Article

Organizational theory: With its applications in biology and ecology

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Abstract
Organizations are goal-directed entities which have been designed as deliberately structured and coordinated dynamic systems that connect with the external environment. Organizational theory is the study of structure, function and design of organization. It aims to solve practical problems, maximize production efficiency and make organization better function and develop. Organizational theory contains various aspects. The history, development, and thoughts of organizational theory and its applications in biology and ecology were described in present paper. We held that more studies should be conducted to apply organizational theory in natural sciences as biology and ecology.

Keywords organization; organizational theory; biology; ecology.

1 Definition

During the past hundreds of years, the definition of organization has being continuously refreshed and improved. Daft and Armstrong (2007) described organizations as goal-directed social entities which were designed as deliberately structured and coordinated dynamic systems that connect with the external environment. Tompkins (2005) held that organizational theory was the study of how and why those complicated organizations behaved as the way they were. Apparently, a complex organization is too enormous and structurally differentiated to be effectively represented by a single individual. Organizational theory is neither a single piece of theory nor an integrated body of information but a field of studies which cover various scientific disciplines and subjects. The depth and breadth of this study field is challenging numerous researchers.

Organizational design is an important field in organizational theory. The importance of improving our knowledge of it remains high in the coming future due to a series of trends, such as advances in information technology that encourage experimentation with new organizational designs; large economies like India and China are attempting to rapidly transform the organizational infrastructure of their administration; the professionalization of the NGO and charity sectors, and multinational corporations' increasing attempts to exploit globally distributed intellectual resources, etc (Puranam, 2012).

2 History of Organizational Theory

As an advanced and broad discipline, organizational theory has a very long history with a mission for pursuing scientism, managerialism and enhanced efficiency and effectiveness (Üsdiken and Leblebici, 2001). It is an

ancient but also modern scientific discipline. Organization research gained its status in science since Aristotle (Rosvall and Bergstrom, 2011). The research on organizations began its journey along the civilization in the human world. However, organizational theory wasn't recognized as a scientific discipline until the 1960s (Cunliffe, 2008). Since 19th century, in particular industrial revolution, organization studies have quickly developed especially in such areas as socio-political questions (Wolin, 1961).

Cunliffe (2008) divided the developmental period of organizational theory into four stages, (1) classical and scientific management/modernism, (2) systems and contingency theories, (3) social construction, and (4) postmodernism. The first stage is classical and scientific management stage, and Adam Smith, Carl Marx, Taylor, Weber, et al., were representative researchers during this period. These researchers have drawn and distilled theories from routine and social activities, and built fundamental concepts of organization. The second stage, system and contingency theories, i.e. modernism, was governed by such researchers as Parsons, Woodward and others. They emphasized the optimization of production efficiency and stressed the need of treating organization as a sophisticated system (Barzilai, 2010). The third stage, social construction, was mainly represented by Berger, Goffman, Weick, etc. They considered that the sharement between organizations was important since they were actually communities which interacted with each other. In the last stage, postmodernism, more researchers appeared, such as Harvey, Cooper and Burrell. During this period, various thoughts on organizations formed and evolved.

A little different from the classification above, Docherty (2001) classified the developmental process of organizational theory into three big stages, (1) classical theory, (2) neoclassical theory, and (3) contemporary theory. In the first stage, the mass production facilitated the overall formation of organization and relative theories. Focuses in this stage were the studies of some contents about laborers, division and scientific management, such as hierarchy, span of control, the degree of centralization and the specialization of work. Unlike the first one, in the second stage, neoclassical theory, organizational theory put its main focus upon the individuals and their mutual relationship (or interactions). In the last stage, contemporary theory, various theories appeared and organizational theory stepped into a new time.

3 Major Theories

Organizational theory came up with different theories. Here we make a summary of these theories.

3.1 Classical organizational theory

This mainly consists of three sub-theories: scientific management theory, Weber's bureaucratic theory, and administrative theory.

(a) Scientific management theory. Frederick W. Taylor was recognized as the pioneer of scientific management. He started the theory with the observation of working process and concluded that how to minimize the input, maximize the efficiency and achieve specialization and standardization. However, this theory was criticized by laborers for the reason that this system overlooked the human's perception and senses.

(b) Weber's bureaucratic theory. Acclaimed as the father of sociology, Max Weber described the basic information about bureaucratic theory. Under his bureaucracy's condition, an organization is governed by top-down rules and regulations; employees work on strictly defined responsibility and own restrained power. He also described the essential means to draw a picture about organizational theory based on the historical point.

(c) Administrative theory. The major representative of administrative theory was H. Fayol. This theory takes the form of hierarchical pyramid as its structure. He developed fourteen principles to advise managers to mandate and fulfill their responsibility. In addition, he outlined five basic elements of management: planning, organizing, command, coordination and control.

3.2 Neoclassical organizational theory

This theory was led by the studies of Hawthorne in the 1920s. Significantly different from the early thoughts and approaches, this theory particularly emphasized the importance of personnel relationships among the workers, employees and managers, reflecting the growing need of humane and emotional care of workers. Laborers with high concentration and volition contribute positively and meticulously, so the company and factory would benefit more and function better. A lot of studies were thus conducted by sociologists and psychologists, among which Elton Mayo contributed the most.

3.3 Contemporary theories

They are also called modern theories. Dozens of new theories have appeared in modern times. Modern theories evolved quickly in rapidly-changing environments into various shapes and structures. Several major theories or methods are described as follows.

(a) The system method. According to this method, an organization is viewed as a system which composes of many mutually connected components, aimed to obtain benefits both internally and externally. Overall an organization consists of three parts: components, linking processes, and goals of organization (Bakke, 1959).

(b) Contingency theory. Contingency theory, proposed by Lawrence and Lorsch, suggests that there is no best way to direct an enterprise, because the requirements for corporations vary enormously in different environments and conditions. A series of factors may work as variables, including environmental uncertainty, technology, size, strategy, resource dependence and public accountability (Tompkins, 2005).

(c) Other theories. There are some other theories that play a better role in the modern organizational theory, such as quality management theory, organizational culture, leadership theory, and so forth.

4 Further Explanation of Organizational Theory

Donaldson (2003) described organizational theory as a positive science. Driven by the environment, scientific methods validated and testified these positive but normative theories. Up to date, organizational science has made huge progress by using the positivist approach. Organizational theory has proved strong potentiality in the future as regards being pursued positively.

Hatch and Yanow (2003) called organizational theory an interpretive science. Many interpretive researchers who like them strongly held that social world and natural world ought to be ascertained in different ways.

Willmott (2003) viewed organizational theory a critical science. While Chia (2003) thought organizational theory as a postmodern science and draw our attention to the requirement for managers and policymakers. Obviously they were more aware of the basic information and situation of our society and industries.

An organization cannot thrive without successful and powerful traits. Faced with threats and chances, it should be sensitive to external changes and keeping adapting and learning (Hannah and Lester, 2009). Learning is not limited to the scope of knowledge per se but a “problem-oriented action” or “knowing” (Kuhn and Jackson, 2008). Roberts (2007) probed into the knowledge in the contemporary organization by summarizing several influential books and has managed to address relevant problems. Rashman et al. (2009) reviewed the literature on organizational learning and knowledge relevant with public organizations particularly, and maintained their uniqueness by using the dynamic model. The external situations in the environment, are also vital issues. Analyzing the community context will revitalize the research on organizations (Freeman and Audia, 2006), since organizations function with other social units interdependently. King et al. (2010) noted that we should locate the organization in a wider social landscape and then explore its uniqueness as a social actor.

In addition to external conditions, internal components are important. An organization cannot survive or

exist without rational structure and design of the system. Rank (2008) argued that although considerable researches aimed at unveiling the complicated function of organizational systems, little attention has been given to the "structural interdependencies between formal organizations and informal networks".

Ocassionally, some peculiar things could boost our understanding on organizational theory. Jones and Munro (2005) examined the works of eighteen researchers on modern organizational theory in the last twenty years. Many topics and debates were discussed including some basic concepts and postmodernism. Warner (2007) mentioned modern literary guru- Franz Kafka. His works shed light on the deep examining of organizations, and further being compared with Max Weber. In addition, some researchers explored the organizational theory in terms of its logics with novel insights and methods (Hannan, 2007; Kamps, 2009; Durand, 2008), which was mainly shaped in the book, Logics of Organizational Theory: Audiences, Codes, and Ecologies (Hannan, 2007). But it has focused to the entire process of theory-shaping, deviating from the traditional way of organizational ecology (Kamps, 2009). Santos and Eisenhardt (2005) stressed organizational boundaries, which may facilitate the understanding of organizations. Kulic and Baker (2008) also held that the boundaries were hard to be drawn clearly under real-world situations. As a response, they proposed another method to cover various views of organizations in a simulative environment using computational organizational theory. Audia et al. (2006) connected the theories of organizational ecology and social network and dug into the variations "in rates of foundings over geographic locales" affected by the structure of relations in various populations.

5 Organizology: A Proposed New Science on Organization

It is true that one cannot find any entry about this terminology in Webster's dictionary and even by searching it on Internet. We could only get just over six hundred outcomes. Actually, this terminology was crafted by Aleinikov in 2003. After sharing the Sedov's statement that moving matter has only two characteristics: the intensity of movement and the organization of movement, Aleinikov proposed organizology- the science of organization of movement, following this binary logic (Aleinikov and Smarsh, 2010).

Science per se needs to be ordered and organized properly. Moreover, a science of organization should be founded considering the development of science and organization. But this did not happen until the recent years owing to the absent of measurement or organization. The proposition of organizology is a beneficial attempt in this aspect. Organizology was founded on one basic measurement to address complex problems with one basic explanation (Aleinikov, 2004). But the defining and refining of this measurement proved to be a challenge and a new unit of organization expressed by the formula T/L (time divided by space) was offered. Also, a few cases were provided to explain its nature in different kinds of organizations. And this unit of organization was named "aleandr" (Aleinikov, 2005). Furthermore, an accurate prediction based on mathematics was given to elucidate this science (Aleinikov and Gera, 2006).

It could be expected that any nascent theory would confront controversy and criticism. Organizology is no exception. Anyway, a breakthrough thought to the classic theory ought to be encouraged.

6 Future Prospect of Organizational Theory

Organizational theory is an unavoidable derivative of historical development, under the impact of multiple forces: industrial revolutions, technological revolution, digital revolution and the third industrial revolution (Rifkin, 2013). A series of revolutions have produced novel thoughts and minds, industries and sciences, craftsmanship and technologies, which endowed humans with new lifestyles and jobs, new ideas to understand the world and new managerial methods. Since the late 1980s, the trajectory of organizational theory has changed from "paradigm-driven work to problem-driven work" (Davis and Marquis, 2005). Huge changes of

organization theory come as the result of discontinuous and fast-changing environment (Marshak, 2004). Accordingly, a new model of reconfigurable organization has been given (Stefanovic et al., 2011). Organizational theory takes nutrients from other scientific fields and industries unprecedentedly, and eventually evolves into various shapes and colors. No one can give an exact answer to this question: what is the future of organizational theory? Every research manages to elucidate his own ideas and imaginations and as a consequence, various thoughts emerge and evolve.

Walsh et al. (2006) poses three fundamental and difficult questions about the future of organizational theory. "How can we understand, live in and live with today's organizations?" He held that the trend is hardly to be traced and predicted, considering this fast-changing world and the influences of globalization. But as difficult as it may be, we could work hard to collect data and empirical evidences and get a handle of it. A little different, Burrell (2003) proposed another two questions concerning the subsequent research areas to deal with and methodology and epistemology approaches to use. Davis and Marquis (2005) argued that the central target in the twenty-first century was to explain the economic institutions.

7 Applications of Organizational Theory in Biology and Ecology

Phillips (1992) considered that some methods used in the natural science had been partly accepted by social science and vice versa (Burrell and Morgan, 1979). Biological systems like social systems represent hierarchical organizations with sub-modules that cover multiple scales (Rosvall and Bergstrom, 2011). Besides contingency theory, which is basically an organic analogy, organizational ecology has been an attractive research in the last decade mainly in the USA. It aims to explain "how social, economic and political conditions affect the relative abundance and diversity of organizations and to account for their changing composition over time" (Baum and Amburgey, 2005), and to emphasize the "evolutionary dynamics of processes" behind them (Singh and Lumsden, 1990). To understand the organizational diversity means to answer a question: "Why are there so many (or so few) kinds of organizations?" (Hannan and Freeman, 1993). This theory uses biological and ecological models to analyze businesses and issues about organizations (Clegg and Hardy, 1999). Dobrev et al. (2006) argued this theory as a "research paradigm", and by this theory, "multivariate models" are used for various potential reasons. Hannan and Freeman (1977) proposed a perspective of population ecology to analyze the relationship between organization and environment. Carroll (1984) reviewed some research on organizational ecology and especially distinguished three different levels of analysis and methods: organizational, population and community, followed by developmental, selection and macro-evolutionary method, respectively. And a development on organizational taxonomies was also recommended. Within more than thirty years, organizational ecology has taken a long step, but it cannot sleep on the pillow of past merits and achievements. Innovations of knowledge and theory are required to revive it. Particularly, ecological theory is of vital importance and most connected with evolution and this is doomed to be given more attention (Amburgey and Rao, 1996).

Baum and Amburgey (2005) maintained that ecological approaches were radically different from the traditional ones. The former methods focus on the contextual factors. However organizational ecology that has built mainly on the population models indeed confuses some sociologists (Hannan, 2005). Using biological theories or metaphors to explain organizational changes has been critically misunderstood (Singh and Lumsden, 1990).

Reuter et al. (2010) proposed new approaches to explain ecological interactions across scales. They stressed multiple organizational hierarchies and their mutual effects. Cross-scale interactions are among the most prominent concerns in ecology and biodiversity problems, invasive species and long-term effects of habitat change (Kerr et al, 2007). Lidicker (2007) came up with the fourth level—"ecospace" of levels of

ecological organizations, apart from the other three, organism, population and community, given the hierarchical arrangements being increasingly favored by many ecologists.

Actually, organization assembles organisms to some extent (Morgan, 2006). They function as a whole. Accordingly, organizational theory may be rationally used to fit with the natural world. Organizations interact with communities they dwell in (Freeman and Audia, 2006). The population ecologists hold the view that the ability of seizing a resource niche and defeating its rivals are really matter. The concept of ecological niche has been successfully adopted by organizational theory researchers. In contrast with the niche in natural world, the organizational niche reveals itself in social and economic world (Boone et al., 2002). Therefore, sociologists have made their minds to discover the appropriate niche by which an organization can develop and prosper (Hannan, 2005). In fact, this view does not satisfy many organization theorists, since they emphasize the role of managers and decision makers but not merely the viewpoint that environments choose organizations (Morgan, 2006). For instance, some critics refuted contingency theory that an organization can be self-adjusted to fully utilize its environment (Pfeffer and Salancik, 2003).

Great theories pave the way for the dawn of typical practices. Couzin (2006) has paid his attention to the social organization in one of the most complex “fission-fusion” systems in nature- elephant populations. However fully elucidating and understanding this system by using various technologies and constructing mathematical models proves a huge challenge still. Co-evolutionary method plays an important role in helping researchers who study the natural environment and organizations to revise their organizational theory (Porter, 2006). It works as a propeller (Lewin and Volberda, 2003). But it should be noted that organizational co-evolution involves some aspects absent from its biological counterpart, knowledge, learning, demand, actor traits and behavior, strategy and tactics (Malerba, 2006; Zhang, 2012). Organizations not only hold a position in large-scale environments but also make them the fundamental concepts in cell biology: self-organization emerged to explain and understand the components and compartments of the cells (Karsenti, 2008).

Organizational theory is evolving rapidly, melting with other disciplines, such as ecology. Examining the history and prospecting the future can be helpful for us to understand and develop organizational theory. So far, organizational theory is mainly a discipline of social sciences. We suggest that more studies should be conducted to apply organizational theory in natural sciences as biology (cell biology, network biology, etc.) and ecology.

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Ecology is the branch of biology that studies how organisms interact with their environment and other organisms. Every organism experiences complex relationships with other organisms of its species, and organisms of different species.Â Ecology Definition. Ecology is the branch of biology that studies how organisms interact with their environment and other organisms. Every organism experiences complex relationships with other organisms of its species, and organisms of different species. These complex interactions lead to different selective pressures on organisms. The pressures together lead to natural selection, which causes populations of species to evolve.