

TRANSFORMATIVE INTERACTIONS: QUALITIES OF CONVERSATION THAT HEIGHTEN THE VITALITY OF SELF-ORGANIZING CHANGE

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ABSTRACT

Complexity theorists propose that organizations are made up of complex responsive processes in which people create and recreate organizational forms through dynamic micro-level interactions. Social constructionists add that conversations are the means by which these interactions occur. Our analysis illustrates how the U.S. National Regulatory Commission (NRC) engaged a wide range of stakeholders in a successful dialogue process to recreate a new system for monitoring nuclear reactors. The success was due, in large part, to the conversational qualities tacitly and explicitly agreed to by those involved in the process which included a spirit of freedom, inclusion, inquiry, spontaneity, and possibility. Using a grounded theory building process, we show how these qualities produced transformative change by increasing levels of interconnectivity, shared identity, and collective capacity among participants. These findings provide the beginnings of a model for understanding continuous and transformative change and demonstrate the value of engaging the “whole system” in sustained dialogue, even in complex, highly regulated environments.

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INTRODUCTION

One hundred and three nuclear power reactors are licensed to operate on 40 commercial utility sites in 31 states throughout the United States. Nuclear generation sources provide approximately 727.9 billion kilowatt-hours (kWh), contributing 20% of the current energy supply in the U.S. Three major constituencies hold high stakes in the production of nuclear power: the U.S. Nuclear Regulatory Commission ([NRC], a government oversight agency headquartered in Washington DC), power plant owners and operators (represented, in part, by the Nuclear Energy Institute [NEI] and hereafter referred to as “the nuclear industry”), and the public (represented by Congress and by organized public activists). All three groups agree they want safe cost-effective power, but they disagree on how best to achieve this. Historically, the NRC defined the rules of the game, with minimal input from the nuclear industry or the public. Over time, however, the burden of the regulatory oversight process restricted the ability of power plants to operate profitably, and, according to some, threatened to decrease rather than increase power plant safety. In 1998, under pressure from Congress, the NRC launched an expansive change initiative to establish, in collaboration with the nuclear industry and the public, a revised reactor oversight process (ROP). The change process was far-reaching and complex. It lasted three years, included hundreds of people from dozens of organizations, involved thousands of hours of negotiation, discussion, dialogue, and debate, and resulted in a radically overhauled reactor oversight process that will have a significant impact on production and regulation of nuclear power for decades to come.

In today’s economy, the ROP change process is significant but by no means unique. Organizations of all kinds face constantly shifting environments to which they must respond rapidly and effectively in order to remain viable. In recent years, the organization literature has paid increasing attention to the chaotic nature of change in complex systems (Dooley, 1997; Frederick, 1998; Stacey, 2000; Thietart & Forgues, 1994). Authors have rightly pointed out that far from being stable and certain, organizational futures, and any attempts to influence them, unfold in unexpected and unpredictable ways. Classical models for understanding and managing change that advocate planned intervention strategies have been criticized for their inability to create radical and sustainable transformation (Lichtenstein, 2000; Mathews, White & Long, 1999; Stacey, 1992, 1996; Van de Ven & Poole, 1995; Zbaracki, 1998). Newer models that take into account the non-linear self-organizing dynamics of change offer alternative explanations about how complex organizations function (Dooley, 1997; Schreyögg & Noss, 2000; Stacey, 1992, 1996).

Common to many of these perspectives is the idea that organizational change is an ongoing, evolving process created moment by moment in the micro-level

interactions among organizational members at all levels throughout the organizational system. Rather than following an explicit, pre-programmed, macro-level path, processes of change emerge in one way or another based on the constantly self-adjusting flow of conversations and coordination activities among people involved in the change process. Yet, much of the organizational change literature falls short of explaining the dynamics by which this kind of self-organizing change takes place. Perhaps because the original formulations of chaos theory came from the physical sciences, many of those who apply these theories to organizations tend to remain locked in a mechanistic view of change. They talk about organizations as physical systems that are governed and manipulated according to scientific (behavioral, social and physical) properties, processes and laws. What these perspectives miss is the uniquely human characteristic of meaning-making through language. Human beings change their world by talking. Through interaction in conversation, they make sense of their surroundings, coordinate their activities, dream about new possibilities, and mobilize energy in the form of collective action (Ford & Ford, 1995; Gergen, 1994a, b; Ludema, Wilmot & Srivastva, 1997; Stacey, Griffin & Shaw, 2000; Thachankary, 1992). This is the contribution social constructionism makes to the literature on organizational change in complex systems; it places the dynamics of communication front and center as the primary means by which change is generated. It suggests that changes in the way people talk to each other (conversational norms and processes, conversational content, narrative slope, etc.) creates changes in the way people act (Gergen, 1994a, b; Shotter, 1993).

This paper shows how five qualities of conversation – a spirit of *freedom*, *inclusion*, *inquiry*, *spontaneity*, and *possibility* – shifted the way people involved in the ROP talked to each other and thereby freed up energy for transformative, self-organizing change. Having *freedom of choice* – to engage or not to engage – gave participants the power to speak their minds about the issues that mattered to them; commitment to *inclusion* resulted in diverse, often conflicting, perspectives that contributed a more comprehensive picture of reality. A spirit of *inquiry* led to on-going exploration of the purpose, principles, and deep structures that governed the oversight process, past, present, and future. Maintaining *spontaneity* allowed participants to remain flexible and experimental in the face of the uncertainties associated with emergent co-creation; and a persistent belief in the *possibility* of finding novel solutions through cooperation and dialogue sustained the momentum and energy needed to arrive at mutually satisfactory outcomes. We argue that these five qualities of conversation increased the ability of the ROP participants to self-organize by enhancing their sense of *identity*, *connectivity*, and *capacity*.

Much of the complexity literature describes *identity*, *connectivity*, and *capacity* as the three primary domains of self-organizing activity (Lichtenstein, 2000;

Moore, 1996; Smith, 1996). *Identity* (self-reference) refers to the governing principles or deep structures intrinsic to the whole system (as distinguished from structures imposed from the outside). The more the emerging dynamic order is congruent with a system's deep structure (Smith, 1996), that is, revealing patterns of behavior that reflect both individual and collective ideologies simultaneously, the greater the likelihood of self-organizing toward organizational survival (Lichtenstein, 2000; Smith, 1996).

Connectivity refers to the quantity and quality of relationships among diverse system components. Rich and variable connections create the paradoxical conditions of stability and instability at the edge of chaos, which contribute to the potential for creative emergence.

Capacity refers to a system's utilization of tangible and intangible resources, including abundant information, technology and knowledge relevant to organizational competence (Lichtenstein, 2000) as well as adaptive learning capability and relational competence required for positive interaction in the context of paradox and conflict (generated by the increasing connectivity). Self-organizing capacity can be summarized as a synergistic flow of energy in the form of interactive resources that create and sustain the health of a complex system (Moore, 2001).

Lewin (1992), Stacey (1996), and other complexity theorists argue that complex systems exhibit a highly "sensitive dependence on initial conditions." This means that small changes can be significant when they occur in conditions of disequilibrium and are amplified throughout the organizational system. We propose that in the new ROP a shared commitment to the five qualities of conversation – freedom, inclusion, inquiry, spontaneity, and possibility – created the *initial conditions* that enhanced the three domains of self-organizing. These qualities created high levels of interdependence among diverse stakeholders, enabled stakeholders to expand their identities to include individual (constituency) and collective (combined constituencies) governing principles and structures, and heightened the shared use of tangible and intangible resources. The quality of the domains, in turn, impacted the degree and direction of self-organizing movement toward organizational transformation needed for system vitality. Figure 1 illustrates the proposed relationship among the five qualities of conversation and the domains of self-organizing that create the potential for transformative change.

Our model is explained by way of two combined theoretical perspectives. The first is a set of metaphors derived from complexity and chaos theories that describe the dynamics of nonlinear self-organizing change that occurs in real organizations as they adapt to their continuously changing environments (Lewin, 1992; Lichtenstein, 2000; Stacey, 1996, 2000; Stacey et al., 2000). The second set of theoretical insights comes from social constructionist perspectives, which describe the conversational processes that enhance the level of connectivity and

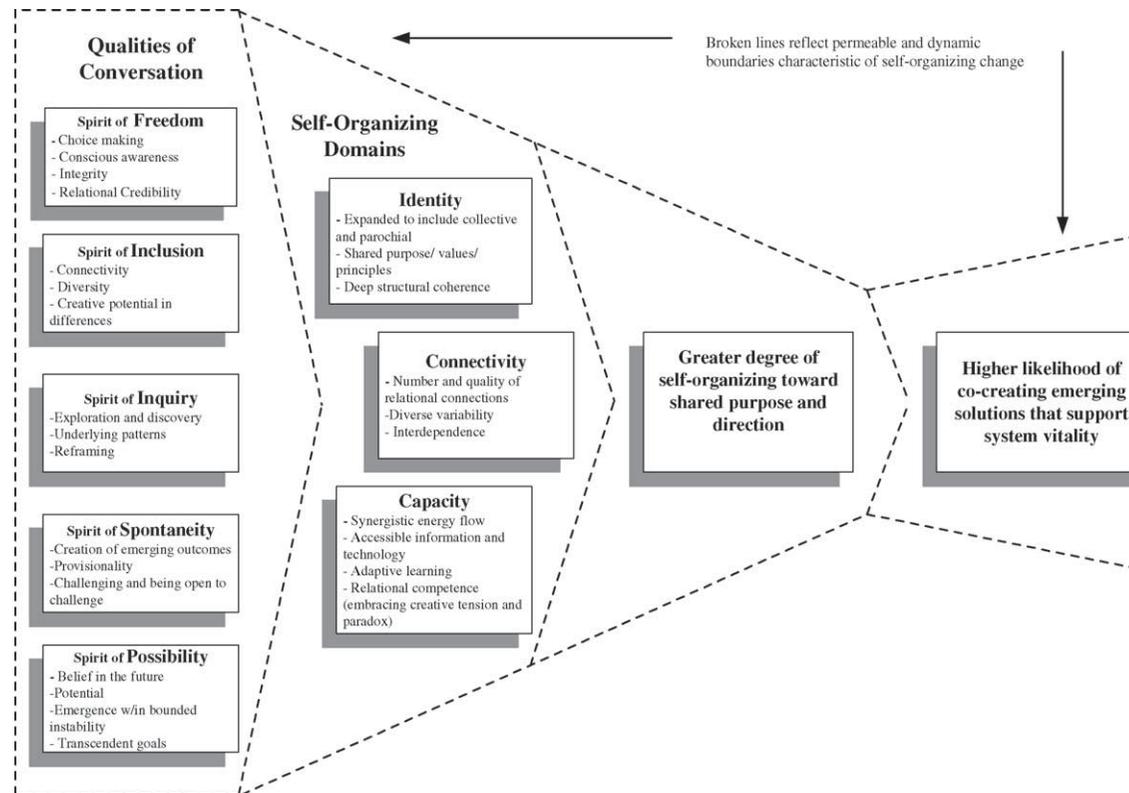


Fig. 1. Qualities of Conversation that Heighten the Vitality of Self-Organizing Change.

interdependence required for self-organizing to occur (Berger & Luckmann, 1966; Gergen, 1994; Shotter, 1993).

THEORETICAL PERSPECTIVES

Classical Management Theories of Change

While the study of organizational change has spanned more than five decades focusing on both content (Antonioni, 1994; Greenwood & Hinings, 1996) and process (Antonioni, 1994; Dennis et al., 2001; Kotter, 1996; Weick, 2000), the majority of theories and practices assumes linear movement from one state of equilibrium through a period of disequilibrium and turbulence to a revised state of equilibrium in which new structures and ways of behaving are reinstitutionalized (Lewin, 1951; Nadler, Shaw & Walton, 1995; Weick & Quinn, 1999). The underlying point of reference for this paradigm of change is Lewin's model that describes change as a process of unfreezing, moving and refreezing in a context of inertia or resistance to change (1951).

Categorization schemes serve to express the relationship of the wide array of accumulated organizational change theories (Struckman & Yammarino, 2003). Classical interventionist theories of change are characterized as episodic, infrequent, discontinuous, and intentional (Weick & Quinn, 1999). Organizational change is seen to be a management-led action in which systematic interventions are designed to achieve predetermined goals (Mintzberg & Westley, 1992; Porras & Silvers, 1991; Van de Ven & Poole, 1995). The role of the leader or change agent is to guide organizational members through the processes of disrupting current patterns, introducing new patterns, and reestablishing stable equilibrium as quickly and painlessly as possible (Finkelstein & Hambrick, 1996; Kotter, 1996).

Punctuated equilibrium (Gersick, 1991; Tushman & Romanelli, 1985), discontinuous change (Nadler, Shaw & Walton, 1995), large-scale change (Axelrod, 1992; Dannemiller & Jacobs, 1992; Weisbord, 1987), total quality management (Juran, 1989), reengineering (Hammer & Champy, 1993), cross-functional work teams (Katzenbach & Smith, 1993), language interventions (Bate, 1990; O'Connor, 1995), alternative interpretive schemas (Barrett, Thomas & Hocevar, 1995; Bartunek, 1993; Isabella, 1990), and learning and development (Argyris & Schön, 1990; Torbert, 1994) are examples of models for understanding and achieving transformative or second-order change¹ through planned episodic interventions. The question that remains open for debate is the degree to which these interventions achieve their intended goal of sustained organizational transformation (Coyle-Shapiro, 1999; Weick & Quinn, 1999).

Emerging Theories of Change

An emerging genre of change theories departs from the traditional models of planned episodic change (Weick & Quinn, 1999). These theories characterize organizational change as *continuous* – an ongoing, evolving and cumulative process. Change is presumed to be emergent, meaning “the realization of a new pattern of organizing in the absence of explicit a priori intentions” (Orlikowski, 1996, p. 65). Continuous change models are built around ideas of improvisation (Moorman & Miner, 1998), natural rhythms (Moore, 2001), translation (Czarniawska & Joerges, 1996), and learning (Sitkin, Sutcliffe & Weick, 1998). Some authors go so far as to say there is no deliberate orchestration of change and no dramatic discontinuity, that the continuous disequilibrium of variations begets subsequent variations with no beginning or end point (Orlikowski, 1996).

Studies that examine change as a continuous experience tend to focus on a microscopic level of change (Ford & Ford, 1995) versus the macroscopic level of planned episodic change (Weick & Quinn, 1999). Recurrent interactions among system members are the feedstock of organizing (Ford, 1999) that is based on mindful construction of responses in the moment rather than “mindless application of past responses embedded in routines” (Wheatley, 1992, p. 90). The emergence of small changes at the micro-level does not mean that they are trivial. “The macro-complexity of organizations is generated, and changes emerge through the diversity and interconnectedness of many micro-conversations (micro-interactions), each of which follows relatively simple rules” (Ford & Ford, 1995, p. 560).

The figure below offers an illustration of the focus of this study in the context of the literature describing the nature of change (ranging from episodic to continuous) and order of change (ranging from 1st order to 2nd order) (Fig. 2).

Continuous activity resulting in 1st order change (upper left-hand quadrant) can be illustrated by the work of a process management team on a manufacturing line that monitors its own process measures and makes continuous modifications to the work as needed to stay within desired control parameters. The changes are continuous because they occur regularly and routinely. They are 1st order because they are made within a given framework rather than to the underlying assumptions that give meaning to that framework. An *episodic intervention aimed toward a planned 1st order change* (lower left-hand quadrant) is exemplified by a training rollout in a purchasing division that has just instituted a new information system to provide a reliable inventory of critical parts. The changes are episodic because they occur only periodically. An example of an *episodic intervention aimed toward planned 2nd order change* (lower right-hand quadrant) is a system-wide restructuring developed around a new information technology system enabling cutting-edge, team-based healthcare to patients in an intensive care cardiac

dynamics through narrative allegory and storytelling (Czarniawska & Joerges, 1996; Gergen, 1994; Grubbs & Denhardt, 1999), and increasing adaptive learning capacity (Fisher, Rooke & Torbert, 2000). In the case of the ROP, the role of the change agents from the NRC was to create a process of conversation that allowed participants to challenge the underlying assumptions of the existing oversight regime and to co-create a new one that would include the voices of all stakeholders and make room for continued renewal and recreation going forward.

Self-Organizing Change Theories

Emerging applications of self-organizing theories derived from the sciences of complexity and chaos in quantum physics, theoretical biology, chemistry, and ecology support the argument that change is continuous and emergent in nature (Chen & Van de Ven, 1996; Frederick, 1998; Goldstein, 1994; Kauffman, 1995; Lewin, 1992; Mandelbrot, 1987; Prigogine, 1996; Stacey, 1992, 1996, 2000; Thietart & Forgues, 1994). Change is seen as an ongoing process that unfolds over time, revealing periods of greater and lesser instability, in which the restlessness of a system is an instinctive response toward survival in a continually changing internal or external environment. Organizations are described as complex adaptive human systems that can be neither controlled nor predicted, but for which order will emerge on its own through diverse interconnectivity among system members (Dooley & Van de Ven, 1999; Goldstein, 1994; Kauffman, 1995; Kiel & Elliott, 1996; Prigogine, 1996; Stacey, 1996, 2000).

Self-organizing change evolves from nonlinear streams of energy that produce continuous learning and adaptation among system members, thus forming the basis of organizational activities and strategies (Schreyögg & Noss, 2000). It is in the agitated state of nonlinear disequilibrium (Prigogine, 1996), referred to by some as the edge of chaos (Kauffman, 1995; Stacey, 1996, 2000), that adaptive learning and transformative change occurs (Stacey et al., 2000). Paradox is a key property of activity at the edge of chaos and contributes to the increased potential for nonlinear disequilibrium leading to novelty and change. It refers to the simultaneous presence of self-contradictory, essentially conflicting forces, none of which can be removed (Stacey, 2000). For example, system behavior at the edge of chaos is simultaneously stable and unstable, certain and uncertain, and predictable and unpredictable. The variations that people bring to their micro-interactions (conversations and coordinated behaviors) generate tension that serves as a potential source of creative energy and transformative change.

The continuous, micro-level interactions among interdependent individuals in an organization have been characterized by Stacey et al. (2000) as *complex responsive*

processes. The word “process” is used to connate the continuous and fluid dynamics of a self-organizing network of activity to counter the more traditional references to “organization” and “system” Which conjure a less representative state of balanced equilibrium within a bounded entity. Complex responsive processes represent energy-in-motion at the edge of chaos; they are described as self-organizing processes of perpetual human interaction (Stacey et al., 2000). Meaning and action, that make sense among the members of the system at the micro-level, emerge as patterns of social interaction. Social constructionist perspectives provide a theoretical framework from which to further understand and describe the micro-interactive patterns of meaning-making and joint action that occur during complex, self-organizing change (Ferdig, 2001).

Social Constructionist Theories

From a social constructionist point of view organizational reality is interpreted, constructed, and enacted through conversations among organizational members (Astley, 1985; Berger & Luckmann, 1966; Gergen, 1994a, b, 1999; Shotter, 1993). Conversations, in this sense, are the sum total of communicative action in which language, body and emotion are inextricably linked (Broekstra, 1988). For example, listening is more than hearing; it includes all the ways in which people become conscious of, and present to, the world around them (Ford, 1999). Conversations, in this broad sense, are the *processes* through which we construct organizations as well as the *product* of that construction. Conversations *are* the organization (Berquist, 1993; Broekstra, 1988; Ford, 1999).

Intersubjective interdependency (Gergen, 1994a) is a constructionist term used to describe how participants of self-organizing change coordinate mentalities in conversation. Constructionists place the locus of meaning in the relational space *between* persons communicating rather than placing it in an object or an individual’s mind. Meaning and knowledge are generated through social interaction in the form of symbol (language and action) patterns that make sense to people in their particular context (Gergen, 1994). Organizations, then, are networks of shared meaning and beliefs where the critical activity is the continued construction and maintenance of the meaning and belief systems (Thachankary, 1992).

The implications for understanding social constructionism in the context of the present study can be summarized in the following four points:

- (1) What people know and believe is a social artifact, a product of agreement among persons in relationship. Organizationally this implies that what a group knows about how best to organize is not determined by any external “law of

nature,” but rather is a product of the group’s collective values, beliefs, choices, and commitments.

- (2) Knowledge is of critical importance in self-organizing because it serves to sustain and support certain patterns of activity to the exclusion of others. Among other things, it delimits what is real, “right,” and possible in life, and thereby, defines the limits of available options for action. Knowledge and organizing are inextricably linked to each other – what a group or organization knows will to a large degree determine what it does.
- (3) Conversations are the means by which knowledge and belief are created. It is through conversations that people share their experiences, ideas, hopes, and aspirations with others. Over time, these conversations begin to determine what a group claims to know and believe. In this sense conversations are important tools for building organizations – they are the implements that groups use to construct beliefs, theories, and rules of thumb that guide their organizing.
- (4) If we accept a direct and simultaneous relationship between language, knowledge, and action, then the nature of our conversations is of crucial importance to the kind of organizational knowledge we create. To a large extent, the qualities of conversation we embody determine the ways in which we jointly create the realities to which we aspire.

While leaders or change agents tend to assume that change is something that someone with more power and authority *does to* someone who has less power and authority (logic of replacement) (Boss & Golembiewski, 1995), the view of continuous and emergent change requires a form of leadership that shows people how *to be* (logic of attraction). It assumes that people change to a new position because they are attracted to it, because they choose to engage in a process of co-creating intentions and action that have meaning for them. The energy of attraction that sustains continuous self-organizing change is fueled by the quantity and quality of connections among people in the organization (Quinn & Dutton, 2001) and by their belief in the possibilities of what they can create together (Ludema, Wilmot & Srivastva, 1997). Conversations (micro-interactions) yield emotional energy – the feeling that one is eager to act and capable of action – which motivates subsequent responses, actions, relationships, allocation of resources, routines, etc. (Quinn & Dutton, 2001). An image of a hoped-for future (Cooperrider, 1990; Polak, 1973) coupled with a clarity of purpose, agency and pathways (Snyder, 1994) leads people to consciously co-create a future in the context of present interactions that is energized by their passion for and belief in what they can create together.

The combined principles of complexity science and social constructionism offer a theoretical basis for describing transformative (2nd order) change as a complex, responsive, self-organizing process, thus building on the logic offered

Table 1. Principles of Complexity Theories Linked with Social Constructionism Contrasted with Classical Change Management Theories.

Classical Management Theories	Complexity/Social Constructionist Theories
Organizations exist in equilibrium; therefore, change is instituted only as needed to restore equilibrium. The goal of management is to increase stability and predictability through planning, organizing and controlling behavior.	Change and transformation are inherent quality of dynamic systems. The goal of management is to increase capacity for learning and self-organizing in continuously changing contexts.
Organizational behavior is essentially linear and predictable; results are proportional to causes. Thus, linear regression models explain most of the variance of organizational change.	Organizational behavior is inherently nonlinear; results may be nonproportional to corresponding actions. New models and methods are needed to understand organizational change.
System components are independent, and can be analyzed and managed by separating them from the rest of the systems, as well as from their outcomes.	Inputs do not cause outputs. The elements of a system are interdependent and mutually causal requiring holistic analyses and responses.
An organization is defined by its design, strategy, leadership controls, and culture.	An organization is defined, first of all, according to its underlying order and principles. These give rise to surface-level organizing structures, including design, strategy, leadership controls, and culture.
Meaning is objective and attributed to "the thing" external to the meaning-maker.	Meaning is intersubjective and created in the relational space between people communicating.
Paradox and contradiction are problems that disrupt organizational equilibrium. Managers deny contradictions and the confusion they cause by choosing (either/or) one position over another.	Paradox and ambiguity are natural characteristics of complex adaptive systems. Managers acknowledge contradictory (both/and) truths as a potential source of creative transformation.
Organizational success is based on maximizing resource utilization needed to maximize profit and increase stakeholder wealth. A manager's emphasis is on efficiency and effectiveness, and avoiding chaos and transformation.	Long-term organizational success is based on optimizing resource flow and continuous learning and adaptation. A manager's emphasis is on supporting structures and processes that accomplish these goals.

by continuous change theories. A summary of these principles, contrasted with principles of classical management change theory, appears in Table 1.

The table is designed to highlight theoretical distinctions between classical management theories and the emerging theories grounded in complexity social constructionist models, however, in practice the differences are not so black and white. While change in human systems is ultimately conversational in nature,

conversations can become engrained over time in an organization's beliefs, values, norms, cultures, policies, decisions, people, and so on. The accumulated mass of continuity and consistency in these conversations maintains and objectifies organizational reality (Berger & Luckmann, 1966; Fairclough, 1992; Watzlawick, 1978). Classical management literature points out how this accumulated mass of background conversations can be very real and difficult to change. Often, it's difficult for people to understand, much less transform at will.

In our view, the complexity and social constructionist literatures help to clarify these dynamics and to increase the potential successful intervention and transformation by explaining the linguistic dynamics of organizational life. They point out that conversations are not only the process through which we construct organizations; they are also the product of that construction. In Ford's (1999) terms "organizations do not simply *have* conversations, they *are* conversations." More specifically, they are networks of conversations. For example, procedures for planning, budgeting, hiring, firing, promoting, managing, rewarding, and so forth are all "macro-conversations" that are interconnected and constitutive of organizations and which are themselves constituted by "micro-conversations" among individuals within the organization. The macro-conversations in turn establish the context in which people act and, thereby, set the stage for what will and will not be done (Berquist, 1993; Broekstra, 1998). Given this perspective, the goal of organizational change is to bring about an alteration in the conversations that support the distribution of actions, behaviors, and practices within the organization. Changing the qualities of conversation, including who talks to whom, when, where, why, about what, and in what way becomes an important vehicle for transformative change.

PURPOSE OF THE STUDY

We discovered this research opportunity quite by accident. One of us, an organizational consultant in the utility industry, observed a Lessons Learned meeting at a local nuclear power plant that had just completed its participation in a six-month pilot implementation of the revised reactor oversight process (ROP) development. The communication interaction witnessed between Nuclear Regulatory Commission (NRC) officials and nuclear plant personnel was dramatically different from what had been observed previously in more than ten years of working in the industry. Instead of typical authoritarian, directive and interrogational comments offered by NRC officials, we heard conversations of interested inquiry and exploration. Instead of the typical submissive responses from plant personnel, we heard idea-generating exchanges and respectful, but firm, counterpoints. We wanted to learn how and why this change was unfolding.

What were the forces and factors that had converged to give birth to this radically new way of communicating?

An initial investigation told us that this was a turbulent time in the complex nuclear utility environment, and that the key constituencies (the NRC, the nuclear industry, and the public activists) had no choice but to figure out a collective solution to a difficult set of challenges, which, in order to happen, required them to figure out new ways of relating with one another. While the reliance on nuclear energy in the U.S. was stronger than ever, the *effectiveness of nuclear reactor oversight* was being challenged by public activists, the *exorbitant compliance costs of "over-regulation"* was being challenged by the industry, *technological advancements* rendered long-standing methods for monitoring nuclear reactors nearly obsolete, and the *NRC's budget was being threatened by Congress* unless substantive changes were made quickly.

To deal with these challenges the NRC initiated a highly responsive process for self-organizing, transformative change that involved a broad group of interested stakeholder (though it is unlikely that they viewed their initiative from the theoretical perspectives described in this paper). The three-year-long ROP development process was characterized by observable cooperation and open communication among participants who held very diverse points of view about what needed to happen. This way of working was in sharp contrast to the ways in which these three stakeholder groups had interacted previously, often characterized by closed communication and a tendency toward regulatory dominance resulting adversarial relationships. We wanted to learn more about what we were seeing.

The official ROP development process began in July 1998 when the Chairman of the NRC set the initial conditions for a new way of working together by calling a meeting among key stakeholders. Including were top-level NRC commissioners, leaders of nuclear power utilities and their industry association networks, as well as representatives of established public advocacy groups who closely monitored nuclear power plant activity on behalf of public safety. People were invited to speak their truths, listen well, and learn from one another. One veteran leader in the industry said he had never experienced this kind of open forum organized by the NRC during his entire nuclear career. There was an agreement to move forward from this meeting toward a joint solution, incumbent on the regulators, the industry and the public advocacy groups, for an improved reactor oversight process.

And internal team of NRC professionals were tasked to develop and launch a plan for engaging interested stakeholders in the process of creating an ROP that would meet collective goals. During the three years that followed the initial commissioner-level meeting, the internal NRC team, with broad input from regulatory, industry, and public stakeholders, convened numerous large-group workshops, more than 70 public information briefings/dialogues throughout the four U.S. geographic

regions, and countless industry/regulatory/public working group sessions that led to additional spin-off groups needed to deal with particular issues. When the pilot and initial implementation processes were initiated there were ongoing public forums for regional and national Lessons Learned meetings, as well as two federally chartered panels made up of stakeholder representatives who were tasked with systematically assessing the ROP progress.²

Information throughout the ROP development process was “fully transparent and scrutable,” an intention referenced often by participants. The NRC website contained a wealth of information ranging from schedule and location of meetings, initial implementation proposals, findings to date determined throughout the various stages of implementation, and so on.

Our research goals were: (1) to observe the micro-interactions among participants of the three-year ROP development process through the theoretical lenses of complexity and social constructionist theories; (2) to participate in the process as members of “the public” when appropriate, thus deepening our insights; (3) to create a narrative description of the ROP development process with those involved; (4) to systematically examine the conversational patterns that occurred throughout the process; and (5) to determine what, if any, qualities of conversation influenced the new ROP outcome. Three key questions guided our study: (1) What was different about the way representatives of the three constituencies interacted during the process of developing the ROP contrasted with their previous ways of interacting? (2) What was the nature of meaning-making through communicative interactions among the participants of change that mobilized energy in the form of collective action for self-organizing transformation? (3) To what extent was the relational transformation – among NRC officials, the industry personnel and public activists – sustained over time as a result of the ROP development process and the emerging ROP outcome?

Methods

Grounded theory (Glaser & Strauss, 1967; Strauss & Corbin, 1998) and narrative analysis (Czarniawska, 1997; Gergen & Gergen, 2000) methodologies were well suited to our goals of generating and building theory in an area where little data or theory existed, and where we could study a process of change as it unfolded over time. Our objective was to develop a thick, textured description about how participants made sense of their reality and chose to interact with one another in the process of co-constructing the industry-wide ROP change. Using narrative analysis methods, we focused on what participants paid attention to, how they interpreted what was going on around them, and how they chose to interact with others in

their present-moment interactions, thus influencing the direction and quality of emerging outcomes.

Data Sources

We used five sources of data during the period from December, 1999 through April, 2001: (1) open-ended interviews with sixty-one participants; (2) observation of eighteen meetings of various size and purpose ranging from small group working sessions to national and regional lessons learned workshops; (3) informal conversations with people in the NRC, the industry and public; (4) meeting transcripts, reports, memos, letters, speeches dating from July 1996 to April 2001, obtained on the NRC website and from Public Documents Room in the Washington office; and (5) journal notes recorded from December 1999 through April 2001.

Informants

Individuals representing the three distinct constituency groups: the regulator (NRC), the nuclear industry (plant operators and their organizing body, the Nuclear Energy Institute [NEI]), and public activists ("watchdog" groups, e.g. the Union of Concerned Scientist) were the informants. We interviewed the former chair of the NRC, current commissioners, program office managers and regional inspectors, industry executives, plant managers, technical experts, lobbyists, anti-nuclear activists, and state environmentalists, among others. We sought to explore differences in how individuals from three diverse constituencies described their experiences of participating in the emerging change process contrasted with their previous interactive experiences with one another. Because of the diverse perspectives among the three constituencies, we expected a high degree of disagreement and ambiguity (Dutton & Dukerich, 1991). However, we were surprised to find many consistent stories and interpretations within and across the three groups suggesting collective beliefs (Walsh, Henderson & Deighton, 1988) and consensual elements (Gioia & Sims, 1986) about how the interactive processes of self-organizing change was experienced.

Data Analysis

To analyze our data we relied on the conventions of grounded theory (Glaser & Strauss, 1967; Strauss & Corbin, 1998) and generative theory, including

narrative development and analysis (Czarniawska & Joerges, 1996; Gergen, 1994a). Grounded theory methods require that data and theory be constantly compared and contrasted throughout the data collection and analysis processes. Thematic patterns of interaction were identified, categorized and further studied for interpretive content and meaning through iterative communication encounters with informants (Strauss & Corbin, 1998). Likewise, narrative descriptions containing illustrative examples were generated and refined in collaboration with informants (Gergen & Gergen, 2000). There were essentially four iterative elements of analysis: (a) conceptual coding (open and axial) of emerging interactive themes and their related properties and dimensions; (b) constant comparison of emerging themes to explore nuances, similarities, and differences of meaning at behavioral and conceptual levels; (c) development and refinement of narrative descriptions in the form of journal notes, memos, dialogue scenarios and integrated storytelling; and (d) development of emerging theoretical propositions grounded in the narrative constructions.

An initial round of data collection resulted in the formulation of pattern characteristics and thematic categories for guiding continued data gathering needed to construct detailed narrative descriptions of the interactive processes. Emerging themes, and their properties and dimensions, were revealed in the open-coding process and later cross-analyzed using axial coding methods, thus enabling the systematic exploration and recombination of related themes. For example, early coding yielded categories related to *provisional thinking*, *undefined outcomes*, and *willingness to challenge and be challenged by others*. Later, during the axial coding phase, these and other interactive themes were combined to reveal the quality of conversation of *spontaneity*. Systematic sampling of pattern characteristics and thematic categories continued throughout the data-gathering process until the emergent themes and patterns of human interaction were theoretically saturated. Eighty-seven initial interactive behavioral themes were observed, recorded, coded and cross-coded and eventually collapsed into the five distinct, yet overlapping, categories of relational patterns (Strauss & Corbin, 1998). Table 2 below summarizes the results of coding process employed in this study.

Narrative analysis methods (Czarniawska, 1997; Gergen & Gergen, 2000) facilitated the integration of multiple perspectives of communication interaction that occurred in the self-organizing change experience. Developing a detailed tapestry of meaning in a single narrative comprised of the richly diverse stories of participants required a relational understanding between researchers and participants. Our task was to jointly construct and rigorously document a compelling story that was fully representative of the storytellers' collective experiences (Gergen, 1994a). Synthesizing the interaction examples while simultaneously generating theoretical propositions (informed by complexity and

Table 2. Emergent Analytical Codes, Categories, and Dimension.

Informant Codes (sampling)	Analytic Codes	Aggregated Categories	Overarching Dimension
<ul style="list-style-type: none"> "choosing to participate" "saying what you think" "open information" "demonstrated intentions" "putting myself on the line" "learning to trust" "authentic dialogue" "commitment" "fair play" "courage" "honoring agreements" "respecting regulatory codes" 	<ul style="list-style-type: none"> Conscious Choice Core Integrity Relational Credibility Enabling Constraints 	<ul style="list-style-type: none"> Spirit of FREEDOM Choice to Engage 	<p>↑</p> <p>QUALITIES OF CONVERSATION</p> <p>(guided meaning-making interactions in context of transformative self-organizing change)</p> <p>↓</p>
<ul style="list-style-type: none"> "first-ever open forum" "got to know them" "invited participation" "felt heard" "face-to-face communication" "began to understand their logic" "needed others' input" "unspoken tension" "contradictory points of view" "intense disagreement" "respectful confrontation" 	<ul style="list-style-type: none"> Expanded Connectivity Diversity/Variability Relational Meaning-making Creative Tension Dynamic Power Relations 	<ul style="list-style-type: none"> Spirit of INCLUSION Enhanced Connectivity 	
<ul style="list-style-type: none"> "asking open-ended questions" "not knowing <i>the</i> answer" "assumptions uncovered" "look at things in new ways" "kept you humble" "figured things out together" "examined 'undisputable' facts" "letting it incubate" 	<ul style="list-style-type: none"> Joint Exploration/Discovery/Invention Deep Structure Exposed Continuous Learning Attention Reframed Relationship of Known/Unknown 	<ul style="list-style-type: none"> Spirit of INQUIRY Open to Question 	
<ul style="list-style-type: none"> "unrehearsed conversation" "ideas-in-the-making" "acknowledged disappointment" "laughter and joking" "challenged each other" "defensiveness explored" "did our homework" "offered ideas pre approval" 	<ul style="list-style-type: none"> Emergent Outcomes Provisional Thinking Genuine Affect Open Challenge Preparedness 	<ul style="list-style-type: none"> Spirit of SPONTANIETY Spontaneous Interaction 	
<ul style="list-style-type: none"> "hanging in there" "common purpose" "moving toward agreement" "creating something better" "shared benefit" "looked for what <i>would</i> work" "public safety is the priority" 	<ul style="list-style-type: none"> Staying Engaged Transcendent Goals Hopeful Future Existing Potentialities Understood Parameters 	<ul style="list-style-type: none"> Spirit of POSSIBILITY Emerging Outcomes 	

chaos, and social constructionist perspectives) resulted in a theoretical framework (qualities of conversation) for understanding the micro-interactions of self-organizing change.

Data Integrity

Criteria for judging the validity of generative theory grounded in case study observation and experience required both structural corroboration for coherence

and internal credibility (Lincoln & Guba, 1985; Yin, 1984). These were achieved through: (a) deep exploration of the participants' experiences (Firestone, 1993); (b) fidelity checks of emerging narratives with a 30% sampling of participants (Lincoln & Guba, 1985); (c) persistent observation, which included meticulous note-taking and systematic data organization (Halpern, 1983); and (d) multiple-source data checks (triangulation) to include written documents, journal notes, observation field notes, and transcriptions of recorded interviews and meetings (Lincoln & Guba, 1985; Miles & Huberman, 1994).

Findings

In this section, we describe five qualities of conversation that heighten the vitality of self-organizing change. In presenting each quality of conversation, we rely primarily on our findings from the data, but we also draw on observations and insight from the social and organizational sciences. This helps conceptually to ground our findings and to provide the reader with a sense of how they are linked to the larger literatures on organizational change, group dynamics, chaos and complexity, and social constructionism.

Qualities of Conversation that Guided Transformative Interactions

The five qualities of conversation include a spirit of *freedom, inclusion, inquiry, spontaneity* and *possibility*. Although participants used a variety of words and phrases to describe their experiences, they reported that when they interacted according to these qualities it increased their willingness and ability to stay engaged in the process and move the ROP initiative forward in a direction to which they were committed. Many also reported that the new ROP process stood in stark contrast to the previous approach, which was based on *de facto* principles of unilateralism, indifference, inflexibility, arrogance, and immutability. Consistent with the literature on chaos and complexity, we argue that when organization members interact in a spirit of freedom, inclusion, inquiry, spontaneity and possibility they increase their levels of interconnectivity, shared identity, and collective capacity. In turn, elevated levels of interconnectivity, shared identity, and collective capacity contribute to vital self-organizing.

Spirit of Freedom

A spirit of freedom enabled participants to choose whether or not and how to engage in the process of change. Freedom to "say what you think" reflected the courage of

individual integrity, thus giving depth and meaning to the emerging outcomes. Energetic, sometimes tense, conversations included elements of personal risk and fear (of uncertain outcomes). However, it was the expression of conflicting points of view that created far-from-equilibrium conditions contributing to the energy for transformative change (Goldstein, 1994; Stacey, 1996). Participants described experiences that were both “exhilarating” and “risky as hell” as they “put themselves on the line” and drew from their inner core of integrity to say what needed to be said. This comment from a utility participant serves to exemplify:

In one of the early stakeholder workshops a performance indicator definition was proposed that in my view reflected a regulatory bias and did not take everything into account. I decided I had to speak up. It was hard to do – because we’d never been encouraged to do that kind of thing before. I gotta tell you, it felt darn risky at first.

A sense of freedom enabled people to develop credibility with one another in the form of *trustworthiness*, *competence* and *goodwill* (Campbell, 1982). Conversational patterns revealed conscious attempts to build trust throughout the three-year long process. One participant described his experience in this way:

You could feel the trust build as we worked together [regulatory/industry working group] to develop and implement the procedures. And, during the pilot . . . when people felt free to speak openly . . . One of the things I truly sensed is that we were no longer adversaries.

One interactive scenario centered on deep difference in viewpoints about whether or not unplanned manual reactor shutdowns should be counted as a high-risk performance indicator. The story illustrates the spirit of freedom in which individuals made tough choices that influenced the integrity of their interactions and thus contributed to quality of the self-organizing change. An industry participant described her experience of the situation:

We got to the eleventh hour and all of a sudden a small group of industry executives said, “No, this isn’t right.” The whole thing got pretty intense because of the implied threat to go to Congress. The NRC was not at all pleased – and I don’t blame them . . . A task group was formed and we found a way to change the language to say what was really intended all along . . . a *better* way of describing the rationale for safety. And, this time, because of all the bruhaha, people really understood what it meant!

A spirit of freedom brought with it understood parameters of controls in the form of codes of federal regulations (NUREG-1649, Rev. 3, 2000), agreed upon principles of risk-informed regulatory oversight, and a healthy respect for the power relationship between the NRC and the industry. Elias (1989) describes dynamic power relationships as *enabling constraints*. People form simultaneously competitive and cooperative relationships with one another as a result of the tension of conflicting individual and collective identities, intentions, etc. These tensions both enable and constrain the creative interactions among people seeking change

(Stacey et al., 2000). The NRC minimized the power differentials represented by their relative position and role by engaging in conversation with industry (and public) participants from a spirit of freedom, thus demonstrating their intention to co-create the revised reactor oversight process *with* those who had a stake in the outcome.

Spirit of Inclusion

We describe a spirit of inclusion as an active willingness to involve people in the conversations of change who hold a significant stake in the emerging outcomes. In this study, a spirit of inclusion expanded connectivity and the rich variability of perspectives, thereby contributing to the quality of self-organizing change (Stacey et al., 2000). Conscious efforts were made to include stakeholders who have a vested interest in how nuclear power plants are regulated. The NRC Chair described the intention of inclusion:

The way to deal with this [regulatory oversight concern] was to bring all the protagonists to the table – in the open. That meant we had to be prepared to hear all the disparaging remarks that anybody might want to make. Even if . . . the comments weren't fair, we had to be willing to listen and understand.

It was in the “heat of differences” (disequilibrium at the edge of chaos) (Kauffman, 1995; Stacey, 2000) among the regulators, industry leaders and public activists that bifurcations (Prigogine, 1996), or transformative shifts in interpretive schemata (Bartunek, 1993), began to occur. One NRC participant describes a transformative shift:

I can remember thinking [early in the process] “These guys are lunatics. How can they possibly conceive of allowing these plants to run under this kind of regulatory process?” The proposed point of view countered everything we thought we knew about regulating power plants. . . .

But after things heated up [intense conversations involving NRC commissioners, industry leaders, anti-nuclear activists and members of Congress], we began to look at the industry proposal with a fresh perspective. Not from the position of “why this could never work,” but from a perspective of “let’s look at this and see what maybe could work in terms of addressing some of the concerns that the industry is raising.” And so it was – a classic shift in perspective. One of those moments in time when the anxiety we felt created a willingness to set aside our time-proven beliefs – our preferences for solving all our regulatory issues internally, deciding the course of action *we* wanted and dismissing input from others.

A spirit of inclusion expanded the self-organizing capacity (Lichtenstein, 2000) of the group by increasing both, access to information and new knowledge generated in the context of the conversations. An NRC participant was explicit about the value of including diverse voices to craft the revised reactor oversight process:

We needed the industry. They had more knowledge than we did about the quality and availability of plant performance data. . . . We needed members of the public to keep us aware of the issues that would most affect public confidence in a new approach to regulation.

The demonstrated spirit of inclusion experienced by participants in this study was in sharp contrast to the ways in which the three constituencies had interacted in the past as illustrated by this comment:

In all my years [35 years] in the nuclear industry, this was the first meeting in which I observed NRC Commissioners in a mode of listening to suggestions about how to make significant changes. . . .

Representative comments from the public activist constituency reinforced the contrast in interactive behavior:

In the past, after the NRC reached a final policy draft they would put it out for public comment. But by that time, so much effort has gone into it . . . you knew they were not going to consider significant changes. Maybe they'd be willing to fix a misspelled word. . . . But, in this case, they asked for input early – as if what we thought *mattered*.

There were plenty of public meetings [during the change development process]. In fact, I couldn't keep up with them all. The thing is, it didn't work to just voice concerns. They wanted our ideas about what *would* work.

The choice to include stakeholder voices increased the connectivity among individuals within a buzzing network of complex human interaction. Meaningful, face-to-face dialogue enabled participants to learn from one another, share experiences, and discover common values and goals in spite of their long-standing differences. They experienced one another's sincerity, capability and commitment as they jointly constructed meaning and actions that made sense to them.

Spirit of Inquiry

A spirit of inquiry served to create a container for people to focus joint exploration and discovery as they learned from one another in dialogue. Instead of communicating a sense “knowing the answers” people demonstrated a willingness to “stew in the questions” long enough to understand and construct meaningful outcomes. Some questions were generative and open-ended, e.g. “What is really going on here?” “What will be the unintended outcomes of making this change in the [specific] performance indicator?” Other questions served to uncover implications or hidden patterns of behavior: “On what information are we basing this decision?” “Do we even remember why we decided to move in this direction?” “What were our assumptions at the time?”

Questions helped to clarify issues, validate understanding, test assumptions and experiment with provisional thinking: “I think we're talking about the same thing . . . Why don't you walk us through your logic?” “When you say the current

process is not working, what do you mean by that? What do we think needs to change and why?” “We obviously don’t agree on this one. . . . Let’s stop and take look at this [particular performance indicator] from [an alternative] perspective.” “What are possible outcomes that we’re just not seeing here?”

A spirit of inquiry served to invite people into the conversation, access dormant ideas, and encourage new vocabulary by recombining individual perspectives and language into new ways of talking and thinking together. Questions that triggered this line of inquiry included: “[Name], what are you thinking? You look like you’ve got something to say about this.” “What points of view are we missing here?” “Who else needs to be in this conversation?” “If it works [in another context], why couldn’t it work here?” “I’ve never thought about it in those terms before. How could we reframe this as a broader environmental issue?”

A spirit of inquiry led to reflection and analysis at both personal and system-wide levels of awareness and learning. The following comment exemplifies reflective inquiry:

This guy [NRC inspector] was downright angry! All of a sudden, I found myself trying to figure out how to deal with the emotional experience of this person sitting across the table from me. He must have a good reason for reacting the way he did. Maybe it was the only perspective he could see from where he sat. I had to ask myself, “Why?” “What led him to make these assumption?” “How is he feeling right now?” “How would I feel if I were in his shoes?” “What can I say and do that will shift things to a better place?” I took it pretty seriously and immediately tried to make sure that he knew where we were coming from on this thing... and I worked harder at trying to understand where he was coming from.

Overall, a spirit of inquiry created a context for relational meaning making that fostered high energy, adaptive learning and creative change in participants’ conversations.

Spirit of Spontaneity

A spirit of spontaneity reflected the unfolding and generative nature of their interactions. Unrehearsed conversations increased the opportunity for innovative ideas to emerge as people exchanged strongly held points of view. This spontaneous interaction was distinctively different from the ways the regulator, industry and public stakeholders had communicated in the past in which ideas were prepared, often scripted, and “lobbed over the wall to the other side for review and comment at a later point in time.” One veteran NRC participant noted, “Prior to this process you would *never* put an idea out for discussion without first getting inside approval up and down the line.”

Being open to spontaneity encouraged cooperation among people who previously stood on opposite sides of the issues. It shifted the relational dynamic from one of defensiveness and “holding information close to the chest” to one

of collaboration and co-creation, building on “rough draft” ideas. Patterns of spontaneity enabled provisional thinking in conversation. People “tried on” ideas together knowing they could abandon what didn’t work. The comments below illustrated participants’ experiences of spontaneity:

We rolled up our sleeves, loosened our top buttons, got the markers out, and started brainstorming ideas. We actually exchanged points and counterpoints. This was [previously] . . . unheard of!

We had to immediately think about doing things we had never done before. . . . And we had to learn to communicate differently. For example, at one workshop the agenda was, in essence, a dialogue question: “Here’s the draft framework and here are some of the defining principals. Where do we want to go from here?”

A spirit of spontaneity did *not* mean that people came to their conversations unprepared. On the contrary, people brought well-research documentation to support particular points of view. However, positions were presented as working proposals to be explored, “ideas-in-the making.” One NRC member described a perspective of spontaneity:

We tried to focus on *progress*, not perfection. We knew if we were trying to develop the perfect process, we would never get there. Instead we had a shared belief that we *were* going to get there. We weren’t exactly sure how, but we knew if we made progress in the right direction, that that was going to be good enough. . . .

The emerging reactor oversight process was often referred to as “a living document,” one that would be continually refined over time in a self-organizing process of emergence as reflected by this description:

We didn’t have an end product in mind but we did have a conceptual vision and some firm milestones for completion. . . . We agreed on high-level principles early on . . . and then the process itself took us where we ended up going.

Spirit of Possibility

Conversations revealed distinct patterns of optimism, a belief among participants of what they could create together. As regulatory, industry and public stakeholders began to connect relationally, commonalities of purpose began to emerge in spite of their parochial differences. They discovered they shared a unifying goal – joint responsibility for ensuring safe production of nuclear energy in the U.S. – that transcended the potentially conflicting goals of each representative constituency. Movement toward agreement visibly energized people as described by this participant:

Before that first meeting in 1998, I think we all thought we were poles apart. . . . During that meeting people started to recognize, “maybe we have some of the same goals and objectives here.”

A key moment for me was when one utility manager spoke up in a conversation in which the radical idea to eliminate resident inspectors was being proposed. He said, in effect, “Wait a minute. We don’t *want* to get rid of the resident inspectors!” All heads turned to look at the guy as if to say, “Huh?” He went on: “The resident program is good for us. Yea, it’s painful, but we need it. . . .” That broke the ice. . . . We were beginning to notice that we all wanted the same thing – safe nuclear power plants.

Working toward the potentiality of what could be (Ludema et al., 1997) created an energy for collective movement toward agreement in the form of novel solutions, consensus building, compromise, and reflective pauses (Ferdig, 2001). The spirit of possibility inspired generative thinking that was tempered naturally by the parameters of control inherent in the power dynamics of self-organizing change (Elias, 1989; Stacey et al., 2000). One participant explained:

When we got hung up, we’d just come back to the principles that we’d agreed on in those early stakeholders’ meetings and ask the question, “Does this get us where we want to be? Are we losing sight of the original intent here?” Then we’d stop and look at each other and say something like, “Let’s rethink this.”

There will continue to be diverse points of view about the respective roles the regulator, the power industry, and the public activists have in ensuring safe production of nuclear energy. However, the people who engaged in this constructive process for jointly creating a radically different approach for monitoring power plants shared a belief that the quality of their conversations influenced the quality of the outcomes. When participants were asked to look ahead and imagine the ways the three constituencies would interact in the future, given their experiences documented in this study, their responses were hopeful. This statement from a utility participant summarizes the views expressed by NRC, industry, and public stakeholders, alike:

I don’t think we could ever go back to the way it was before. We’ve all learned enough from this experience that we can take on whatever comes at us in the future. We know more changes [in the regulatory process] will be required going forward. But we now have a process in place that will enable us to keep the conversations going. . . . I am really optimistic! Probably the greatest learning is that we discovered we really do share a common interest, that we can sit down and talk openly about our issues, recognizing that it’s okay to disagree and figure things out together. *Just talking* made all the difference. It’s a whole new paradigm.

The five qualities of conversation, and descriptions of interactive behaviors represented by each, are summarized in the Table 3.

It should be pointed out that the data also revealed paradoxical patterns of interactive behavior. For example, with *freedom* came understood parameters of control (e.g. uncompromised standards of nuclear safety); a spirit of *inclusion* contained elements of exclusion (not everyone could participate); a spirit of *inquiry* included acknowledgement of documentable certainties; spontaneous exploration

Table 3. Qualities of Conversation that Contribute to Transformative Self-Organizing Change.

Spirit of Freedom	Spirit of Inclusion	Spirit of Inquiry	Spirit of Spontaneity	Spirit of Possibility
Choosing whether and how to engage in self-organizing change	Expanding number of micro connections	Collectively exploring, discovering and inventing solutions	Co-creating emerging outcomes	Staying in the game
Discovering and honoring core integrity of self and others	Expanding diversity and system variability through increased connectivity	Uncovering deep behavioral patterns that influence choices and actions	Thinking provisionally	Discovering transcendent goals that serve the common good
Choosing how to develop relational credibility through competent, trustworthy and genuine interactions with others	Co-constructing meaning and action in the relational space of dialogue	Engaging in continuous, adaptive reflection and learning	Acknowledging the human experience as a part of meaningful exchange	Seeking a hoped-for future reality
Becoming conscious of enabling constraints that impact freedom of choice	Holding the creative tension of disagreement, thus enabling potential for transformative emergence Being aware of emerging power relations and their effect on joint creation of meaning and action	Framing/reframing conversational focus Structuring “the known” as a way to explore the “unknown”	Challenging others while remaining open to challenge by others Preparing for credible presentation of positions	Building on existing potentialities Simultaneously honoring and challenging “understood” parameters of control that emerge within the interactive process

(*spontaneity*) was simultaneously accompanied by careful planning and research; and creative *possibilities* were actively sought in the context of undisputed limitations (e.g. codes of federal regulation).

Classical management thinking suggests that rational people should be able to resolve paradox and the conflicts they create (Stacey et al., 2000). However, complexity theorists remind us that complex systems are inherently paradoxical and that the simultaneous conditions of order and disorder, certainty and uncertainty, autonomy and interdependence, etc. are powerful sources of collective energy for self-organizing change (Stacey, 1996; Wheatley, 1999). This view is consistent with organizational theorists who describe paradox as a natural and inevitable force of individual and collective life (Quinn, 1988; Smith & Berg, 1987; Stacey, 1996; Wheatley, 1992) generating the potential for “tremendous amounts of energy [in which] new elements are created” (Smith & Berg, 1987, p. 225).

People in this study demonstrated a capacity for dealing with paradoxical tensions. Through deliberate and respectful conversations, they revealed to themselves and each other the circular, deep structural patterns of polarized behaviors (vicious cycles) (Smith & Berg, 1987; Stacey, 1996) that had traditionally existed between the regulator, the regulated, and the public activists. Learning to stay with the creative tension of the paradox enabled them to find a common link among opposing forces (Smith & Berg, 1987) and establish new relational patterns of collaborative interaction.

The tension of differences generated by paradox also provided the control parameters for creative emergence (*bounded instability*) (Stacey, 1992). The state of balanced equilibrium achieved through established controls, exclusivity, certainty, predetermined blueprints and limiting rules (classical management theories) was challenged through the relational interactions demonstrated by participants that pressed toward freedom, inclusivity, inquiry, spontaneity, and possibilities (complexity/social constructionist theories). Through communicative behaviors they created an “interactive disequilibrium” that generated energy and creative potential for the emergence of transformative change within the undisputed boundaries of safe industry performance.

Sustained Effects of ROP Development Process

Follow-up interviews (July, 2004) with selected participants of the nuclear ROP change process indicate that the shift in the quality of relationships developed among the NRC, nuclear industry, and public activist groups during the three-year process of developing the ROP has been sustained. The newly created ROP itself is described as a “living document” that enables continued conversation and

deliberation about issues of reactor safety within the parameters of the new nuclear reactor monitoring system³. One participant summed it up this way:

Of course, not everyone agrees about any given question that might come up, but we now know how to work together to figure out solutions that can ensure public safety and the health of the industry. . . . Clearly we need to continue to work at strengthening relationships [among the three constituencies], but the foundation is there, and we know how to do it. . . .

An NRC official reported that the interactive processes are encouraged through ongoing stakeholder meetings that help to inform participants of emerging challenges and learnings that can inform the NRC of needed modifications and refinements of the ROP evaluation tool. According to participants' recent characterizations, the technical application of the ROP tool has sustained the intended objectives that included: (1) a reliable source of current and historical safety performance data for every nuclear power plant in the U.S., thus enabling a more objective form of ongoing regulatory oversight (than the previous evaluation system allowed); (2) transparency of comprehensive safety performance information available to the public, as well regulatory and industry personnel; and (3) a credible and robust system of reactor oversight that can be modified according to ongoing lessons learned as new operational safety challenges emerge. In addition, participants report steady improvement in overall plant safety performance trends (with some leveling effect as high standards are maintained) as a result of the method of evaluation and reporting inherent in the new ROP. Further, there have been no significant nuclear safety incidents since the implementation of the new ROP, though, the NRC maintains continuous and systematic scrutiny of all plants, using its authority to shut down a plant when warranted until corrective actions have been placed.

DISCUSSION

The qualities of conversation identified in this study formed the interactive container in which transformative self-organizing change occurred. In effect, the quality and quantity of participants' micro-interactions contributed to the robustness of three domains of self-organizing activity described in the complexity literature as *identity*, *connectivity*, and *capacity*. Identity is characterized as the way a system refers to itself within the whole. Connectivity describes the quantity and quality of relationships among diverse system components. Capacity refers to a system's ability to access and generate knowledge relevant to system competence and sustainability (Lichtenstein, 2000; Moore, 1996; Smith, 1996; Stacey et al., 2000).

The degree and the direction of movement toward organizational transformation needed for system vitality were influenced by the robustness of the self-organizing domains, which, in turn, were influenced by the qualities of conversation that guided the change. These principles, in effect, constituted the *initial conditions* that set the context for the responsive, generative processes of change at the micro-interactive level (refer back to Fig. 1). Rather than worrying about how to initiate a planned change intervention that included strategies for creating the acceptance of predetermined outcomes among those being impacted by the change, NRC leaders (as agents of change) focused their energy and attention on creating the conditions for self-organizing change. They acknowledged that they did not (nor could they) have all the knowledge and perspectives needed to successfully create and implement a risk-informed, performance-based approach for monitoring nuclear power reactors. By intuitively drawing upon the basic principles of self-organizing, and by engaging the whole system in the development of a revised approach to reactor regulation, the leaders of the change process drew upon the diverse strengths of the system to co-create outcomes that will sustain the vitality – and safety – of the nuclear energy system in the U.S.

Managing in this way is not easy, especially in high reliability industries such as the nuclear power industry for which there is *no margin for error in operating safe power plants*. However, it was precisely because the NRC chose to respond to the changes in the regulatory/industry environment with a self-organizing approach to creating and implementing a revised method for monitoring nuclear reactors that a successful industry-wide transformation occurred and has been sustained.

IMPLICATIONS

The results of this study have broad implications for organizational leaders and agents of change who are called upon to initiate timely and effective system-wide responses to rapidly changing internal and external conditions. First, this research suggests a new perspective for thinking about organizational change. Instead of planned interventions in which leaders or agents of change move an organization from an existing state through a period of transition toward predetermined outcomes, change is described as an ongoing self-organizing process of lively and meaningful interaction among members of a system in which they jointly construct movement toward emergent and transforming outcomes. It is the *conversations of meaning and action that constitute self-organizing change*.

Of particular interest in this regard is the range of large-group interventions currently being used by organization change practitioners, including the Search Conference (Emery & Purser, 1996), Future Search (Weisbord & Janoff, 1995),

Open Space Technology (Owen, 1997), Whole-Scale Change (Dannemiller Tyson Associates, 2000), Real Time Strategic Change (Jacobs, 1994), the Conference Model (Axelrod, 2000), the Appreciative Inquiry Summit (Ludema, Whitney, Mohr & Griffin, 2003), and others.

These approaches share many common features. First, they stress the importance of getting the “whole system in the room.” When people see interconnections among departments, processes, people, and ideas, they know better how to participate and, therefore, are able to make commitments that were previously impossible or unlikely. Second, large group interventions encourage a focus on the future. Cooperrider and Srivastva (1987) and Whitney and Trosten-Bloom (2003) suggest that a continuous focus on deficiencies can demoralize human systems, whereas imagining ideal futures creates hope and positive energy. Large-group interventions provide a constructive space for people to generate energy for action by imagining the future rather than focusing exclusively on problems. Third, dialogue – conversation at the micro-interaction level – is central to large-group interventions. When people are free to listen to each other and to share their unique experiences, they get a much clearer picture of one another’s perspectives and are more likely to build shared understandings. They are also more likely to discover common dilemmas and shared aspirations that are larger than their own agendas. Lastly, large group interventions are committed to shared self-management. People invest energy in organizational issues that are of concern to them which, in turn, contributes to the amount and quality of work they choose to engage in on behalf of the whole system. These large-group methods comprise a practical application of complexity and social constructionist theories. They affirm the idea that the future is truly unknown and unknowable, and that people in organizations are continuously in the process of building something new.

A further implication of this study relates to the role of an effective leader or change agent. Their role begins to shift from one of knowing the answers and directing planned change aimed toward specified outcomes to one of creating a *context for self-organizing change* in which purposeful outcomes are jointly created by diverse members of the system. Leaders and agents of change must become adept at *engaging the wisdom within the system* in the ongoing process of co-creating meaningful action that serves the whole system.

The insights from a case study in the nuclear industrial complex are potentially useful to leaders and change agents in other high-reliability settings who want to create a context for generating self-organizing changes during critical periods of transition needed to sustain system vitality in a rapidly changing environment. In particular, the ROP study provides a model by which regulators in other high-reliability industries, also operating on traditional assumptions regarding the use of power and control, can set up systems to work collaboratively with

industries in developing a system of regulation that serves the collective interest. For example, this model provides insights for generative interaction aimed toward strategic sustainability that can be equally effective within oil refineries, chemical processing and coal-mining industries. It also has prospective application for developing safety standards and practices in industries that may be less regulated from a public safety standpoint, but which experience serious safety compromises within employee ranks at great human and monetary cost, industries such as pre-cast concrete and heavy-equipment manufacturing. In sharp contrast to the high-reliability and safety-impacted industries, this approach to self-organizing transformation also has prospective relevance in not-for-profit organizations struggling to survive in difficult economic times. For example, members of a Chicago dance company discovered that through collaborative conversations they were able to redefine and sustain themselves in a cultural marketplace that required continuous responsive interaction with its audience, its funders, and the larger community within which it performed. The opportunities for learning to understand and live creatively within the unpredictable dynamics of today's social, economic and ecological realities are seemingly limitless.

Additional research is essential to further understand the self-organizing processes for transformative change. Systematic empirical research of self-organizing change phenomena will facilitate deeper understanding of the micro-interactive processes of joint meaning-making and action in complex situations. The explanatory power of the model offered in Fig. 1, which illustrates the qualities of conversation that influence self-organizing change, can be further validated through replication and variations of this study conducted in other complex organizational settings. Further understanding of the conversational qualities that influence the initial conditions for transformative change will help to guide leaders and agents of change in developing skills needed to create and hold the container for collaborative, creative interaction among diverse stakeholders who have a vested interest in change outcomes.

Action research seems particularly well suited to learning about transformative change in real-time organizational settings. Leaders are struggling to make sense of rapidly changing economic, social and political environments and are ready to experiment with optimal ways to engage the wisdom of those within the organizations they lead in order to create meaningful and responsive strategies for sustainable growth. Scholars and consultants who study change and assist organizational leaders are called upon to bring the most innovative thinking about how organizations function to their clients. Perhaps it is time to shift the implied objectives of predetermined outcomes inherent in traditional change interventions to objectives designed to help our research partners and clients learn how to hold the space for ambiguity and uncertainty within which meaningful

conversations can lead to purposeful self-organizing change in the interest of the collective whole. Well-defined action research projects, conducted in collaboration with organizational leaders and internal change agents during times of transition, can lead to further understanding of relational, interactive behaviors required to participate effectively in generative processes of transformative change.

NOTES

1. Second-order change refers to change in the cognitive frameworks underlying the organizations activities, changes in the deep structure or shared schemata that generate and give meaning to these activities; sometimes described as transformative change (Bartunek & Moch, 1987; Fisher, Rooke & Torbert, 2000; Watzlawick, Weakland & Fisch, 1974).

2. One participant observer and co-author of this article was invited to be a member of the Initial Implementation Evaluation Panel as a representative of "the public."

3. While the events of September 11, 2001 resulted in tighter control of physical security information pertaining to nuclear power plants in the U.S., public activists, by following appropriate security clearance measures can continue to gain access to information needed to monitor the reactor oversight process and related reactor performance trends.

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