difficult (I-8).*

Another participant early in his career noted how, in his experience, students and support staff were often disconnected from the decision-making. From his point of view, the future of higher education would look different than it does today. In the future,

> *all levels of the organization would be involved in very different ways. We would do away with the archaic class system and with the adultist attitude that "we know what's best for you." Students would be connected in many more places. They would have a right to be part of the management of this place. They would be part of the real decision making and thinking. CTs [clerical-technicals] and secretaries would have the opportunity to participate equally. Students would have a share in much, much more of the decision-making than they do now (I-13).*

As a paradigm based on wholeness, the complexity sciences require participation of each and everyone. It also requires the full engagement of all aspects of each person. As Zohar notes, "the human self has three levels: the mental, the emotional, and the spiritual—that deep layer of the self from which we are in touch when questions of meaning and value" (Zohar, 1997, p. 10).

Some participants felt that Zohar's treatment of wholeness was lacking. For example, one senior level administrator was astounded that Zohar only listed three aspects of individuals. In her mind, the physical level was important as well (I-2). Another participant felt Zohar's treatment underemphasized the dynamic nature of the levels. The tenured faculty member preferred an alternative conceptualization using hands, head, and heart.

> *With "hands, heads, and heart," you definitely get the sense of the interactivity between the three of them. They are clearly a quantum expression, because they overlap, are inside of one another, and have flexible boundaries (I-10).*

There has to be room for the rogues

> *It's all about the questioning. The whole thing is about asking the questions that need to be asked. We are always asking the wrong questions and then not coming up with the right answers. AND, we don't even have everyone at the table to ask the right questions (I-5)* noted a student affairs executive manager.

Some questions seem so basic that we cling to them even though they are not the right ones to ask. (White, 2002, p. 38). "The 'perfect' question often lies out of the range of everyday vision, and it is endlessly changing. To see it requires searching through diverse bits of information after taking off the blinders" (White, 2002, p. 41). Often the right questions are asked by the "wrong people" in the organization, or even by outsiders.

An organization based on complexity science ideas must not only tolerate new questions, it must find room for the rogues, the deviants, and the mavericks. "Deviance is the source of all innovations. It's the wellspring of new ideas, new products, new personalities, and ultimately new markets. It can be a force for

good or for evil (and sometimes both). In its purest sense, deviance is really nothing more—or less—than any one of us taking one measurable step away from the middle of the road" (Mathews & Wacker, 2002, p. 70). Making room for the deviants requires leaders to do three things: identify who they are, create a culture that supports them, and preserve institutional space for them to operate in. A mid-career executive explained:

> *within the [leadership] skill set, you'd also have to deal with the deviant in your unit, and to be able to tell the difference between the deviant that will bring you creative breakthroughs and the deviant who is simply destructive (I-8).*

As a leader following complexity ideas, you would need to be able to discern the difference between "a maverick and a pain in the ass...the maverick is dissatisfied with the way things are—and does something about it, instead of simply [whining] about it" (Cheverton, 2000, p. 22). To support the deviant, you would also have to find

> *a balance and have both a culture and a counter-culture (I-5)* according to one mid-career student affairs professional.

Organizational "culture serves as a prophylactic, protecting business-as-usual businesses from new opportunities...[it] works to eliminate deviant employees, ...to discourage deviant ideas,...[and to] punish deviant behavior and attitudes (Mathews & Wacker, 2002, p. 83). You have to create a place within your organization for the rogues to flourish, or to at least, be tolerated.

"There has always been a tension between the status quo and the new idea. In lots of cases, the tension is so strong, it's painful and destructive. The

status quo pulls harder, offering the illusion of safety and comfort. Rather than experience the discomfort, many people acquiesce to stagnation" (White, 2002, p. 79). Leaders drawing on the complexity sciences must manage this tension—between the culture and the counterculture, between the status quo and the new idea—in a positive way. According to a mid-career executive manager, their ability to *frame a way of finding another edge to work on (I-3)* depends largely on their ability to use conflict, difference, and paradox generatively.

A part of one another, apart of one another

The importance of difference, diversity, and conflict as sources of generative tension and the skills required to manage these tensions for creativity and innovation were another theme common in the participants' interpretations. Complexity science leaders know that

> they need friction, tension, and conflict to make a spark. They actually like those dynamics, up to a point. New ideas come out of the rub between at least two very different positions or points of view. Tension can cause you to reach a new height or better place.
>
> Creative people find ways to optimize tension—not enough and you go no where; to much and you go nowhere. If you get it right, tension becomes a creative tool. (White, 2002, pp. 79-80).

These generative tensions or generative relationships can be encouraged in organizations. For example, generative relationships can be purposefully created by bringing "two or more people or groups of people with diverse objectives and independent and autonomous responsibilities work together on a common project to improve performance of all of the participants involved" (Sherman &

Schulz, 1998, p. 81). The minimum requirements for generative relationships to work include an essential diversity, distance between the participants, and simultaneously shared directedness that motivates the participants to bridge the distances that exist (Lane & Maxfield, 1995). According to complexity science concepts, the group's joint input furthers the group individually and as a whole. "It is the embodiment of the complexity notion that the whole is greater than the sum of its parts" (Sherman & Schulz, 1998, p. 83).

Generative tensions do not always have to be encouraged. "Paradox and conflict are inherent characteristics of the chaordic organization" (Hock, 1999, p. 9). Out of paradox and conflict often come new ways of thinking. One participant advocated embracing paradox.

> *We have to understand paradox as a mental construct to support both-and thinking and whole systems thinking and diversity. Our ability to support diversity rests on our ability to frame paradox. Our current thinking about diversity comes from a conflict way of viewing the world in conjunction with our having lived in a duality, line linear-thinking mode versus a complex, simultaneous, even chaotic world.*
>
> *Thinking about diversity as complexity—you do not have "manage" things because they are not inherently at odds with one another. They are embedded, essentially connected with each other. We need to consider difference in this context, as a paradox, in each of us. We are "a part of one another and we are apart of one another" (I-3).*

Success, therefore, lies in recognizing the power inherent in the paradox and in the ability to sustain the conflict positively. In other words, "Success has to do with the ability of an organization to sustain and manage contradiction and tension (Stacey, 1992, p. 39).

On the organizational level, successful organizations must sustain and manage contradictions and tensions, too. It must display both "fit" and "split" at the same time. "Fit" allows organizations to conduct their day-to-day business in an orderly way. "Split" means giving individuals "freedom to act, decentralizing, differentiating, promoting variety and rivalry." Organizations need "split" because "without it they cannot develop new perspectives and innovative actions. Developing new perspectives means shattering old perspectives and changing old structures—creativity requires destruction" (Stacey, 1992, p. 38).

Leaders must be able to have their organizations thrive in the tension between "fit" and "split." That tension is "creative because it provokes inquiry and questioning. That tension leads to the learning organization, with its continual dialogue between contradicting points of view" (Stacey, 1992, p. 39). Tension leads to what Pascale calls "contend," the positive use of conflict and tension to create and generate new perspectives. Through this clash of opposites the organization "transcends" to a new constellation of "fit" and "split." (Pascale, 1990).

Successful leaders must manage other tensions as well—tensions caused by conflicting sets of expectations across the institution's boundaries. In the complexity sciences paradigm, successful leaders realize that they must manage differently in different parts of the organization. For example, they may have to manage external expectations for their units differently than the way they manage internal ones. To be successful at this, a seasoned female manager adds

you'd have to be able to make them [higher ups] understand it [your approach] and to have skills to show them that you aren't operating under the same old set of goals and objectives. You'd have to be able to sense the politics externally. These are difficult skills. In terms of leading your unit, you'd need to be able to look like a formal leader who is "in control" to the rest of the university. And at the same time, you'd have to be doing the opposite within your unit, not having control in a formal way (I-8).

Another participant referred to managing inside and outside different as bounded flexibility. A central administrator recently promoted to assistant provost said leaders using the complexity science paradigm

achieve it through "bounded flexibility"—you cannot go outside the boundaries, yet within the boundaries, you leave your hands off and let them do what they need to do (I-9).

Other tensions between internal and external expectations center around the time it takes to institute changes.

Finally, leaders who seek to benefit from the generative relationships caused by diversity, different, tension, and paradox must be prepared to help others learn to embrace emergence, to wait patiently for the outcome. A mid-career executive manager added:

[Leaders] have to be able to lead others to tolerate diversity, messiness, and ambiguity (I-8). You have to be able to work with those who "can't stand not knowing where we are going" or those who demand "just tell me what you want to have done and I'll do it." It's a whole new approach (I-8).

A bunch of condescending mumbo-jumbo

One of the central responsibilities of a leaders or a manager is communication. The complexity sciences paradigm poses a significant challenge, as Martha W. Gilliland knows. As chancellor at the University of Missouri, Kansas

City, she knows the difficulties of using complexity science language to talk about transformational change in higher education all too well. Just last year, she initiated a campus-wide visioning process informed by the complexity sciences. The *Blueprint for the Future* is a "program designed to change the university from a "Cartesian" organization—one that is deterministic and hierarchical—into a "quantum" one, that is unpredictable by its nature and stresses relationships among people" (Fogg, 2002, p. A10). The Blueprint for the Future has created controversy on her campus.

> Some professors call it harmless, and some say it will help the university live up to its potential. But others say it is a waste of time, a bunch of condescending mumbo-jumbo that has no place at the university (Fogg, 2000, p. A10).

Participants in this study echoed the concern about the difficulties of the complexity sciences language and the accessibility of the ideas. A seasoned executive administrator said:

> *The major problem with the complexity sciences is their complexity…the difficulty describing and explaining what these ideas mean and how they operate. Unlike other organizations, higher education has a mandate to be accessible to everyone. We have an obligation, a dimension of accessibility, even to those who do not have a clue about any of this. In other words, how do you help people who aren't already here [complexity sciences viewpoint] in understanding these ideas? (I-1).*

Another participant active in student affairs administration added:

> *I wonder if they [complexity science ideas] will ever take off—if the ideas will ever be accessible enough to the average person who rarely dwells in this realm? (I-14).*

The foreign nature of complexity sciences language is also thought to create a barrier between those who seek to use it to frame higher education and those who allocate funding for higher education. A senior administrator echoed this criticism:

> *The complexity sciences don't help higher education be better understood. They make having a translator a requirement. Can you imagine going to the Capitol to ask for more money using this language? It won't work. Complexity may drive us internally and externally, but it has to work across boundaries as well (I-1).*

Summary of Themes

Structure and boundaries

- It's a network model—its centralized and decentralized at the same time
- There's an energy at the edges
- An amoeba, a web, a network, and a matrix
- The boundaries are shifting

Planning and budgets

- It came. It went. Nothing is forever anymore.
- ...even if it's not in our annual report
- There's the problem with the metric

Leadership and management

- You must constantly regain your balance
- The bodies are weak, the spirits are strong
- The narrow path between love and fear
- There has to be room for the rogues
- A part of one, apart of one another
- A bunch of condescending mumbo, jumbo

Interpretations and Findings

The two grand tour research questions asked participants to share their interpretations of the present influences of the complexity sciences and to anticipate what the future influences of the complexity sciences might look like. Accordingly, the overview of the findings were originally organized into two sections—present influences and future influences. As the data coalesced, a third section, in between influences, was added to capture interpretations that had the liminal quality of being "in between" the present and the future.

The final section of this chapter contains the interpretations and findings flowing from the study's data. It centers on eleven specific findings. Findings One through Four address the first research question: are the complexity sciences currently influencing a new organizational paradigm in higher education? Findings Five through Eight relate to the second research question: How might the complexity sciences influence future organizational paradigms in higher education? The remaining findings concern the "in between" nature of some of the research data.

Findings

This study's findings are based on the participants' interpretations, ideas in the literature, and the researcher's reflections. They are not findings of fact. The findings are organized into three sections—the present, the future, and in between. In the present and the future sections, the first two findings address

dimensions of organizational life in higher education, while the last two findings relate to concepts from the complexity sciences.

The present

The first research question explored current influences: Are the complexity sciences currently influencing a new organizational paradigm in higher education? All of the participants shared their interpretations of how current dimensions of organizational life seem to be influenced by the complexity sciences. Some participants, however, noted dimensions that they felt remained outside of the influence of complexity science concepts at present. Similarly, all participants gave interpretations of the influence of complexity science concepts in higher education. Several participants pointed out complexity science concepts they were not able to see currently in action from their perspectives. The first four findings detail the participants' interpretations of the current influence of the complexity sciences on organizational life in higher education.

1. **From the participants' points of view, the complexity sciences seem to influence some dimensions of organizational life in higher education. These dimensions include: activities, structure, leadership, management, and culture.**

Some participants can already see ways in which higher education's activities are being influenced by complexity science ideas. Programs, like the Student Life response to September 11th, have some chaos-like attributes. Some structures are already becoming less centralized, more web-like or network-like. In some units, leadership and management practices are becoming more participatory and human-centered. These shifts also represent a shift in the campus culture.

2. **According to the participants' interpretations, some dimensions of organizational life in higher education remain outside of the influence of complexity science concepts. These organizational dimensions include: culture, budgeting, planning, rewards, and productivity measures.**

In other places, the culture of the university remains a bureaucratic, mechanistic culture. Planning and budgeting are seen as centralized mechanisms for prediction and performance evaluation. Even when given the opportunity to engage, some employees prefer to simply be told what to do. Some participants view the current metric for productivity and rewards to be outside the influence of the complexity sciences.

3. **From the participants' perspectives, complexity science concepts currently influencing organizational life in higher education include: self-organization, potentiality, dynamical relationships, emergence, and systems.**

Participants already see ways in which self-organization takes place at work. Interdisciplinary research teams or even topical networks emerge from the energy of their participants. Potentiality, and the search for adjacent possibilities, can be thought of as influencing disciplines forming on the edges of others. Outreach and extension staff are reconceptualizing their working models to reflect the dynamical relationships between university and community. These models reflect an understanding of systems thinking.

4. **According to the participants' interpretations, some complexity science concepts do not seem to influence organizational life in higher education today. These concepts are: systems, nonlinearity, open and closed boundaries, holism, and dynamical relationships.**

In other instances, however, the participants did not believe the complexity science concepts were having an influence on the current organization. Many cited the silo mentality of the disciplines and departments as counter examples for systems thinking. Planning and budgeting were characterized as linear processes. Despite encouragement to collaborate, internal reward systems continue to be closed. Students, as well as faculty and staff, are not always encouraged to be their whole selves or to consider the relational aspects of their presence on campus.

The Future

The second research question was an anticipatory one, exploring how the complexity sciences might influence future organizational paradigms in higher education. All participants pointed out ways in which they believe the future dimensions of organizational life in higher education might be influenced by the complexity sciences. Some participants, however, identified dimensions of organizational life that they felt might remain outside the influence of the complexity science concepts in the future. Similarly, all participants shared their interpretations of how some complexity science concepts might influence future organizational paradigms in higher education. Several participants identified complexity science concepts they believed would not influence future organizational life in higher education. Findings five through eight detail the participants' interpretations of the future influence of the complexity sciences on organizational life in higher education.

5. **In looking to the future, the participants anticipated that some dimensions of higher education organizations would be influenced by the complexity sciences. These dimensions include: culture, disciplines, structure, leadership, management, conflict, and diversity.**

Participants anticipated that the organizational culture of higher education would become more participatory and inclusive. They projected that disciplines would continue to form and re-form around salient issues. In their interpretations, the image of higher education included open boundaries and matrix structures. Leadership and management would have a less bureaucratic, more empathetic tone—taking into consideration the human dimensions of perpetual change. Leaders and managers would also reframe conflict and diversity, so that they were both seen as valuable sources of innovation.

6. **From the participants' perspectives, some dimensions of organizational life in higher education may remain outside of the influence of complexity science concepts. These dimensions include: culture, structure, productivity measures, leadership, and management.**

For many participants, the academic culture, included the power of the faculty, would continue into the future. Participants felt that the silo structures of departments and the sharp division between the academics and operations would be slow to disappear. While most participants criticized the current system of productivity measures, few suggested alternative. Some participants felt that leadership and management would continue to operation from a place of political power and prestige.

7. **According to the participants, the complexity science concepts influencing the future of higher education include: holism, systems, evolution, disequilibrium, chaos, dynamical relationships, potentiality, and open and closed systems.**

Participants speculated that the movement towards holism would continue to shape more connective curricula. Systems models depicting layers of interaction and dynamic relationships between the university and communities were considered appropriate for the future. Some participants thought the concept of managing for disequilibrium (holding units at the delicate tension of "fit" and "split") would hold sway in the future. Other participants projected that "exit strategies" for new, but potentially no longer needed initiatives would become part of the future of higher education. Potentiality, as a guiding principle for hiring decisions and as an inspiration for activities, was thought to continue to affect higher education's future. Finally, as structures and boundaries define and re-define themselves, the opening and closing of the university's systems to forces in the environment were thought to be complexity science concepts important in the future of higher education.

8. **From the participants' points of view, some complexity science concepts did not seem likely to influence the future of higher education. These concepts are: participatory, emergence, dynamical relationships, and nonlinearity.**

As participants imagined the future of higher education, some complexity science concepts did not resonate with their image. Many did not believe that institutions of higher education would become place where all members were invited to engage as equal participants. Some participants did not see emergence as part

of higher education's future; instead, they thought the strong cause-and-effect, linear thinking would continue to dominate organizational life in higher education's future. Similarly, acknowledging the dynamical relationships and the interconnectedness implicit in the universe seemed to be a stretch for many participants to see in higher education's future.

In Between

As the data coalesced, it became clear that the participants' interpretations of the complexity sciences did not fall crisply into the categories of the present and the future. Some dimensions of organizational life were believed to be influenced by the complexity sciences; and, at the same time, other participants believed those same dimensions to be untouched by complexity science concepts. Similarly, certain complexity science concepts were singled out as having an influence on organizational life in higher education; while, at the same time, the same concepts were believed to have little influence on higher education. These seeming contradictions suggest a liminal quality of being "in between" the present and the future. A few participants believed that the complexity sciences in higher education are in a permanent state of "in between-ness," and that complexity science paradigm co-exists now and will continue to co-exist with the current paradigm. Findings Nine and Ten pertain to the "in between" interpretations of the complexity sciences' influences in higher education.

9. **Some dimensions of organizational life were believed to be influenced and to be closed to the influence of complexity science ideas.**

For example, within some units, participants felt that the culture was participatory and inclusive, inviting engagement from everyone. At the same time, some participants felt that there is an unspoken schism between faculty and the university's staff and students. In a parallel way, some participants believed the campus-wide planning process—Vision 2020—was an open planning process, designed to elicit ideas from diverse campus stakeholders. At the same time, participants felt that the annual planning and budgeting process was highly centralized and bureaucratic.

10. **Some complexity science concepts were interpreted as having and as not having an influence on organizational life in higher education.**

For example, participants felt that the academic part of the university was, in some respects, self-organizing. For the most part, the curriculum is not centrally organized, but instead lies in the hands of the faculty. Even academic departments may re-organize in response to changing needs. On the other hand, the work performed by individuals considered employees, such as cafeteria workers and grounds crews, was not interpreted as an outcome of self-organization. Instead, service work was valued for its uniformity, reliability, and predictability.

CHAPTER FIVE

CONCLUSIONS

This final chapter begins with an overview of the study's purpose, methodology, and findings. Conclusions are listed and situated in the context of appropriate literature and relevant theory. The chapter concludes with recommendations for further research. Given the exploratory nature of this study, particular attention is paid to improving the current study, extending the current line of inquiry, and exploring new areas for research based this study's initial conclusions.

Summary and Findings

Purpose

The complexity sciences are influencing organizational paradigms in a number of fields—supply chain management, finance, public relations, and medicine. Little is known, however, about if and how the complexity sciences might influence organizational paradigms in higher education. This purpose of this study was to explore that question. A qualitative research design was used to understand the current and potential influence of the complexity sciences from the perspective of executive managers and senior faculty at a major university. Two grand tour questions were explored:

According to executive managers and senior faculty,

- Are the complexity sciences currently influencing a new organizational paradigm(s) in higher education?

- How might the complexity sciences influence future organizational paradigms in higher education?

Methodology

Data collection was guided by naturalistic, interpretivist traditions. A purposive sampling method was used to identify 14 participants. Phenomenological, open-ended interviews were conducted until the data reached the point of redundancy. In addition to interview data, data included documents supplied by the participants and field notes written by the researcher.

Following an inductive, iterative process, the data were analyzed to discover the meanings associated with participants' perspectives. Open coding using the constant comparative method and memoing techniques was used in data analysis. The findings were reported using "thick, rich" description.

Criteria for validity included coherence, consensus, and instrumental utility (understanding and anticipation). Verification procedures included peer debriefing and reflexive journaling throughout the study. An external reviewer examined the final research report to attest to its authenticity.

Findings

The findings are composed of seven general findings. The finding concerning leadership and management includes seven sub-parts. The findings also include four findings specifically related to this study's research questions, and an additional two findings about the "in between" nature of a complexity sciences influenced organizational paradigm.

In general, this study found that:

- Ideas about organizational change were met with skepticism, as participants felt that true paradigmatic shifts were rare in higher education.
- While present and future interpretations of the complexity sciences were forthcoming, none of the participants believed that a complexity sciences paradigm is or would become the dominant paradigm in higher education.
- Dimensions of organizational life were not uniformly thought to be influenced by the complexity sciences now, or considered open to the influence of the ideas in the future.
- In both the present and the future, complexity science concepts were not consistently interpreted as having an influence on organizational life in higher education.
- A few participants believed that the current organizational paradigm and a complexity sciences organizational paradigm co-exist in higher education today and that this co-existence would continue into the future.
- If the complexity sciences were to become the dominant paradigm in higher education, participants believed that managing the human dimensions of perpetual change would be a challenge.
- In a complexity sciences organizational paradigm, approaches to leadership and management would be significantly different. New approaches would include:
    - Responding and adapting to the constantly shifting forces of change
    - Encouraging others to tolerate ambiguity, uncertainty, and messiness
    - Creating a climate supportive of questioning, dialogue, and inquiry
    - Supporting a counter-culture, including room for rogue individuals
    - Working with the common good in mind
    - Using participatory, inclusive, holistic approaches
    - Reframing difference, diversity, paradox, and conflict as generative forces

- Managing internal and external expectations differently
- Finding ways to communicate the new ideas and practices in a credible and meaningful way to different audiences

The specific findings related to the study's research questions—one about present influences and one about future influences. The findings are based on the themes and interpretations the participants shared regarding dimensions of organizational life and complexity science concepts.

According to their interpretations about the present and the future:

- Some dimensions of organizational life in higher education are currently being influenced by the complexity sciences, and, at the same time, some dimensions of organizational life are thought to be beyond the influence of the complexity sciences.
- Some complexity science concepts are influencing organizational life in higher education, and at the same time, some complexity science concepts are not influencing organizational life in higher education, at present.
- In the future, some dimensions of organizational life may be influenced by the complexity sciences; while other dimensions may be uninfluenced by these new ideas.
- In the future, some complexity science concepts will influence organizational life in higher education, and at the same time, some complexity science concepts will not be influential.

Some of the findings were contradictory, indicating an "in between" quality:

- Some dimensions of organizational life were believed to be both influenced by the complexity sciences and closed to their influence.
- Some complexity science concepts were interpreted as both having and as not having an influence on organizational life in higher education.

Conclusions

This study was about the Old Story. It was about the New Story. And, in the end, it turned out to be about being "in between" stories. The stories represent paradigms, ontological perspectives that define the parameters of our organizational life and provide meaning for the work that we do. The Old Story, the familiar story, is changing. The New Story has not quite come into focus as of yet. We find ourselves, at the moment, in between stories.

The Old Story

The Old Story rose to prominence over 300 years ago. The scientific revolution, sparked by Newton and others, created a story of the universe based on mathematical principles and physics principles. The Old Story is based on simplicity. The image of the machine, working with clock-like predictability, took hold in our collective thoughts. These beliefs, now deeply rooted in our culture, encompass a way of knowing that values understanding how separate parts function individually; viewing the past, present, and future as linearly connected; knowing through objective, scientific study of the smallest parts possible; relying on hierarchies for organization and centralized authority for decision-making; believing in one, objectively knowable reality; and seeking the most efficient means as an end goal.

Organizational scientists, like Weber, Gilbreth, Taylor, and Babbage, relied upon this scientific philosophy to construct new "scientific management" practices for the increasingly large organizations of the industrial revolution. The rigid, bureaucratic, management-intensive ways worked well in the highly

routinized assemblies lines of the industrial era. However, in the fast-paced, information and technology-intensive world of work, these ideas no longer serve as well as a basis for our organizational operating principles.

The New Story

The New Story, suggested by Schwartz & Oglivy and many others since 1983, is based on fundamentally different principles. The New Story is an organic one, based on a complex view of the universe. Its guiding image is a living system, such as an ecosystem that learns and adapts to shifting internal and external environmental forces. This New Story encompasses a different way of knowing that values: understanding the dynamic, relational nature of an interrelated universe; acknowledging the self-organizing, emergent dialectic pattern of order and chaos; affirming nonlinearity, non-locality, and discontinuity as significant forces; celebrating difference, diversity, conflict, and paradox as generative source of innovation, creativity; relying on networks or webs for organizational structure and decentralized decision-making; and seeking adaptation, learning, and change as means to the end goal of evolution.

Organizational scientists, such as Stacey, Pascale, Youngblood, and others, rely on this organic, systems view to describe the "new sciences" approach to organizing, leading, and managing our organizational life in a world of ambiguity, uncertainty, and turbulence. The flexible, decentralized, responsive approaches they champion work well in the contemporary, fast-paced, information-intensive organizations and environments.

According to Capra, leadership and management in a complexity sciences paradigm must be based upon a basic understanding of the underlying phenomena : spontaneous emergence, dynamic structural coupling, and continuous learning. In human systems, "the creation of knowledge in social networks is a key characteristic of the dynamics of [organizational] culture" (Capra, 2002, p.101). Leading and managing social networks for knowledge creation requires new approaches and new skills.

According to the participants in this study, the New Story requires leaders and managers to:

- Respond and adapt to the constantly shifting forces of change
- Understand the human dimensions of negotiating perpetual transitions
- Encourage others to tolerate ambiguity, uncertainty, and messiness
- Create a climate supportive of questioning, dialogue, and inquiry
- Support a counter-culture, including room for rogue individuals
- Work with the common good in mind
- Use participatory, inclusive, holistic approaches
- Reframe difference, diversity, paradox, and conflict as generative forces
- Manage internal and external expectations differently
- Find ways of effectively communicating these new ideas and practices

Being In Between Stories

"It's all a question of the story. We are in trouble now because we do not have a good story. We are in between stories" (Schwartz & Oglivy, 1983, p. 1).

Twenty years later, the data in this study suggest that we continue to be "in between stories." The betwixt and between nature of the participants' responses indicates that both The Old Story and The New Story influence organizational life at this institution. We are still in between stories. This "in between" state deserves further investigation.

Recommendations

Recommendations include ideas about improving and extending this line of inquiry. The first section, concerned mostly with the research design, focuses on ways in which the study could have been improved. The second section proposes ways in which the study might be expanded to explore the research questions in other contexts. Drawing upon the study's findings and conclusions, the final section suggests directions for future research.

Critique of This Research

Exploratory studies, similar to this one, might be improved with the following adjustments in the research design, methodology, and implementation. For beginning researchers, a pilot study is invaluable for becoming more comfortable with the interview process and for making adjustments in the interview questions. After the pilot study, the researcher should meet with peer debriefers, so that they may provide feedback on what ideas might be explored more completely in subsequent interviews, on expanding interview and field notes to create a thorough research record, and on other improvements in the

research process. Peer debriefing should not be delayed until the "real" research begins.

The researcher should anticipate varying levels of understanding of complexity science concepts among the participants. It is likely that some participants will be well-versed in the ideas, while others may have only been introduced to them through the study. To meet participants at their level of understanding, the researcher should be nimble with explanations and flexible with interview questions. Along these lines, the researcher should consider a different way to familiarize participants with complexity science concepts. *ReWiring,* chosen for the ease in which it could be read, was not scholarly enough for most participants; they were frustrated and critical of its "pop" nature. At the same time, the Harvard Business Review article provided only a skeletal overview of the complexity science concepts. Another method for ensuring participants' familiarity with complexity science concepts should be employed in future studies.

Future research, especially interviews, should take place in a place that is comfortable for both the participants and for the researcher. While participants may be comfortable being interviewed in cramped offices or noisy café areas, the researcher should be firm about having adequate table space for good note-taking and an atmosphere with as little distraction as possible.

Finally, future research may be strengthened by bringing the participants together for a group debriefing or a focus group at the end of the study. One-on-one interviews provide one level of understanding; however, a group dialogue

may bring out deeper collective understandings, including synergies or discontinuities. These, too, are important, because organizational paradigms have both individual and collective aspects.

Moving Beyond the Exploratory Design

Recommendations for extending the original research include possible future directions based on the study's original research problem and design. The original research problem could be explored in three additional ways—studying the problem from other perspectives, researching the problem at other types of institutions, and understanding differences in perspective within institutions.

This study was bound by its elements of design, including the snowball sample method for identifying study participants. The study explored the perspectives of executive managers and a few senior faculty. **The snowball sample did not generate an evenly distributed sample across appointment types and institutional roles. The findings of this study may have been significantly different if other members of the institution were included in the sample or if the sample were purposefully stratified by age or gender.** Future research, therefore, should be more purposive in identifying different types of individuals to interview. For example, presidents and provosts, academic deans, and department chairs or unit directors, because as they are often directly responsible for leading change, would be important perspectives to study. Other perspectives might include faculty who research organizational change in higher education and faculty who study organizational change in other fields.

Due to the exploratory nature of this study, data collection was limited to one major university. Future research might naturally involve other major universities or include other types of institutions (other Carnegie classifications, for-profit, etc.). Further research along these lines might uncover similarities or differences according to institutional type.

Finally, future research might explore differences of perspective within institutions. In this study, the researcher noticed a difference of perspective between those who worked in student affairs, as researchers, and in operations. Several participants commented on differences they perceived between those considered to be faculty and "employees," (i.e. food service help, custodial worker, etc.). Future research exploring these different "within-institution" perspectives might explore how the complexity sciences are perceived by people who work in different areas of the organization (student affairs, research faculty, operations, etc.), by people who focus on the edges of the institution (centers or interdisciplinary collaboratives) and those whose work is in its core; and by people who research or teach different aspects of complexity (physics, biology, etc) and by those whose academic work does not focus on the foundations of complexity science.

Recommendations for Longer Term Research

The final set of recommendations for future research emerges from the study's findings and conclusions. The new directions for future research include suggestions concerning the different dimensions of organizational paradigms—

structure and boundaries; planning and budgeting; and leadership and management.

An organizational paradigm informed by the complexity sciences defines structure differently. Longer term research might focus on understanding the new perspectives on internal organizational structure. A better understanding of the informal and formal structures as well as the interplay between them is important. Similarly, we need to know more about the roles of the organization's core or center and its peripheries as well as the dynamic relationship between the two areas.

A second important focus would be to learn more about the shifting organizational boundaries in higher education. Research is needed to understand the impact of arrangements that transcend or blur the organization's distinct boundaries. For example, we need to know more about collaborative research arrangements between institutions of higher education; new public-private partnerships to provide or improve campus infrastructure; and cooperative agreements that concentrate disciplines on different campuses regionally. We also need a better understanding of the implications of these shifting or blurring boundaries. We need to know what such changes might mean for higher education in terms of improved learning, research efficiency, public perception, funding formulas, etc.

The planning and budgeting process is a third area where long term research is needed. Because success is defined differently in an organization influenced by the complexity sciences, the planning and budgeting processes

and performance/reward structures need to be reformulated to support the new definition. Longer term research is needed to learn more about how unit planning, annual budgeting, performance measures, and reward structures are being modified to value innovation, collaboration, creativity, risk-taking, and contributions that do not directly contribute to the bottom line (i.e. those contributing socio-emotional goods). Research along these lines might explore ways in which these organizational processes might be shifted away from focusing on the known "small, achievable wins" to focus on less certain but more meaningful impacts, over time.

Leadership and management represent a fourth area where addition research is needed. Leaders and managers in an organizational paradigm influenced by the complexity sciences operate in significantly different ways than their Newtonian counterparts. Participants in this study believed that they must learn to lead their organizations through flux; help their employees through transitions related to loss; encourage a counterculture and a culture; and value conflict and support diversity. Key research questions relate to these leadership and management abilities.

An important research question relates to how leaders are able to see their way through the turbulent, white-water conditions of perpetual change and lead the organization through persistent flux, uncertainty, and ambiguity. Additional research might uncover how successful leaders and managers deal with the human dimensions of perpetual change—on how they guide their

colleagues and employees through the transitions due to the loss associated with on-going change.

Leading and managing an organization in a way influenced by the complexity sciences rely on a commitment to pursuing a one-size-does-not-fit all approach. Understanding how leaders encourage and protect the rogues, deviants, or innovators, on the individual level, and strengthen the edges and peripheries, on the organization level is important. Future research into those areas would also uncover how, in a dialectical or paradoxical way, successful leaders work to create both strong cultures and countercultures.

Finally, longer term research should explore the importance and the role of conflict in organizational paradigms influenced by the complexity sciences. Researchers should learn more about the generative power of tension, conflict and paradox. They need to uncover the ways in which successful leaders reframe conflict, so that it can be viewed constructively as a source of innovation. Similarly, it is essential to understand how leaders value difference, helping others see how fundamental diversity is in the organization's future success.

Concluding Observations

From the External Reviewer

As the final research report took shape, the external reviewer was given a copy of the draft dissertation to review. The external reviewer was chosen for his prominence in the field of chaos and complexity in higher education. He was asked to comment on whether the findings and interpretations were "consistent

with his own experience." The reviewer commented on the parallels and noted the differences between his work and the findings in this study. He gave special emphasis to issues related to leadership and planning. Overall, he felt that the essence of this study's findings and interpretations resonate with his scholarly experience with the complexity sciences in higher education. The letter soliciting his review and his full review appear in Appendix J.

From the Researcher

The Old Story may indeed be giving way to the New Story, as bureaucratic mechanical images of organizations are replaced by more organic, systemic ones. The popular and scholarly literatures are filled with theoretical pieces and applied work demonstrating how the paradigm embodied in the complexity sciences is shaping contemporary organizational life. And, no doubt it is.

At this study's conclusion, the researcher, however, believes that the salient question is not whether the Old Story is giving way to the New Story—a dualistic question if there ever were one. The better question might be: given our growing awareness of the New Story, how do we bring both Old Story and the New Story together as we shape organizational life? How do leaders and managers negotiate the uneasy co-existence of two such opposite worldviews? How might we exist "in between" Stories, capitalizing on the generative tensions that spark between the two?

In the following Reflective Afterword, the researcher expands on these conclusions, shares her personal interpretations of the research findings, and explicates her new understandings of the complexity sciences and organizations that have emerged through the process of completing this dissertation study.

CHAPTER SIX

REFLECTIVE AFTERWORD

"*Given all that you have learned—through your readings and the interviews, what are your thoughts about the complexity sciences now? We want to hear more from you*," commented several of my dissertation committee members during my oral defense. "*You need to expand Chapter Five.*" Their comments caused a dilemma for me. In my mind, Chapter Five documents the study's conclusions based solidly on the data. My thoughts, in contrast, are a whole other story. They are a mélange of insights sparked from the data mingled with personal reflections and intellectual speculations. My thoughts are not solely based on data. As a result, I do not believe personal thoughts belong in Chapter Five. What do I do now? How do I respond to their request without compromising on an important aspect of the research design?

This final, unplanned chapter is the answer. It is a direct response to their request "to hear more from me" and follows a suggestion made by one of my peer debriefers. After reading a draft of the dissertation, she wrote:

> I offer the following suggestion with open hands: as qualitative researchers I believe any methodological reflections that can be offered "at the end of the day" are useful in moving the qualitative/interpretivist project forward. I would value a postscript (similar to Appendix A) where Diane talks about her joys, frustrations, and complications in getting "their lives" into "our works" (Geertz, 1988).

Chapter Six is just such a "postscript," a Reflective Afterword relating my bracketed thoughts and personal reflections on both the study's methods and its topic. It is meant to satisfy the reader's question—what does she think now?—as

well as provide methodological closure to a qualitative/interpretivist study. Chapter Six is organized into three main sections: Surprises Along the Way, The Complexity Sciences Now, and Future Directions.

Surprises Along the Way

For me, the utter joy of this research project was in the "search" itself. When we, researchers, do not know something, we diligently set out to find answers to our questions. In finding answers, we are bound to be surprised by two entirely different things—by what we did not find (but had expected to) and by what we did find, even if it were unexpected. Three such surprises stand out to me as significant ones worthy of exploration in this afterword. They are: the holes in the literature, the important but overlooked first finding, and unexpected interactions among some participants.

First, I was surprised by the holes in the literature. As I looked further into the literature linking the complexity sciences to organizations, I was disappointed by the absence of what I had expected to find—a systemic and comprehensive treatment of complexity science ideas across literatures. Similar to double-jumping in checkers, I had hoped to transpose complexity science concepts from one domain to another to another. Specifically, I hoped to "jump" from biological and physical sciences literature to organizational and management literature to the higher education literature.

The first transposition from biological and physical sciences to the organizational and management literature was not as straightforward or easy as I

had expected. Much organizational literature, though it claimed to explain an entirely new paradigm, was often one-dimensional. Leading authors linking the complexity sciences to organizations often chose to focus on a single aspect of the complexity sciences paradigm instead of providing a thorough treatment of the new, emerging paradigm.

For example, in his 1992 book, *Managing the unknowable: Strategic boundaries between order and chaos in organizations*, Stacy draws upon chaos theory concepts such as order, disorder, disequilibrium, and self-organization to explain how organization adapt to uncertainty and flux. Stacy, however, does not make use of any complexity concepts from biology to explain the importance of edges or peripheries (either as individual rogues or as organizational skunkworks) in creating strange attractors around which chaotic forces may self-organize. In a reverse pattern, Sherman and Schultz in their 1998 work, *Open boundaries: Creating business innovation through complexity*, draw upon biological concepts in their work, relating edges and peripheries to self-organization and non-linear emergence. However, Sherman and Shultz do not use many chaos theory concepts (bifurcation points, sensitivity to initial conditions) in their book. Over and over again, as I read the organizational and management literature, I was surprised to find similarly uneven or sporadic treatments of the complexity sciences. Not one book or article I reviewed took a comprehensive approach to describing a complexity sciences paradigm, though the 2000 volume by Stacey, Griffin, and Shaw, *Complexity and management: Fad or radical challenge to systems thinking?* came the closest.

If the first transposition—from physical and biological science to organizational and management literature—revealed holes in the literature, the second transposition—from organizational and management literature to higher education literature—revealed chasms on the scale of the Grand Canyon. Very little has been written about the complexity sciences as an organizational paradigm in higher education. Cutright's 2001 volume, *Chaos theory and higher education: leadership, planning, and policy*, and his other work represent a first step in the interpretation of the complexity science sciences in the context of higher education. It is only a first step, however, the edited chapters examine how the complexity sciences might influence different dimensions of organization life in higher education (i.e. planning, leadership, policy) and not organizational paradigms as a whole.

Based on the reactions of my study's participants, as exploratory and limited as they were, I believe now more than ever that it is time to start to filling in the gaps in both literatures (organization/management and higher education). From my perspective, it is a worthwhile goal to understand how complexity science ideas may influence (or reveal) new understandings of our organizations, including higher education organizations.

Second, I was surprised by the very first finding of this study. This study's most important finding—and, unfortunately, the easiest one to overlook—is that there was something to say about the influence of complexity science concepts in higher education. When I began this study, I honestly did not believe many participants would find a complexity sciences' influenced way of thinking relevant

to higher education. The literature did not indicate that the participants would have examples, ideas, or reactions to complexity science ideas in higher education. Before I started the interviews, I braced myself for the possibility that the participants would have absolutely nothing to say and that complexity science ideas would not resonate with them at all. I was truly prepared for the very real possibility that my dissertation would conclude that the complexity sciences were not relevant in higher education. I had convinced myself that, in an exploratory study, such a finding would be an important contribution nonetheless. At the very least, we would know that there was nothing to know.

Was I ever surprised! The participants who enjoyed the book, those who said, "*I've been thinking this way for a long time and just didn't have the words to describe what I was thinking! This book was a gift!*," had plenty examples to share. Even the participants who thought the book was a poorly written patchwork of underdeveloped and misappropriated ideas had complexity sciences' influenced examples to share. I was surprised that every participant had something to say about my study's main questions.

Their examples were wonderful! When I began this study, I had no way of anticipating the rich imagery they were prepared to share with me. When my first participant arrived with sketches of amoebas, webs, networks, and matrices, I was thrilled. Later, as one participant made her point about the powerful forces of goodness and evil, she characterized it as the classic struggle between Superman and Lex Luther, his arch rival. A tenure faculty member described how he came to find the central concept of his academic work from a jumble of ideas

that were "like a laundry basket of miscellaneous socks." Participant after participant found meaningful ways to share their perspectives on higher education, as viewed through the lens of the complexity sciences. Like Cutright's work, my study represents the tip of the iceberg in this area of understanding and discovery.

Finally, I was surprised by an unintended consequence of the study. On their own, some participants discovered that they were all reading the same book, at the same time. They started discussing the ideas in the book with one another, completely outside of my one-on-one interviews with each of them. This development surprised and delighted me. Clearly, their conversations were a confirmation that the book's ideas had resonance. Their interactions also demonstrated a complexity sciences idea in action. What was originally framed as a linear research exchange—one-on-one interviews with each participant and me—changed, completely on its own accord, into a series of decentralized, interconnected, conversations among some of the participants. Had I framed this research as an "action research," I would have expected the study to trigger additional activity among the participants. However, it was never my intention to spark such exchanges; they just happened naturally.

Complexity Sciences Now

As I completed my study, I found that the salient question is not whether the Old Story is giving way to the New Story in some tremendous paradigm shift. Instead, I am left with less dualistic questions. I wonder: given our growing

awareness of The New Story, how do we bring both The Old and The New Story to bear on our perceptions and understandings of organizational life? How do leaders and managers negotiate the uneasy co-existence of two such opposite organizational paradigms? How might we exist "in between" stories, capitalizing on the generative tensions that spark between the two?

I believe that both The Old Story and The New Story provide important insights to us about organizational life, including life in higher education. The Newtonian, Cartesian, LaPlacian way of viewing organizations as linear machine-like entities offers us a perspective that is appropriate in some circumstances. The Old Story helps us create stability and maintain organizational life in a predictable manner. A complexity sciences perspective is useful in other circumstances. It allows us to view organizations as organic, living systems capable of learning and evolving. The New Story helps us understand dynamic, interconnected forces of change across space and time. I agree with Stacey, Griffin, and Shaw when they argue for both stories:

> *Any kind of organization is a dynamic interplay of stability and change, of continuity and novelty, of decay and generation, of the sameness of identity and the difference of change in identity (Stacey, Griffin, & Shaw, 2000, p. 5).*

The challenge is having the wisdom to discern when The Old Story or when The New Story will leads to deeper understanding and effective action.

Future Directions

What does this dynamic interplay mean for scholars and practitioners of organizational management and change, including those whose focus is in higher education? On a very basic level, it requires three major changes. First, it means that we all must come to understand both The Old Story and The New Story, in their fullest senses. We must change our collective perception of organization life and open our eyes to new ways of seeing what is happening right in front of us. In order to do that, we must develop new vocabularies for describing what we see and for conveying what we now know.

Second, we must teach for understanding both The Old Story and The New Story and for the wisdom to know the difference between the two. Faculty who prepare the next generations of organizational leaders (be they in business, outreach, education, or government) need to teach the concepts of the complexity sciences along with the more traditional, mechanistic models of organization. To support this change in education and training, new curricular materials—texts, case studies, audio-visual materials—need to be developed exemplifying The New Story and showing how to use both perspectives well.

Third, as the participants of the study pointed out, we must do more than understand these two radically different approaches. We must act differently too. We must teach ourselves and others to lead and manage using both Stories as well. Participants identified nine skills leaders and managers who include the complexity sciences in their approach would need to develop:

- Anticipating, responding, and adapting to constantly shifting forces of change

- Encouraging others to tolerate ambiguity, uncertainty, and messiness
- Creating a climate supportive of questioning, dialogue, and inquiry
- Supporting a counter-culture, including room for rogue individuals
- Working with the common good in mind
- Using participatory, holistic, inclusive approaches
- Reframing difference, diversity, paradox, and conflict as generative forces
- Managing internal and external expectations differently
- Finding ways to communicate the new ideas and practices in a credible, meaningful way to different audiences.

I find four of these leadership and management skills particularly intriguing and expect that some of my future research might focus on further understanding these issues: 1) how leaders anticipate change and adapt to permanent white water conditions; 2) how leaders encourage others to tolerate ambiguity, uncertainty, and messiness; 3) how leaders and managers create strong counter-cultures and encourage rogue, maverick, or deviants on the individual level, and how they support pockets of change, at the organizational level; and 4) how difference, paradox, and diversity can be reframed as generative forces for change and innovation. I see these questions as important ones for many types of organizations, including institutions of higher education.

As Schwartz and Oglivy noted in 1983, we are "in between" stories. Twenty years later, this study's data suggest that organizational life as we know it continues to be "in between" stories. The challenge, then, is to learn how to understand the "in between" essence of organizational life and to become skilled at leading and managing in a state of permanent transition. My hope is that further scholarship and experience will help us come to know and be comfortable operating in a state of being "in between" the two stories.

APPENDIX A

RESEARCHER'S STATEMENT

Intellectual Interests

I have had a longstanding interest in organizations, their culture, related through stories, symbols, and myths, and their behavior, evident in policies and practices. Deal and Kennedy's *Corporate Cultures* (1982) informed my anthropological perspective on organizations. At the same time, my interests in leadership and management (and the distinctions between the two) deepened through coursework at Penn State's School of Business and at UCLA. Experiences in Kenya and Tanzania, as well as a minor in French Business, underscored the importance of cross-cultural differences and helped me to understand how ontological differences profoundly affect even the smallest details of daily life. To this day, cross-cultural differences (broadly defined) are an essential part of my reflective practice, as I read, observe, act, reflect, and dialogue about leadership and management in my professional life.

I have also been greatly influenced by Bolman and Deal's *Reframing Organizations: Artistry, Choice, and Leadership* (1991) and Morgan's *Images of Organization* (1997), both provide different lenses or frames for viewing organizations. I wondered, however, if some of the frames or lenses were poorly suited for leaders and managers who work in complex environments. By complex environment, I mean organizations where internal and external boundaries constantly shift and where uncertainty and ambiguity are key characteristics of their environmental contexts. It was this question that originally brought me Michigan State University for doctoral research.

Personal beliefs

At MSU, I was introduced to a small but growing area of scholarship and practice, one that brings new understandings in physics and biology to bear on organizational paradigms. These loosely coalesced theories are referred to collectively as the complexity sciences. The complexity sciences and their implications for contemporary organizations have captured my curiosity and interest for several years. I have had the opportunity to work in a small pocket of the university, where complexity science ideas are the primary organizing concepts. This experience has given me a practice field in which my scholarly questions are grounded. I am sure that my interest in the complexity sciences is due to personal reasons as well. They resonate deeply with my personal world view, characterized by these beliefs:

- It all depends on how you look at things, therefore, there is no one right way to do things and respect for individual differences is a must.

- Everything is interconnected; therefore, the even the smallest details matter, because you never know what profound effect they will have elsewhere (systems, Butterfly effect, nonlinearity, tipping point).
- Trust emergence; encourage innovation, participation, and creativity; and foment synergies whenever possible (self-organization, evolution, connectedness).
- Actively explore unrealized potential, adjacent possibilities, and weird ideas on the fringes. Be optimistic, hopeful, and future-oriented (potentiality, quantity-quality dialectic).
- Time is not linear—the past and future are with us in the present, though we are often unaware of them (nonlinearity).
- The alignment between the process (how you do it) and product (what you do) creates coherence and integrity. As such, the interplay between the journey and the destination is important (particle/wave dualism, wholeness).
- Learning through reflection (from self) and dialogue (through others) brings insight and understanding.
- Physical, cultural, and emotional environments have profound effects on what is believed to be possible. Rich, playful environments that are both safe/trusting and challenging/stretching make the most difference.

Views on Organizational Paradigms

While many complexity science concepts are congruent with my personal worldview, they do not reflect my general views about organizations. For the most part, I believe organizations to be hierarchical structures, where possibilities and potentials are bound by formal and informal rules, roles, structures, and policies. Organizations are lead and managed to reproduce the status quo as efficiently as possible. Emphasis on standards and quantitative performance measures creates cultures of rigidity and inflexibility, often reflected in top-heavy bureaucracy. The messiness of creativity, innovation, and risk-taking is to be avoided, or in rare instances where it is encouraged, it is confined to special "innovation" units of the organization.

While this "machine-like" organization is commonplace, I do believe that it is beginning to give way as more networked, entrepreneurial organizations achieve success in the marketplace. Internet start-up companies and other smaller businesses are beginning to follow a different set of rules, knowingly or unknowingly influenced by the complexity sciences. However, I have seen little evidence that education, and higher education in particular, is adopting a new way of doing its business. In most of the practice literature, chaos is to be avoided at all costs, and in the research, increasingly sophisticated and powerful models are created to project enrollments and to predict student learning outcomes. None of this seems to take ambiguity, uncertainty, or unpredictability into account. I am left wondering how institutions of higher education, faced with

the dual challenge of rapidly changing internal and external constituencies, will continue to be successful in the future.

My intellectual interests, personal beliefs, and views on organizational paradigms came together to help me frame my research problem. Despite my personal views and biases, I was committed to hearing the participants, understanding their points of view, and relating their perspectives to the readers of this research.

MICHIGAN STATE UNIVERSITY **APPENDIX B**

July 31, 2001

TO: Frank FEAR
323 Natural Resources

RE: **IRB# 01-502** CATEGORY: EXEMPT 1-C
APPROVAL DATE: July 31, 2001

TITLE: THE COMPLEXITY SCIENCES AND FUTURE ORGANIZATIONAL PARADIGMS IN HIGHER EDUCATION: AN EXPLORATORY STUDY

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete and I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the **UCRIHS approved this project.**

RENEWALS: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Projects continuing beyond one year must be renewed with the green renewal form. A maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for a complete review.
REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB# and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.
PROBLEMS/CHANGES: Should either of the following arise during the course of the work, notify UCRIHS promptly: 1) problems (unexpected side effects, complaints, etc.) involving human subjects or 2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of further assistance, please contact us at (517) 355-2180 or via email: UCRIHS@msu.edu. Please note that all UCRIHS forms are located on the web: http://www.msu.edu/user/ucrihs

Sincerely,

Ashir Kumar, M.D.
Interim Chair, UCRIHS

AK: bd
cc: Diane M. Doberneck
65 Agriculture Hall
Bailey Scholars Program

OFFICE OF
RESEARCH AND GRADUATE STUDIES
University Committee on Research Involving Human Subjects
Michigan State University
246 Administration Building
East Lansing, Michigan
48824-1046
517/355-2180
FAX: 517/353-2976
Web: www.msu.edu/user/ucrihs
E-Mail: ucrihs@msu.edu

MICHIGAN STATE
UNIVERSITY

June 25, 2002

TO: Frank FEAR
323 Natural Resources
MSU

RE: **IRB # 01-502** CATEGORY: 1-C EXEMPT
RENEWAL APPROVAL DATE: June 25, 2002

TITLE: THE COMPLEXITY SCIENCES AS AN EMERGING ORGANIZATIONAL PARADIGM IN HIGHER EDUCATION: AN EXPLORATORY STUDY

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete and I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the **UCRIHS APPROVED THIS PROJECT'S RENEWAL.**

This letter also approves the project title change.

RENEWALS: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Projects continuing beyond one year must be renewed with the green renewal form. A maximum of four such expedited renewal are possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.
REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB# and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.
PROBLEMS/CHANGES: Should either of the following arise during the course of the work, notify UCRIHS promptly: 1) problems (unexpected side effects, complaints, etc.) involving human subjects or 2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of further assistance, please contact us at 517 355-2180 or via email: UCRIHS@pilot.msu.edu.

Sincerely,

Ashir Kumar, M.D.
UCRIHS Chair

AK: kj

cc: Diane M. Doberneck
65 Agriculture Hall
Bailey Scholars Program

OFFICE OF
RESEARCH ETHICS AND STANDARDS
niversity Committee on Research Involving Human Subjects
Michigan State University
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FAX: 517/432-4503
: www.msu.edu/user/ucrihs
E-Mail: ucrihs@msu.edu

APPENDIX C

The Complexity Sciences and Future Organizational Paradigms in Higher Education: An Exploratory Study

Informed Consent Form

You are being asked to participate in a study designed to explore your ideas about the complexity sciences and future organizational paradigms in higher education. You will be furnished, free of charge, a copy of Danah Zohar's book, *Rewiring the Corporate Brain* to read prior to a 1-hour interview held at your convenience in your office on campus. A second interview of similar length might be scheduled to explore your ideas further. The interview will be conducted in an informal, conversation manner with questions designed to elicit your ideas and interpretations concerning the complexity sciences. The researcher will take notes during the interview; no audio-tapes or transcripts will be produced.

While participating in this study, you will encounter minimal risks, including possible ennui with the subject matter or slight inconvenience in scheduling the interview. Care will be taken to minimize these risks, and it is anticipated that the benefits of participating in this study will outweigh the potential risks. Those benefits include reading Zohar's intellectually stimulating book and engaging in discussion about the future of higher education based on complexity science concepts.

In the analysis and reporting of this research, your identity will be held in the strictest of confidence. In addition, your privacy will be protected to the maximum extent allowable by law.

With your signature below, you indicate your voluntary participation in this study acknowledging that you may: 1) choose not to participate in this study at any time; 2) refuse to answer certain questions; or 3) discontinue your participation at any time without penalty.

If you would like to discuss any questions about this study, you are invited to contact the Principal Investigator, Frank A. Fear at (517) 432-0734 or David E. Wright, Chairperson, University Committee on Research Involving Human Subjects (UCRIHS), at (517) 355-2180. UCRIHS approval for this project expires on [date to be added].

_____ UCRIHS APPROVAL FOR _____

Signature THIS project EXPIRES: *Date*

JUL 3 1 2002

SUBMIT RENEWAL APPLICATION
ONE MONTH PRIOR TO
ABOVE DATE TO CONTINUE

The Complexity Sciences and Future Organizational Paradigms in Higher Education: An Exploratory Study

Informed Consent Form

You are being asked to participate in a study designed to explore your ideas about the complexity sciences and future organizational paradigms in higher education. You will be furnished, free of charge, a copy of Danah Zohar's book, *Rewiring the Corporate Brain* to read prior to a 1-hour interview held at your convenience in your office on campus. A second interview of similar length might be scheduled to explore your ideas further. The interview will be conducted in an informal, conversation manner with questions designed to elicit your ideas and interpretations concerning the complexity sciences. The researcher will take notes during the interview; no audio-tapes or transcripts will be produced.

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If you would like to discuss any questions about this study, you are invited to contact the Principal Investigator, Frank A. Fear at (517) 432-0734 or Ashir Kumar, MD, Chairperson, University Committee on Research Involving Human Subjects (UCRIHS), at (517) 355-2180.

_____ _____

Signature **Date**

UCRIHS APPROVAL FOR
THIS project EXPIRES:

JUN 2 5 2003

SUBMIT RENEWAL APPLICATION
ONE MONTH PRIOR TO
ABOVE DATE TO CONTINUE

APPENDIX D

INTERVIEW PROTOCOL

Research Questions	Interview Questions & Probes
	What ideas did you take away from Zohar's book? *Probes*: margin notes, compelling, far-fetched, underdeveloped, important word or image
Are the complexity sciences shaping a new organizational paradigm in higher education?	In thinking about how Higher Education operates, have you seen any complexity science concepts in practice? *Probes*: holistic, ambiguity, on the edge, emergent, self-organizing, both-and, uncertainty, potential, unfolding, more specifics
	What do you think of the complexity sciences as an organizational paradigm in higher education? *Probes*: structure, management
How might the complexity sciences shape the future organization of higher education?	This is a creative question. Imagine the complexity sciences as the dominant paradigm in HE. What would that look like? *Probes*: draw a picture, organized, structured, rewards
	Sometimes powerful ideas are not powerful enough to shift organizational paradigms, but they do have considerable influence on organizations. If the complexity sciences were to influence higher education, what might those influences be? *Probes*: speculate, specifics

APPENDIX E

INTERVIEW DEBRIEFING FORM

Date:
Interviewee by number:

Describe the tone of voice, expressions, gestures, and other non-verbal communications that occurred during this interview.

How would you capture the essence of the interview in 12 words or less?

How would you depict these impressions graphically?

When you think over the interview, what is the most interesting thing that you learned?

What surprised you?

What connections or resonances do you see?

What am I learning about conducting the interviews?

What went well? Why? Is there a way to incorporate this into future interviews?

What ideas, themes, or unclear statements should have been/should be followed-up on?

Are there things that were said—you understand differently now?

What else?

APPENDIX F

CHRONOLOGY OF RESEARCH ACTIVITIES

June 26, 2001	Dissertation Committee meeting to discuss proposal by conference call
July 31, 2001	Institutional Review Board approves study, IRB# 01-502
November 21, 2001	Pilot Interview #1
November 27, 2001	Pilot Interview #2
January 8-9, 2002	Attended retreat sponsored by Provost's Office
February 9, 2002	Pre-study design decisions; subsequent proposal revisions submitted to dissertation committee for consideration
February 22, 2002	Revised proposal discussed with Howard Person
March 1, 2002	Revised proposal discussed with Ann Austin
March 19, 2002	Revised proposal discussed with Lorilee Sandmann
March 21, 2002	Revised proposal discussed with Frank Fear; Revised proposal approved
April 7, 2002	Proposal defended at Resource Development seminar
June 5, 2002	Interview #3
June 10, 2002	Interview #4
June 18, 2002	Interview #5
June 17, 2002	Interview #6
June 18, 2002	Interview #7
June 20, 2002	Interview #8
July 1, 2002	1st Meeting with Peer Debriefer 1
July 3, 2002	1st Meeting with Peer Debriefer 2

July 11, 2002	Interview #9
June 25, 2002	Interview #10
June 25, 2002	Institutional Review Board renews human subject approval, approves changed title
July 12, 2002	Interview #11
July 5, 2002	Interview #12
July 17, 2002	Interview #13
August 5, 2002	Interview #14
October 25, 2002	2nd Meeting with Peer Debriefer 1
October 28, 2002	2nd Meeting with Peer Debriefer 2
November 25, 2002	3rd Meeting with Peer Debriefer 2
December 13, 2002	Full draft to dissertation chair
December 16, 2003—January 26, 2003	Revisions suggested by dissertation chair
January 9, 2003	3rd Meeting with Peer Debriefer 1
January 27, 2003	Materials to peer debriefers
January 27, 2003	Draft dissertation to committee members
January 31, 2003	Presentation in Resource Development department
February 3, 2003	Oral Defense, videoconference
April 19, 2003	Revisions to the committee
May 12, 2003	Letter from the External Reviewer
May 20, 2003	Final copy submitted to dissertation office

APPENDIX G

DOCUMENTS

Participant	Document Given to Researcher During Interview
5	Vision Statement and Goals for Unit, recently re-written to reflect a new ethos of "partnering"
7	Draft of an article about institutional transformation
	Wegner, G. (2002, August). Michigan State University, Strategy without deep pockets: enhancing institutional capacity from within. *Policy Perspectives.*
9	Bartlett, C. A. & Ghoshal, S. (1991). *Managing across borders: The transnational solution.* Boston, MA: Harvard Business School Press.
10	Robison, L. J., Siles, M. E. & Schmid, A. A. (2002). The social capital paradigm: a bridge between social sciences. Powerpoint presentation.
	Robison, L. J., Siles, M. E., & Schmid, A. A. (2002, June). Social capital and poverty reduction: Toward a mature paradigm. Conference paper.
14	Zolner, J. P. (1999). Curriculum change at Babson College. Harvard Institutes for Higher Education. Harvard Graduate School of Education.
	Marcus, J. (2002, Spring). An unknown quantity. *National Crosstalk, 10*(4),
14	Re-organized at former institution. The model reflects a networked-node approach for student support services; using both a centralized and decentralized way to access services.

Participant	Documents Referenced During Interview
2	MSU learning community provides time, space to reflect. (2002, June) " *Women in Higher Education, 11*(6), 8-9.
	Great Places to Work, Inc. www.greatplacestowork.com/gptw/model.html, 7/29/02
6	Young, J. R. (2003, February 22). Ever so slowly, colleges start to count work with technology in tenure decisions. *Chronicle of Higher Education*. A25-A27.
7	Van der Werf, M. (2002, June 14). Mount Scenario's Final Act. *The Chronicle of Higher Education, 48*(40), A24-27.
10	Fogg, P. (2002, February 1). Do you have to be a nice person to win tenure? *The Chronicle of Higher Education*, A8-A9.
11	Gose, B. (July 5, 2002). The fall of the flagships. *The Chronicle of Higher Education*, A19-A11.
	Selingo, J. (2002, May 31). Mission Creep? *The Chronicle of Higher Education,* A19-21.
	Brainard, J. (June 14, 2002). U.S. Agencies look to interdisciplinary science. *The Chronicle of Higher Education, 48*(40), A20-21.
	Brainard, J. (September 27, 2002). Another record year for academic pork. *The Chronicle of Higher Education, 49*(5), A20-A22.
13	Harvey, L. (2002, July). Eulogy for Charles Beachnau. *Bailey Dailey* pp. 1-3.

APPENDIX H

CODING SCHEME

Code	Origin of Data
I-#	Interview—Interview Number
RJ	Reflexive Journal
D	Document

APPENDIX I

504 Division St.
East Lansing, MI 48823

Dear [peer reviewer],

I have enclosed a draft copy of my dissertation—*The Complexity Sciences as an Emerging Organizational Paradigm in Higher Education: an Exploratory Study*—for your review. This study followed naturalistic, interpretive research traditions and involved semi-structured interviews with 14 executive managers and senior faculty at one research-intensive, land-grant university in the Midwest.

Qualitative studies often rely upon different *communities of validation* to verify the credibility of the research and to attest to its quality. The study's participants, the general public, or the research community may be called upon to comment on whether a study's findings and interpretations are "consistent with their own experience." This study made use of both peer debriefers and an external reviewer.

You were selected to serve as one of this study's peer debriefers. You were chosen for your expertise in qualitative research methods and for your willingness to meet with me during the course of my research.

After reading the dissertation text, please write me a letter with your reactions to my study. The letter does not need to follow any particular format. Letters shown in other qualitative studies were from 1 ½ to 2 pages long and have included comments on the research process and product. You may want to comment on the literature review, research questions, data analysis, emerging themes, contributions to the field, and future research directions. You do not need to address all of these areas; they simply serve as suggestions. Feel free to include your suggestions on how the study's quality could have been improved. Your letter will become an Appendix in my dissertation. You do not need to return the dissertation text.

If you have any questions regarding my dissertation, please call me at 1-517-432-0732 (days) or 517-896-8339 (evenings).

Sincerely,

Diane M. Doberneck

MICHIGAN STATE
UNIVERSITY

February 14, 2003

This letter is written as follow up to serving as peer debriefer for Diane Doberneck throughout her study of The Complexity Sciences as an Emerging Organizational Paradigm in Higher Education. I would first like to comment on the process of peer debriefing with Diane, and then I will offer my thoughts on the product.

Let me begin by saying Diane conducted herself throughout the duration of her study as a seasoned qualitative researcher. Diane was flawlessly methodical, ethical, persistent, and meticulous in her pursuit of data. I was impressed by Diane's innovative creation of an interview debriefing form (Appendix E) in an effort to continually surface fresh insights. During my debriefing sessions with Diane I witnessed a researcher who worked doggedly to remain open to her respondents, listen deeply, and stay grounded in the data—never an easy task. Finally, I would like to add that I was pleased to see Diane allow herself the space to be surprised by the data. To me this is the mark of excellence in qualitative research.

In reading Diane's dissertation I have but a few comments as peer debriefer. In judging the merit of this study we are directed to Eisner's criteria of: coherence, consensus and utility. Indeed, this study hangs together, is consistent with my experience of the evidence and is useful. I believe the study is an accurate analysis and representation of the many hours of inquiry Diane invested in this study. Lastly, I offer the following suggestion with open hands: as qualitative researchers I believe any methodological reflections that can be offered "at the end of the day" are useful in moving the qualitative/interpretivist project forward. I would value a short postscript (similar to Appendix A) where Diane talks about her joys, frustrations and complications in getting "their lives" into "our works" (Geertz, 1988).

Congratulations Diane, you should be proud of this very fine study.

Sincerely,

Laurie Thorp

Dr. Laurie Thorp

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College of Communication Arts and Sciences
College of Engineering
College of Natural Science
College of Social Science

Margaret Desmond
3540 Wakefield
Berkley, MI 48072

March 5, 2003

After serving as a peer debriefer for Diane Doberneck during her study entitled *The Complexity Sciences as an Emerging Organizational Paradigm in Higher Education: An Exploratory Study*, she requested that I respond to her dissertation. This letter is in response to that request.

Throughout her study, Diane was a diligent and proficient researcher. She conducted herself in a highly organized yet flexible manner. During our debriefing session, not only was she open in sharing her successes but also her obstacles and frustrations. It was evident that she was learning from them all and incorporating what she could into her work. Likewise, Diane was very open to her respondents, learning not only from their words but also from the interviewer and respondent interactions. She was similarly open to emergence, as exemplified by the inclusion of the documents unexpectedly given to her during interviews.

It has been fascinating to serve as a peer debriefer with Diane. Wearing the two hats as peer (supportive of process) and as debriefer (critical of process), gave me an intimate view into her research. From this view I can attest to the high quality of this study. It is a well-written, exploratory study of shifting paradigms in higher education. The study contributes to the fields of organizational studies, leadership studies, and higher education. Her data collection methods (snowball study, reflections, etc) reflected the emerging ideas she set out to explore. Finally, she let it be an exploratory study; Diane did not know where the study was going to take her and she let it evolve.

Times have been changing rapidly in higher education the last few years. With the increasingly tight state budgets, more change is further accelerating. As many educational organizations retreat to the familiar, Diane's study may prove to be timely and important for those hoping to lead into new directions.

Congratulations to Diane on a job well done and best wishes in her next steps with this study.

Cordially,

Margaret Desmond

Margaret Desmond

APPENDIX J

504 Division St.
East Lansing, MI 48823

Dear Dr. Cutright,

I have enclosed a draft copy of my dissertation—*The Complexity Sciences as an Emerging Organizational Paradigm in Higher Education: an Exploratory Study*—for your review. This study followed naturalistic, interpretive research traditions and involved semi-structured interviews with 14 executive managers and senior faculty at one research-intensive, land-grant university in the Midwest.

Qualitative studies often rely upon different *communities of validation* to verify the credibility of the research and to attest to its quality. The study's participants, the general public, or the research community may be called upon to comment on whether a study's findings and interpretations are "consistent with their own experience." This study made use of both peer debriefers and an external reviewer.

You were selected to serve an external reviewer for this study. You were chosen for your scholarship linking chaos theory to higher education and your active participation in the American Education Research Association's Special Interest Group on chaos and complexity.

After reading the dissertation text, please write me a letter with your professional reactions to my study. The letter does not need to follow any particular format. Letters shown in other qualitative studies were from 1 ½ to 2 pages long and have included comments on the literature review, research questions, emerging themes, contributions to the field, and future research directions. You do not need to address all of these areas; they simply serve as suggestions. Feel free to include your suggestions on how the study could have been improved. Your letter will become an Appendix in my dissertation.

If you have any questions regarding my dissertation, please call me at 517-432-0732 (days) or 517-896-8339 (evenings).

Sincerely,

Diane M. Doberneck

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OHIO UNIVERSITY

May 12, 2003

Diane M. Doberneck
Bailey Scholars Program
65 Agricultural Hall
East Lansing, MI 48824

Dear Diane,

Thank you for the opportunity to review your dissertation. I will comment about the work itself, but if you'll indulge me, I'd like to focus on some recommendations for your further work and research, building on this strong base.

First, your method was intriguing, having interview subjects read Zohar's book before interviews. While this is a daunting task for the subject, the method is in line with and perhaps an advance upon Marshall and Rossman's (*Designing Qualitative Research*) concept of "elite interviews." These individuals expect to know and understand the research framework, who are comfortable with give-and-take, and who expect to be involved in theory and idea formation. I sense that you met and enhanced this circumstance by the considerable groundwork that went into the interviews.

I am not surprised that the reception your and Zohar's ideas received was mixed. First, they do counter the dominant, implicit metaphor of organizations, that of a mechanical entity, as is asserted by Gareth Morgan and Margaret Wheatley, among others. Second, the circumstances you describe, whether attached to the term chaos, complexity, or someone else, carry with them the implication of a loss of control, or even the illusion of control; this is uncomfortable for many, particularly with a lack of full definition or vision for a workable alternative. Third, no matter how powerful a metaphor may be for us or others, the real utility afforded us by metaphors, as again Morgan reminds us, is not as an exclusive framework, but as one tool in a bag of many for viewing the organization and its issues; sometimes the organization *is* better viewed as a machine, or an organism, or whatever.

The community of we who are interested in complexity/chaos as a metaphoric tool for understanding or living in organizations, particularly colleges and universities, have not done a particularly effective job, I'm afraid, at making these ideas as relevant, useful, or even understandable as we might. Perhaps the ideas are just no good. But I think rather that the situation is due in some large part to two trends, which I put forward for your consideration.

The first is a drift toward more and more technical finesse and complexity in our ideas, at the expense of clarity, accessibility, and memorability for the non-specialist. You cite, very appropriately, the work of Ralph Stacey in your dissertation. But my thought is that his best work on this broad topic was a little-known monograph that he did in the early '90s with D. Parker, from the Institute of Economic Affairs in London: *Chaos, Management and Economics: The Implications of Non-Linear Thinking*. It is a short, clear work, with very useful definitions. Each subsequent work of Stacey's has, I'm afraid, added 50 pages to the framework but very little in the way of new ideas. Scholars are impressed; I don't hear his name among practitioners.

The second self-imposed barrier we in the field have not yet crossed is moving this broad metaphor from *descriptive* utility to *prescriptive* utility. We have not adequately addressed the "so what?" issue. Consider Cohen and March's "organized anarchy" (which I've always thought is at least a cousin to organizational chaos/complexity theory). They not only described the circumstances of the organized anarchy, but articulated very specific advice for those who wish to lead or thrive in this circumstance. I believe that this is why the metaphor has proven so durable. (I'd also note that I think chaos/complexity is an advance over organized anarchy in one critical respect. The effectiveness of Cohen and March's advice is dependent upon exclusive knowledge of the principles and tactics; for example, if we're all aware that the first item on a meeting agenda is the most likely candidate to be the garbage can, the tactic is useless. Organized anarchy has a very cynical dimension. Chaos/complexity, on the other hand, is *more* effective when everyone has a similar understanding of the organization and the strategist's tactics.)

So I would challenge you to consider two ideas for your further work: eschew science-envy techno-babble and continue to write in English, and look for ways to advance practical applications of these ideas, even as you advance our appreciation for the descriptive elements of the metaphor.

Margaret Wheatley has tackled this dual task very effectively with business organizations with her *Leadership and New Science*; it is no small accomplishment that her book was named Book of the Year by *Industry Week*, hardly a bunch given to flights of abstract fancy. Within higher education, there is little of a similar style and intention. Among these few resources or models, I would encourage you to look at *Systemic Leadership* by Kathleen Allen and Cynthia Cherrey. The book's only significant limitation is that it is directed particularly toward student affairs professionals. But the ideas presented there, drawing upon complexity, chaos, and systems theory, are very powerful frameworks and tools for affecting and leading change within higher education.

There are certainly corners of higher education that "get it" with regard to this metaphor. You say that your own department within the university is such a place; congratulations! Another is the student affairs division at the University of Illinois, which is now involved in a strategic planning process very explicitly referenced to chaos/complexity theory. Perhaps one direction for your work, and another application of your qualitative research

expertise, is to do case study where people are living the metaphor—particularly if it works! People want to see the ideas road tested and proven.

I look forward to reading additional contributions from you, and I would welcome as well the chance to discuss—even argue—about these ideas. After all, you and I both know that the assertion that something is "just" a metaphor misses the reality that the entirety of our understanding and operation in the world is based on metaphor. These things are important enough to argue about, not just as an intellectual sport, but for the goal of real improvement in our universities and their service to society.

Best wishes,

Marc Cutright, Ed.D.
Assistant Professor

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