ENERGY AND LEARNING AT WORK: THE IMPORTANCE OF ENERGY

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Abstract

Energy is central to learning, management, and work. The authors suggest core definitions for human energy, work and learning and propose that energy is a key concept for the study of learning and managing in the workplace.

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While early organization scholars (Barnard, 1968/1938; Katz & Kahn, 2003; Parsons, 1968/1937) considered energy as fundamental to organizations, and in spite of the recent common use of many energy-related terms and issues, such as inertia, dynamic structure, force, and work, only a few current scholars (e.g., Baker, Cross, & Wooten, 2003; Bruch & Ghoshal, 2004; Czarniawska & Joerges, 1995; Dutton, 2003; Schwandt & Marquardt, 2000) address the concept of energy. As important as the biological legacy of complexity science is to our understanding of how organizations learn, become, and organize (Clegg, Kornberger, & Rhodes, 2005), the physics of energy remains fundamental to a consilient understanding and fluent conversation among the sciences, whether physical, biological, or social. Energy is central to organizing, working, and learning.

Despite the interest in energy-related concepts and related issues in organizations, the literature on energy in organizations, particularly as it relates to organizing and learning, is disjointed and the construct underdeveloped. This paper analyzes the use of the energy construct by assessing the theoretical development with an emphasis on how it is conceptualized in relationship to organizing and learning. Conclusions are drawn from the literature and the implications for future theory, research and practice are explored.

1. DEFINING ENERGY AND WORK

The word "energy" is derived from the Greek words *energeia*, meaning "activity, operation," and *energos*, meaning "active, working" (Harper, 2001). As Barnard (1968/1938) observed, "The life of an organization depends upon its ability to secure and maintain the personal contributions of energy (including the transfer of control of materials or money equivalent) necessary to effect its purposes" (p. 90). Katz and Kahn (2003/1966) have also stressed the importance of energy to the survival of organizations as systems.

Taylor and Casey (2011) discuss a number of definitions of energy identified in a variety of traditions, including psychology, sociology, education, and organizational behavior. While some definitions fall more into the potential energy domain (energy as the ability to do something) and others fall into the kinetic domain (force of action, influence), there is a fairly common conception of energy in regard to its producing of an effect. More diversity exists in terms of describing energy as it is experienced. Some describe it as a kind of thought (e.g., Ellis, 1962, 1979), while others describe it as a feeling (e.g., Collins, 2004; Dutton, 2003) or as a complex sense of vigor (e.g., Shirom, 2004) or vitality (e.g., Dhawan, Roy, & Kumar, 2002; Varela & Depraz, 2004). How individuals and collectives experience, become aware of their human energy, and to what extent remains uncertain.

In addition to Parsons' (1978) Freud-based goal-oriented energy framework, conceptual frameworks based on energy have recently joined the social science literature. Shirom's (2004) concept of vigor is comprised of emotional energy, physical strength and cognitive liveliness. Collins (2004) links his Interaction Rituals chains theory of social energy to the work of many scholars and researchers, especially Durkheim, Goffman, and Garfinkel. According to Collins' theory, individuals derive emotional energy from their participation in interaction rituals, which in turn affects their attraction (feelings of membership and identity with the group) or repulsion from future similar rituals, forming chains of rituals, networks, and other structures. Yet other scholars provide insights on

energy, either under other guises or through related concepts, such as motivation (Ryan & Deci, 2000; Thomas, 2002) and vitality (Ryan & Deci; Ryan & Frederick, 1997), discretionary effort (Huselid, 1995), passion (Vallerand et al., 2003) and flow (Csikszentmihalyi & Rathunde, 1993). According to Ryan and Deci, intrinsic motivation, is the power, force, or energy that emerges from within the individual and is based on internal meaning and value rather than external rewards. Intrinsic motivation requires three contextual elements: competence (a form of knowledge), autonomy (a degree of freedom), and relationship (a perceived connecting through the spaces of separation from the collective).

The authors of this paper define human energy at work as "the *force or power of human movement, action, change, or being*" [original italics] (Taylor & Casey, 2011). In line with the classical physics definition of energy as "the ability to do work," (Young, cited in Dell, Anthony, Rand, 2004) human energy can be seen as the source or origin of human work (Taylor & Casey, 2010). Energy is the source of all human doing/human being; it is at the root of its composing and decomposing molecular interactions (Maturana, 2002).

Scholars connect energy or vigor with work performance (Baker, Cross & Wooten, 2003; Shirom, 2004). Work is the transformation of energy into goal-oriented action (derived from Schwandt, Ayvaz, & Gorman, 2006; Taylor & Casey, 2011), and that action can range from arduous to minimal physical activity, speech acts, or internal acts such as thoughts or feelings (Adler & Obstfeld, 2007; Merrett & Easton, 2008; Parsons, 1968/1937). It can involve individual or collective action. Linking ideas – just like molecular bonding, holding planets in orbit, and fusion – take energy. We need rest, nutrition, excitement, autonomy, competence, and relationship to write, think, work, learn, and interact (Ryan & Deci, 2000).

1.1 KNOWLEDGE AS ENERGY; KNOWLEDGE AS WORK

"How, at a given moment, do individuals and groups at a certain place happen to notice an idea" (p. 180) in a momentary space and become entrained by it, ask Czarniawska and Joerges (1995). Much as light collapses on the human eye as a photon of energy coalescing from a quantum wave, the information in the environment collapses into a point of meaning for the organization and its members. The three energy frameworks cited above can inform the collective attention and entrainment described by Czarniawska and Joerges (1995). Parsons cites the goal or purpose that gives the idea meaning to individuals and the collective, Shirom cites the interplay of emotional energy, physical strength and cognitive liveliness, and Collins cites the spark of collective effervescence and excitement, the feelings of solidarity, and residual emotional energy in individuals once they leave the collective co-presence and recall the experience. Just as the light energy leads to a psychological perception of a visual image, information energy can lead to waves of knowledge (Backer, 1993; Mouritsen & Larsen, 2005) and meaning for individuals and organizations. Information as energy (Weiner, 1965) is not a new idea, and knowledge as energy is a logical derivation. Human beings use knowledge, and thereby transform energy – they work. And as they work they learn (Brown & Duguid, 1991). Some call some human beings "knowledge workers" (Blackler, Reed, & Whitaker, 1993),

but in the sense of knowledge as waves of energy available to human societies, we are all knowledge workers.

The utilization of knowledge is itself a form of work – transformation of space (Serres, 2007; Wolfe, 2007) – a use of energy for a goal or purpose. Individuals must work, even if minimally, to acquire and use knowledge. To do this they must expend energy, even if the acquisition and use of knowledge also provides energy or makes its use more efficient.

Knowing and acquiring knowledge is inherent in the human being and is centered on learning by doing (Dewey, 1922). Logically, then, energy – the force of human work and action – is essential to learning (Chickering & Gamson, 1987; Colbert, Newman, Ney, & Young, 1982; Dewey; Hill, 1996; Lannert & Hoyer, 1998). One cannot have learning – individual or organizational – without energy. This iterative, non-linear process could be described as energy→doing→learning and knowing. Depending on conditions and contexts of these factors, there can be reciprocal progression: energy→doing ←→learning as well as energy←→doing←→learning (Dewey).

1.2 INDIVIDUAL AGENCY IN NETWORKS

Social organization intermittently oscillates between construction and decay of patterns of action, and social actors at the centers of organization are points of energy interacting with and affecting the social context in which they are embedded (Summers-Effler, 2007). Barnard (1968/1938) indicates that individuals freely choose to contribute their energy cooperatively in organizations. Bourdieu (1989; 2000) would argue that individual freedom is constrained by *habitus*, and other scholars might argue for an even more deterministic view. However, Ryan and Deci (2000) assert that autonomy is a factor in energy and motivation. Free choice or will to contribute one's energy is an emotional or affective phenomenon. Fox (2000) outlines how organizational practices evolve through the agency of members of occupational communities. He cites Foucault's concept of *pouvoir/savoir* – to be able to (have power to)/to know. This is a clear connection of knowledge, power, and ability to act. The concept of energy emerges as Fox emphasizes Foucault's concept of power as force, in the sense of the self acting upon itself, reminiscent of Ryan and Deci's intrinsic motivation. "Every bit of practice involves some relation of force" (Fox, p. 860), and that force is largely internalized. Similar to the focus of Clegg, Kornberger, and Rhodes (2005) on learning, becoming, and organizing, Fox finds the focus of actor-network theory to be on how any actor "comes to be and function like an actor" (p. 858).

Both conscious and unconscious factors can increase, decrease, focus, or fragment emotional energy in organizations. Even when action is unconscious, action calls upon and is generated or affected by collective effervescence, solidarity, and emotional energy, which arise in a feeling of membership in a group during a successful interaction ritual (Collins, 2004). Fox (2000) describes the triadic communities of practice, from the apprentice working and learning at the periphery to the master, who holds the more energizing and influential central position (Collins) in the community. Therefore, generation, transformation, and focus of emotional energy is the strategic organizing factor

in the application of human physical, mental, and emotional energy toward action, learning, and work.

1.3 ENERGY EXPENDED IN COMPLEX INTERACTION – THE CASE FOR LEARNING

The process of knowledge creation in today's society is dependent on a series of interactions of the individual with various social collectives in complex contexts. These interactions, and subsequent knowledge production, are not without a cost or expenditure of energy. However, the human process of knowledge creation can represent cycles of human behavior that require energy input (usually in the form of new information and human effort) and energy output (usually in the form of new knowledge). The cycles of knowledge creation can be very efficient (requiring small amounts of new information with novel rearrangement into emergent new knowledge), or they can be of high cost (resistance to the consideration of novelty or the lack of recognition of potential micro or macro social benefits) that result in increased organizational entropy and potential death of the collective. In our discussion of the energy–learning relationship, we contend that the key to the "energy efficiency" of these cycles lies with the amplitude of "tension" generated during the interactions and its dependence on the realignment of social structuring media (Giddens, 1984) of the collective.

We operationalize the collective (macro) by defining it as a dynamic and continuously emerging social pattern of agent interactions and collective actions characterized by a common set of values (Pruzan, 2001) and knowledge (Schwandt, 2002). Inherent in this definition is a variance in the nature of collectives based on the extent of integration, acceptance of common values, and participation in the knowledge creation process. Although the "collectivity" construct can refer to any level of the social system, such as societies or industries (Abrahamson & Fombrun, 1994; Astley, 1984; Astley & Van de Ven, 1983), the major focus of the present argument will be limited to the micro-macro level of the social system.

This section of our paper argues that knowledge creation is related to the energy expenditure required to overcome or reduce the interactive tensions between micro and macro levels of the human social system. We provide an analytical theoretical frame that incorporates concepts such as social co-evolution, collective schemata, self-organization, reciprocation, and non-linearity to ad clarity to the concept of the tension energy associated with collective learning during collective - individual interactions. Our argument relies on two theories that focus on the micro-macro interactions and emergent social phenomena: Stones' theory of strong structuration - associated with micro-macro interactions (Stones, 2005); and the theory of complex adaptive systems - concerned with social change as a complex adaptation (Anderson, 1999).

Complex adaptive social systems theory contributes to our understanding of social collective learning processes because it assumes emergent phenomena form interacting independent agents. Four characteristics of the theory help explain social interaction and pertain to collective learning. First, *schemata, or schema*, provide understanding and act as cognitive and emotional guidance for agents and the collective in their social interactions. They are comprised of sets of simple "rules" for sensemaking and are indicative of,

"…cognitive structure that determines what action the agent takes at time *t*, given its perception of the environment at *t-1*" (Anderson, 1999, p. 219). Second, *nonlinearity* means that the actions and interaction of the agents and the collective are not simply additive and they exhibit non-proportional cause-effect relationships (small forces can result in potentially large consequences). Third, these systems are *self organizing* that is they can create spontaneous restructuring to adapt to new environmental conditions. Fourth, they co-evolve through emergent social phenomena that allows them to regenerate and self-organize their knowledge schemes and social structures for potential next interactions (Dooley & Van de Ven, 1999).

We define learning as a process of acquiring knowledge that leads to new abilities or understanding within the collective (Schwandt, 2009). This definition incorporates the essential elements of knowledge and understanding of the collective, however, it also assumes individual learning. It has no preconceived orientation to success or particular value set. Agents and collectives can both acquire "destructive" knowledge as well as "constructive" knowledge. In addition, learning can occur at all levels of significance. It occurs at routine levels of day–to–day cognition (for example -- team learning to accomplish a work task), and it can occur at levels of high emotional and radical change (for example -- issues of a changing cultural pattern, collective and individual schemata, and basic assumptions).

Interactions involving micro-macro levels have an inherent unpredictability and uncertainty associated with them and are reflective of complex adaptive systems (Buckley, 1968). The reformulation of social systems as complex and adaptive system is based on the collective's capacity (and need) to restructure and change its governing values (cultural pattern reorganization) based on new information and the learning process. This morphogenic orientation to social system's evolution has implications for not only social structural change, but also for the altering of "meaning" schemata of the collective and agent. This inherent learning process suggests that a collective social structure emerges via agent interactions and requires the collective and the individual to cognitively adjust their structural orientation, or value patterns, without a necessary external influence (self organizing).

During these periods of change the energy expended in these interactions may be a function of the "extent" or "deepness" of the norm or pattern change and the availability of new information. Adaptation of schemata (basic assumptions) and the associated energy expenditure is accompanied with the addition of the uniquely human characteristic of "tension." Tension is latent and is often "felt" by the agent in their interactions - both cognitively and emotionally. These latent forces are derived from situations in which existing schemata can provide sufficient guidance. "They steer emergent co-evolutions in efficaciously adaptive directions. At the same time they damp down maladaptive co-evolution by the motivating agents to pursue these" (McKelvey, 2002, p. 12). However, in many instances the schemata does not provide sufficient guidance for action. In these situations the agents, or the collective, are either confronted with paradoxes and dilemmas of equally plausible path, or they have to develop new schemata for the situation. These latter situations require both the collective and the agents to expend extraordinary amounts of individual energy-actions to resolve their dilemmas or paradoxes. This process of

energy expenditure and tension reduction can be a very nonlinear because of the agent's capacity for free choice within the existing norms and values of the collective, and successful resolution may end in an alteration, or replacement, of existing schemata. These particular situations constitute deep collective learning and may lower the efficiency of the knowledge creation process.

Theoretical and empirical efforts concerning organizational learning (Schwandt & Marquardt, 2000), sensemaking (Weick, 1995), structuration (Barley & Tolbert, 1997; Swanson, 1992) and complexity theory (Axelrod, 1997; Stacey, Griffin, & Shaw, 2000) have focused on the need to better understand the nature and dynamics of the collective-individual interactions and this emergent tension-energy. Here "dynamics" refers to the powerful ongoing and productive activity of the "actions and interactions" of the individual and collectives that contribute to the emergence of new knowledge and structures that are made available to the collective.

As agents interact with each other, or with the information they obtain from their environments, each interaction potentially changes both the context and content of the proceeding actions by cognitively and emotionally altering the schemata of the agents and the collective. Giddens's (1976) theory of structuration, or duality of structure, provides a meso/macro theoretical platform to formulate and interpret the relationships between the normative structure provided by the collective and the interactions of the agents involved in knowledge creation. To add dynamic specificity to the coevolution of collective emergent structures and their reciprocal influence on the actor, Giddens functionally classifies emerging norms and rules as "modalities of structuration": signification, legitimation, and domination. The rules of *signification* enable and guide meaningful communication and sensemaking among the agents. It provides structure to clarify information and knowledge for the agents, in the context of the collective. Norms of *legitimation* provide the collective with the ability to morally sanction specific actions and reject others. They provide the rules of inclusion within the cultural boundaries of the collective. The modality of *domination* addresses the functions of command, power, and authority over people and resources. "The actors use appropriate 'rules and resources' (structures) to give 'form' to situations of action by interlacing … meaning, normative elements and power" (Parker, 2000, p. 57). These modalities set limits on actions, provide focus for collective goals, define the nature of interaction and allow us to understand the tension and energy associated with their adaptation.

Stones (2005) elaborates on Giddens' structuration theory emphasizing the micro nature of the duality of structure. By using his "strong structuration" theory we can add a micro dynamic specificity to the emergence of the collective's coevolving structuring processes and their impact on the collective's knowledge creation and energy expenditure. He introduces *in-situ* variability through his model of quadripartite nature of structuration. This entails the conceptualization of Giddens' structuration theory with four aspects that are recurring and reciprocating in nature; external structures, internal structures (with conjunctually-specific knowledge of external structures and general dispositions, or habitus), active agency (agents' practices) and outcomes (Stones, 2005).

Schwandt (2009) argues that the use of Stones' strong structuration concept allows the analysis to emphasize the cognitive and emotional capacity of the agent as a dynamic

component in the collective's capability to self-organize and regenerate itself through knowledge creation. Stones makes this point by saying, "… even traditionally conceived social structures don't work by themselves; they work on a basis of agents acting *in situ*, drawing upon and being influenced by interpretive schemes, conceptions of values and norms, and power resources" (Stones, 2005, p. 52)

The concept of "reciprocating influence" of human interactions has provided an action-knowledge link for many authors in their explanation of emerging qualities of the collective such as identification (Scott, Corman, & Cheney, 1998), innovation (Coopey, Keegan, & Emler, 1998), identity (Gioia, Schultz, & Corley, 2000), and organizational transformations (Sarason, 1995). During these reciprocating interactions the agents are free to make "informed choices" concerning their actions. However, there is also a nonlinear aspect of "choice" that emerges in the form of the unpredictability of human motives. The interactions of the agents, because of their potential self-serving orientation, may or may not result in the adaptation to the currently accepted schemata (Schwandt, 2007).

This uncertainty, and nonlinearity of the complex adaptive social system, may impact the collective's ability to systematically integrate and self-organize its social patterns with environmental conditions and objects. Both actions of dissolution and/or creation of related conditions, processes, and knowledge schemata may occur for effective coevolution of the collective. Dissolution actions break the symmetry of current collective and individual knowledge structures (schemas), thus increasing the degrees of freedom available to the collective that in turn encourages learning (exploration). On the other hand, creation includes actions of experimentation and alignment with deep collective social patterns that are irreversible (exploitation) (Jantsch, 1982). Actions of both dissolution and creation can be present simultaneously, and lead to the paradoxical and complex social conditions (Schwandt, 2009) related to exploratory and exploitative collective learning.

In many situations, the interactions of the agents, because of their self-serving orientation and therefore non-linear nature, result in the possible tension associated with adaptation to the currently accepted norms/values and collective structuring. For example, the lack of creativity and innovation in an organization may create a "situation" and "end" that forces the consideration of changes in norms that govern how structuring (leadership) interactions deal with information dissemination. Greater flexibility, rather than tight order, of information diffusion can lead to higher levels of knowledge creation (Schwandt & Marquardt, 2000). Thus, over time, new norms governing structuring of relationships within the collective may coevolve with the need for new knowledge and values concerning innovation, thus requiring additional active and emotional energy.

1.4 MANAGING ENERGY, LEARNING AND WORK

Essentially, then, the work of the manager, as well as organizations, is to focus the energy in the organization to achieve its strategic goals, including the goal of enhancing organizational learning. For the manager, understanding how to identify and facilitate the productive release of sources of energy that are stored internally in groups and in the organization, including stored information about the manager's own impact on the group and the organization, can be a strategic factor for his/her success in fulfilling the goals of his unit and for his/her development as a manager (Barnard, 1968/1938; Casey, 1997;

Lindeman, 1989/1926; Schwandt & Marquardt, 2000; Weick, 1979/1969; Weisbord, 2004). The manager and the organization also need to effectively scan (Hambrick, 1981) and, when appropriate, access and manage external sources of energy, including energy in the form of information and knowledge that can enlighten his/her own strategies as well as those of the organization (Schwandt & Marquardt, 2000).

As Clegg et al. (2005) contend, management does not drive action in organizations by its intentions. Rather, "organization happens in the interstices, it occurs in the places between" (p.154), where linking and connecting happen. It is the result of a desire for order and intelligence to prevail over confusion and noise. Tampoe's (1993) study found autonomy to be important to the "motivated energy" of knowledge workers. These findings confirm the contention of Ryan and Deci (2000) that autonomy, competence, and relationship are required for intrinsic motivation, a manifestation of the force – the energy – within. Management, then, of energy, learning, and work, requires the creation of space for many voices (Clegg et al., 2005), for actors to search for meaning (Czarniawska & Joerges, 1995), and for the energy to learn in interstitial communities (Fox, 2000).

1.5 STRENGTHS AND WEAKNESSES OF AN ENERGY APPROACH TO WORK AND LEARNING

Using energy as a fundamental concept in work and learning and for how energy is translated from individual to collective and collective to individual has the benefit of proven usefulness in physics, chemistry, and biology, as well as early use in social science. An energy approach is well suited to the concepts of work and learning. It is implied in the work of organization scholars, such as Clegg et al (2005), and Fox (2000), and explicit in others, including Czarniawska and Jeorges (1995) and Mintzberg (1991). It has an established history in organization science.

Electrons, photons, and phonons speak to us indirectly. Human beings can speak to us directly. But is it all that easy to simply ask someone about how he defines energy and or ask her to describe the experience? According to Luhmann (1990, p. 76), "reality is what one does not perceive when one perceives it" (quoted in Wolfe, 2007, pp. xxiii-xxiv). "The very distinction that makes the world cognitively available for an observer is also . . . what makes the world *unavailable* [original italics], in the sense of creating its own outside" (Wolfe, 2007, p. xxiv). In the autopoiesis (Maturana, 2002) of one who is performing work, transforming energy into space, there is a natural filtering out of consciousness of much of the body's process of energy acquisition and processing. Yet energy must be perceived to be available for the individual (Dutton, 2003) as well as the organization to focus it on a purpose and expend energy to move toward or away from something. Researchers seeking to learn more about how individuals notice and language their experiences of energy must take heed of this challenge in research of human energy and its relationship to workplace learning.

1.6 CONCLUSION

When considering the challenges of using the concept of energy in exploring work and learning, it is important to remember that words are, basically, metaphors or consensual placeholders for experience (Berger & Luckmann, 1967; Fowler & Fowler,

1908; Hofstadter, 2006). Though we have learned much in our study of energy and use energy in many of its forms to do monumental works, the term "energy" remains, essentially, a placeholder for the force inherent in motion and change, which remains a mystery. Though we use the term and proffer a definition, moving the boundaries of our definitions as we test out possibilities can bring us to new knowledge about the phenomenon, similar to Einstein's analogical use of the molecular model of ideal gases to test the possibility of light being comprised of particles and thereby making some successful calculations and discoveries (Hofstadter, 2006). Social scientists can use the idea of energy to probe how "out of the myriads of ideas floating in the translocal organizational thought-worlds, certain ideas catch on" (Czarniawska & Joerges, 1995, p. 174). Our individual and collective understanding of our experiences translate and evolve over time and space (Czarniawska & Joerges, Kuhn, 1996), and our experiences, though we may understand something about them now, always have an element of mystery – an unknown aspect (Wolfe, 2007). Even in physics and chemistry, the concept of energy is theoretical. Einstein reported that at the age of 4 or 5, his father gave him a compass, and his experience of the compass convinced him that "something deeply hidden had to be behind things" (Levenson, 1996, transcript, p. 1). Whether the force within a quark, a black hole, a person, or an organization, we are seeking to know more about that force and how it acts – how it operates in emergence and change. As Dylan Thomas (2003) said, "The force that through the green fuse drives the flower drives my green age." Use of common terms and metaphors, such as energy and work, across sciences can help us expand our understanding of ourselves and the larger social as well as physical and biological systems in which we have emerged and continue to evolve and learn. To paraphrase Serres (2007), "We are; we live; we think on the fringe;" (p. 127) we act; we learn; we transform "on the crest" (p. 127) of a wave of energy.

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