Is management an art or a science?

A clue in consilience

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Introduction

Is effective management an art or a science? Can it be both? How, exactly, should we think about the management of an organization? For years now, an often spirited art-versusscience debate has ranged through an extensive body of literature on organizational management (Bohn, 1994; Calkins, 1959; Hubner, 1986; Mathur, 1994; Schiemann and Lingle, 1997; Shallenberger, 1960; Weick, 1996), and many subfields of management, including organizational behavior (Caminiti, 1995; Choo, 1995; Watkins, 1993) and leadership (Lester et al. , 1998, Pitcher, 1997a, b). 1

An art-versus-science dialogue flourishes in business administration (Ashkenas*et al.*, 1998; Bort, 1996; Gilad and Herring, 1996; Haslip, 1996; Lewis, 1997; Marullo, 1998; Mullin, 1994; “Outfitting an Office…”, 1997; Sexton and Smilor, 1986; Sherden, 1994; Smith, 1998; Timpe, 1986-9) and related areas such as banking (“Evasive Action…”, 1995; “Risk Management…”, 1997; Wray, 1996). The debate also continues in public administration (Beard, 1939; Lepawsky, 1949; Lynn, 1996; McDonough, 1998) and related areas such as health administration (Jeska and Rounds, 1996; Kay and Nuttall, 1995; Meszaros, 1997) and corrections (Bowker, 1982).

Edward O. Wilson is not known as a contributor to the literature on management. His early work is on the study of social insects, particularly ants. When he wrote *Sociobiology: The New Synthesis* (1975), he inaugurated the scientific study of animal societies and communication. All told, he is the author of 18 books, and two of them, *On Human Nature* (1978) and *The Ants* (1990, with Bert Holldobler), received the Pulitzer Prize. He is currently Pellegrino University Research Professor and Honorary Curator of Entomology of the Museum of Comparative Zoology at Harvard.

With the publication of his latest book, *Consilience: The Unity of Knowledge* (1998), Wilson entered the management as art versus science debate, simply because his book is about everything. Consilience means a “jumping together,” which is what Wilson wishes would happen with the natural and social sciences, the arts, politics, ethics, and every other form of human knowledge. He believes that all real phenomena, from galaxies and planets to people and subatomic particles, are based on material processes that are ultimately reducible to a small number of fundamental natural laws that explain everything. All explanations for everything are causal and all causes are material.

Wilson laments the increasingly complex, specialized, and fragmented state of human knowledge today and argues that the progress of science has always been a story of increasing consilience. Is management an art or a science? If Wilson’s belief in a unified theory of everything is correct, maybe we should be asking a much larger question. Is a consilience of all of our ways of thinking about management feasible?

Wilson’s description of science

Science is extraordinary. With the aid of science, we can visualize matter across 37 orders of magnitude, from the largest galactic cluster to the smallest known particle (Wilson, 1998a, p. 47). When science is done correctly, it can advise us in all of our day-to-day decisions and actions. Wilson only acknowledges one resource limitation on the pursuit of scientific knowledge, a lack of data.

Wilson is a natural scientist and, for him, science is not a philosophy or belief system. Science is science. It involves the expansion of sensory capacity by instruments, the classification of data, and the interpretation of data guided by theory. Scientific theories are falsifiable. They “are constructed specifically to be blown apart if proved wrong, and if so destined, the sooner the better” (1998a, p. 52).

Science is a method of doing things. It “is the *organized, systematic enterprise that gathers knowledge about the world and condenses the knowledge into testable laws and principles*” (1998a, p. 53, author’s emphasis). There are five “diagnostic features” that distinguish real science from pseudoscience. The first is the repeatability of research results, preferably by independent investigators. The second is a reporting of research as simply and elegantly as possible. Third, scientific findings are subject to universally accepted and unambiguous scales of measurement. Fourth, scientific research stimulates new learning and new knowledge. And finally, science is consilient. Research results can be connected and proved consistent with one another.

Astronomy, biomedicine, and physiological psychology possess all of the features of real science. Astrology, ufology, creation science, and Christian Science do not (Wilson, 1998a, p. 54). Wilson is silent on the matter, but there is certainly plenty of other support for placement of a science of management among the former and not the latter "sciences."

Management as a science

The origin of a modern science of management can be traced to the work of Frederick Taylor (1911) and Luther Gulick (1937). However, when James D. Thompson helped launch the first issue of *Administrative Science Quarterly*, he remarked that "the possibility of a science of administration is only now coming to be taken seriously" (1956, p. 103). Thompson envisioned an applied science built from a combination of both deductive and inductive techniques for the development of logical, abstract, tested systems of thought. A science of administration would "be distinguished from administrative lore by the methods used to build that knowledge of administration" (1956, p. 104).

From its struggle to be taken seriously in the 1950s, the science of management and administration has become a principal component of management theory and practice in the 1990s. It is prominent in the academic literature (Assad*et al.*, 1992; Austin, 1993; Culbert, 1996; Mingers and Gill, 1997; Plane, 1994; Reisman, 1992; Sproull, 1997)[2] and in business school classrooms (e.g., Anderson *et al.*, 1996; Eppen *et al.*, 1998; Taylor, 1998). In public administration, a "new" science of administration (Daneke, 1990; Dennard, 1996; Kiel, 1994; Neumann, 1996; Overman, 1996) is establishing a presence with the literature of traditional administrative science (Dunsire, 1973; Lee, 1990; White, 1975).

Wilson's description of the arts

Wilson thinks that the creative arts and science are very different from one another (Lester, 1998). Scientific knowledge is useful to us because it provides us with objective, verifiable knowledge about the real world around us. The creative arts, broadly defined, are also beneficial, but in a different way. They are in tune with our underlying "human nature," which Wilson says is an inborn ensemble of instinctive or "epigenetic rules" that govern our behavior (Lester, 1998).

Epigenetic rules are hereditary predispositions in our mental development that are anchored in neural pathways in our brain and are prescribed by our genes. Natural selection favors epigenetic rules for behaviors that foster our survival; for example, parental investment in children, territoriality, taboos against incest, and keeping contractual agreements. Taken together, these norms of behavior or action become the elements of human cultures.

Artistic expression, then, arises from and resonates with our human nature. Wilson argues that creativity, ethics, culture, in fact all products of the mind, are materially grounded in physiochemical activities of the brain in interaction with the human body. Emotions link artistic expression and human nature. If we see a movie that encourages or condones incest, it arouses a feeling of disgust because the images on the screen trigger a negative emotional response linked to one of the underlying epigenetic rules (the incest taboo) that define human nature. A knowledge of words, images, archetypes, and abstractions that resonate with our epigenetic rules helps us make decisions that support our survival as social beings.

Management as art

When viewed as an art, effective management is a remarkable, but natural, expression of human behavior. It is intuitive, creative, and flexible. Lee G. Bolman and Terrence E. Deal, authors of Reframing Organizations: Artistry, Choice, and Leadership, see managers as leaders and artists who are able to develop unique alternatives and novel ideas about their organizations' needs. They are attuned to people and events around them and learn to anticipate the turbulent twists and turns of organizational life:

> *Artistry in management is neither exact nor precise. Artists interpret experience and express it in forms that can be felt, understood, and appreciated by others. Art allows for emotion, subtlety, ambiguity. An artist reframes the world so that others can see new possibilities. (Bolman and Deal, 1997, p. 17)*

Modern organizations rely too little on art in their search for attributes like quality, commitment, and creativity. "The leader as artist relies on images as well as memos, poetry as well as policy, and reflection as well as command" (Bolman and Deal, 1997, p. 17). Artistic leaders and managers help us see beyond and improve collective performance.

Like management science, management as art is also well established in the general literature on management (Badaracco, 1998; Blaise, 1998; Goldberg and Sifonis, 1994; Morgan, 1993; Rabinovitch, 1997; Selznick, 1996; Smither, 1998; Tead, 1951) and leadership (Degree, 1989; Magill and Slocum, 1998; Wheatley, 1992). It is also prominent in business administration (Eden, 1997; Mann, 1971; Pascal and Amos, 1991; Thomas, 1994) and public administration (Baseman, 1993; Vickers, 1965).

A search for consilience à la Wilson

Wilson assumes that all phenomena are based on material processes that are causal and, “however long and tortuous the sequences,” ultimately reducible to the laws of physics (1998a, p. 266). A consilience of knowledge about the management of organizations would demand a vision capable of sweeping from whole societies to an individual human brain. It would involve both reduction and synthesis. To dissect something into its elements is consilience by reduction, and to reconstitute it is consilience by synthesis (1998a, p. 68).

Wilson offers an example of consilience in practice from his early research on ants (1998a, pp. 70-71). To explain communication within an ant colony (e.g., an internal alarm alerting an entire colony to an attack by a predator), Wilson and his associates studied an ant colony across four levels of organization, from superorganism (the whole colony), then reductively to organism (individual ants), to glands and sense organs, and finally to molecules (pheromones). He also worked in the opposite direction (synthesis) when he predicted the meanings of signals observed in the colony (e.g., “alarm, danger” versus “food, follow me”) by linking various signals to matching changes in the molecular composition and concentration of individual ant pheromones. The result was a comprehensive or “holistic” study of ant communication.

Follow the lead of Wilson, and the strategy in the search for consilience in management theory and practice would require the pursuit of coherent cause-and-effect explanations for all relevant phenomena across multiple levels of organization from society to neuron. The cutting edge of investigation would be reductionism. And dealing with increasing complexity from the brain, to an organization, to society as a whole would be the major challenge in the search for consilience in approaches to the management of organizations.

A more inclusive search for consilience

Wilson readily acknowledges the limited reach of conventional scientific thinking when he notes that “at each level of organization, especially at the living cell and above, phenomena exist that require new laws and principles, which still cannot be predicted from those at more general levels” (1998a, p. 55). Part of this limitation may be rooted in a reluctance to make a distinction between complex systems—between non-living systems, living systems, and living systems with people in them. They differ from one another. Probing the differences would open the door to new kinds of data and new ways to think about complex systems, especially complex human systems.

Although Wilson’s search for consilience is courageous and sweeping, he is too confined to traditional theoretical perspectives from the physical sciences. Several years ago, Paul Diesing said that if we knew the whole truth our “predictions would always be correct; but since all existing theories (and approaches) are incomplete and partly false, it is better to bring together a variety of partial theories to better approximate the whole truth” (1962, p.179). Wilson unnecessarily limits his consideration of all of the ways we come to understand things.

Playwright Tom Stoppard contends that “science and art are nowadays beyond being like each other. Sometimes they seem to be each other” (Miller, 1997, p. 41). For Wilson, the arts were a necessary “prescientific” step in our evolutionary quest for knowledge (1998a, pp. 210-37). But he argues that, unlike science, the arts do not contribute anything truly concrete and verifiable to our knowledge of reality. In fact, he thinks that a future consilience of scientific knowledge may include an explanation of art. Wilson unnecessarily minimizes the ability of human imagination, like that commonly exhibited in the arts and in the sciences—in symbols, images, and metaphor—to contribute anything tangible to a consilience or “jumping together” of all the ways in which we come to understand and explain the world.

Managing human systems

When management is considered a science, the knowledge that a manager uses to keep an organization moving effectively in a given direction largely has its origin in rigorous scientific research acquired in strict adherence to the scientific method. When management is viewed as art, knowledge about how to keep an organization moving successfully in the right direction is in tune with primal human nature and springs from a manager’s intuition, imagination, and creativity. It is apparent that inclusion of the wellestablished and enduring body of literature and research that addresses management as an art in a consilience with our accumulated knowledge about the scientific management of organizations will require a significant change of Wilson’s rules for consilience.

While it is true that the great successes of the natural sciences have been achieved by reducing and explaining physical phenomena in terms of their constituent elements, organizations involve human perceptions, interactions, emotions and feelings—all things that cannot be dissected and reassembled to explain how an organization works. And while mathematics is the “natural language” of physics, it is not the natural language of organizations. If a consilience of the art and science of management is to happen, it will require a greater general willingness to think about organizations as complex, nonlinear human systems, and it will require an open-minded exploration of the as yet unproven explanatory power of metaphor as a theoretical

concept.

New scientific theories evolving out of a variety of disciplines, including physics, biology, and computer science (see Dennard, 1996; Evans, 1996; Heylighen, 1998; Kirshbaum, 1998; Neumann, 1996), are generating new ways to think about organizations as living nonlinear human systems. Human systems possess the dynamism and other characteristics of non-living nonlinear systems (e.g., the weather) and the familiar features of other living systems, including the ability to grow, recreate themselves, and die. And, because human systems include people, the metaphor generated and used exclusively by people is a unique feature of all living human systems.

An organization, like all human systems, is made up of an extremely varied collection of “parts” that, taken together, form the organization’s tangible or material basis of existence. The parts of a typical organization include managers, employees, offices, equipment, written policies and procedures, e-mail, logos, memos, and an almost infinite variety of other things. An organization exists as highly interactive and meaningful relations between all of the parts that constitute it in interaction with elements of its environment. An organization cannot be successfully reduced or dissected with the instruments of physics or chemistry, which are the sciences of matter. A living human organization is not entirely quantifiable or explainable by the methods of the conventional physical sciences.

The concept of emergent properties or behaviors is critical to understanding an organization as a complex, living nonlinear system. The emergent behavior of living systems may be expressed by the behavior of the elements of a system in interaction with one another and the environment, but the emergent behavior of a system is not a property of any individual element and it cannot be explained as a summation of the properties of those elements. Examples include behavior in such diverse nonlinear living systems as Wilson’s ant colonies, the Department of Defense, traffic jams, and the Dow Jones composite stock market index.

Like all living organisms, organizations contain within themselves a way to control relationships between their parts and relationships between their parts and the environment. In a biological system, DNA is the instrument or plan that distributes the control of interactive relationships between the parts of the system to the parts themselves (Langton, l989). The resulting relationships between parts of the living system (muscle groups, nervous system, organs, etc.) then express life, the emergent behavior unique to all living organisms. The property of “aliveness” can be traced to an organism’s DNA.

The corresponding mechanism or internal frame of reference that distributes control of interactive relationships to the elements or parts of an organization is a common body of metaphor (CBM). Through metaphor, our understanding of things is acquired, defined, and organized in terms of our existing knowledge of things already retained in our minds as remembered images, ideas, symbols, and stereotypes (Morgan, 1986; Morgan, 1993; Roher, 1997). We come to know things in terms of what is already known to us. Our understanding of ourselves and the world around us, in turn, guides our behavior. Acquired through shared experiences, an organization’s unique CBM influences the way organization members characteristically interact with each other and with other people, and how they interact with elements of the physical environment.

In more conventional terms, an organization’s CBM is comparable to its culture. “A culture may be conceived as a network of beliefs and purposes in which any string in the net pulls and is pulled by others, thus perpetually changing the configuration of the whole” (Barzun, 1989, p. 89). Like organizational cultures, a CBM defines and, at the same time, is defined in interactive relationships between the parts of an organization. Over time, the resultant interactive relationships between parts of an organization, in interaction with a CBM and with the features of the organization’s environment, express the identity of an organization as a living human system.

Organizations are physical systems like the weather, Wilson’s ant colonies, and other complex systems, but the vital presence of a common body of metaphor or CBM distinguishes human organizations from other complex systems. Wilson may be correct when he assumes that all tangible phenomena are based on material processes that are causal and, however long and tortuous the sequences, such phenomena are ultimately reducible to the laws of physics; but like it or not, an organization is more than physical phenomena and causal relationships. Certainly, in its early stages at least, a consilience of knowledge about the management of organizations will have to consider the inclusion of knowledge beyond that obtained exclusively from research grounded in the traditional sciences.

Complexity theory and metaphor

At first glance, complexity theory and the concept of metaphor seem particularly well suited to the task of developing new ways to think about organizations as complex human systems. However, Wilson thinks that the value of both the theory and the concept is, at best, very uncertain. If he is correct, they will contribute little if anything to a consilience of our knowledge about the management of organizations.

Wilson knows that all living systems are complex and he acknowledges the work of a group of computer-oriented “complexity theorists” who are searching for precise mathematical models or algorithms to explain the emergence of such phenomena as cells, ecosystems, and minds (see Kauffman, 1993; Langton, 1989; Morowitz, 1995). He writes that he is impressed by their sophistication and spirit, and his heart is with them, but his mind is not, “at least not yet” (1998a, p. 88).

Wilson thinks that, so far at least, complexity theorists lack data, their propositions need more detail, and their conclusions tell us little that is really new. His real concern, however, is that none of the elements of complexity theory has anything like the generality and adherence to factual detail that he would like to see in a true scientific theory. Living systems are complex, but after giving all due respect to complexity theory, Wilson still thinks that “the laws of physics and chemistry … are enough to do the job, given sufficient time and research funding” (1998a, p. 91).

If Wilson is skeptical about complexity theory, he sees even less scientific value in the concept of metaphor. This is curious, because he recognizes the importance of metaphor, especially in the creative arts (1998a, pp. 218-22). And when he writes about culture, he could easily be writing about a CBM or common body of metaphor. “Culture, rising from the productions of many minds that interlace and reinforce one another over many generations, expands like a growing organism into a universe of seemingly infinite possibility” (l998a, pp. 223). It “is historical; includes ideas, patterns, and values … is based upon symbols; and … each society creates culture and is created by it” (1998a, pp. 130-31).

The inborn ability to generate metaphors with ease and move them fluidly from one context to another is a special human adaptive power granted to the arts by the genetic evolution of the brain (1998a, p. 219). But Wilson argues that art is the antithesis of science because it has no scientific meaning or value (1998a, p. 218). Metaphor does not lend itself to reduction and cause-and-effect scientific analysis. Therefore, by its very nature, metaphor cannot precisely explain why anything occurs and cannot contribute anything meaningful to a consilience of factual knowledge about the management of organizations.

Conclusion

Is a consilience of the art and science of managing organizations possible? Maybe. Wilson believes that the search for a consilience of all scientific knowledge will provide coherent explanations for all relevant phenomena across multiple levels of complexity, from neuron and brain, to organization, and to society as a whole. He begins with the assumption that all tangible phenomena are based on material processes that are ultimately reducible to the laws of physics. All explanations are causal and all causes are material. Unfortunately, his beginning assumptions are far too restrictive to guide the formative stages of a consilience of our knowledge about organizations and other complex human systems.

Art and science both foster new and creative ways to understand organizations and communicate what we know about them. They both generate and employ metaphors of management that help us form our perceptions, assumptions, and new ideas about organizations. Both inspire our imagination. Research in the art and science of management will continue systematically to gather knowledge about the behavior of people in organizations and try to present that knowledge in new and testable theories, concepts, and hypotheses. But future research also must be pursued with enough flexibility to permit the emergence and investigation of entirely new knowledge about organizations and the way we manage them.

Notes

1. The selection of literature on an art versus science of management is intended to be representative of an ongoing debate in the literature, and does not include a commensurate recognition of management as a craft and other portrayals of the management of organizations.

2. In addition to the Administrative Science Quarterly (established in 1956), other journals to advance the science of management in business and public administration (with date of introduction) include the Journal of Applied Behavioral Science (1965), Journal of the Academy of Marketing Science (1973), Management Science (1954), Marketing Science (1982), and Organization Science (1990).

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