

Learning Organizations and the Paradigm of Complexity: the Work Design Approach

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Abstract. The paper presents a framework for organizational design and management based on a new methodological approach. It is built upon two topics: learning organization and complexity theory. Concepts, characteristics, and implications of the complexity theory as applied to learning organization study are presented, considering work system design as a human process of action and decision making. They are conceived as a nonlinear dynamic systems, self-organized and self-regulated organizations, built upon relationships, learning and innovation processes. The complex approach of organizations allows the deepening of questions about organization theory. It involves the rethinking of the way organizations and work are studied, defined and built.

Keywords. complexity theory; learning organizations; work system design.

1. Introduction

As the organizational study advances, theorists recognize that the current models are not capable to explain how and why changes happens in organizations. The assumptions that organizations are non linear dynamic systems that self-organize, operating in uncertain and turbulent scenarios, have been demonstrate that today's organizations are essentially complex systems. New social and political scenarios, technological innovation and globalization are changing the way organizations operate. Thus, the nature of work system design is changing to reflect, in one hand, the competitive global economy, and, in other hand, the ergonomic aspects of the work. In response, new theories of how organizations should function and be study has emerged. The namely Learning Organization (LO) could be a proposition, because this kind of organization is, by definition, based on systematic organizational learning, that provide conditions and facilities for the process of self-renewing, change and learning capabilities. It is self-regulated and self-organized¹. According to these premises, LO could be inserted in a complexity approach. Complexity theory has the potential to be applied to organizational study, specially focuses on how learning can be fostered in these organizations. It can be useful to deepen the comprehension about LO, and organization dynamics in general. The objective of this

¹ Learning Organization is not considered here as a simulacrum, nor an ideal state.

paper is to present a novel framework for organizational design and management based on complexity theory. Concepts, characteristics, and implications of the complexity theory as applied to LO study are presented. In particular, it discusses work system design as a human process, according to a complexity perspective.

2. The Complexity Theory

At the beginning, complexity's study seems to be itself a complex task. The comprehension and definition difficulties fall in its intrinsic ambiguity and diverse associated concepts. According to the etymological view, the word "complexity" comes from *completectere*, whose root *plectere* means to interlace, twisted build. From French, "*complexité*" comes from the Latin word *complexu*, that means to embrace. In Spanish, "*complejidad*" means amalgam. In a rational, positivist view, complexity is linked to disorder, irrationality, high number of components, uncertainty and entanglement, that appeals to put in order. However, a distinctive aspect of complexity, contrasting with the newtonian science, is the nonlinear dynamic system concept.

The links between the system theory and complexity theory are profound (Von Bertalanffy 1934). Nevertheless, the complexity theory has not its origin in system theory. The historic roots of paradigm of complexity has been in the self-organizer systems operational dynamic, under the Cybernetic studies. Leading pioneers in complexity include Prigogine and Stengers (1984), Maturana and Varela (1980), Kauffman (1993), Mandelbrot (1977), and Morin (1973). The complexity paradigm emergence was an attempt to understand the reality, in an ontological way (being in world), considering that the traditional science is no more sufficient to explain the phenomena (Morin and LeMoige 2000). In terms of science itself, complexity theory make a huge advance from the classical science theory, going beyond systemic worldview. It represents a step in a different direction, neither always controlled, nor predictable.

Methodologically, complexity principles (emergence, hologramatic, recursive, dialogic, and auto-eco-regulation) conduct the science to a complexity intelligence, that is based on non fragmented standpoint, in which the scientist plays an essential part: he is the product and the producer of its reality. First of all, it permits to build a new scientific paradigm, based on reunion and description of non linear events. It means the re-linking between two different cultures: the human and the scientific (Morin 1998). Complexity is blurring the boundaries between disciplines, offering a single set of explanatory principles applying to all dynamic systems. It also holds significant implications for the design and evolution of social organizations, emphasizing semantic and heuristic comprehension of the reality.

2.1 Organizational Studies and Complexity Approach

Organizations can be conceived, in a basic level of analysis, according to a linear and mechanistic standpoint. As a technological system, it could be linked to the paradigm of traditional, taylorist organization. This perspective is based on a linear thinking and, in that way, it is carried out an axiomatic perception of the reality.

In a systemic level, organizations can be conceived as a sociotechnical systems, based on human-technology interaction. This is the archetype of a pos-industrial and knowledge organization. The central feature is the systemic thinking, that emphasizes reality's modeling, based on simplification, harmony, stability, and control, according to a abstract and functionalist perception.

And finally, in a complex level, organizations can be conceived as a sociological systems, where focus falls on relationships, interactions, learning, innovation, dialogic processes. Technology is view only as a human-centered instrument. Organization is a non linear dynamic system: it changes over time, in a predictable or unpredictable way, according to a non-linear causality. Therefore, it is a complexity standpoint, shaped upon a semantic and heuristic perception of the reality.

In recent years, complexity theory has become an important issue in organization analysis and business strategy, particularly in management practice. Since the Organization Science Winter Conference (OSWC), in Atlanta (USA), 1996, which set out to explore the implications of the science of complexity for the field of organization studies; interest in complexity has grown dramatically (Lewin, 1999). Because of complexity theory is an emerging approach, its concepts are not sufficient explained yet, thus its application in organizational and management studies. Nevertheless, the large acceptance of complexity toward the management community has been evidenced by the growing number of articles, papers and thesis about the theme (Stacey, 1996; Anderson, 1999; McKelvey, 1999, Brodbeck, 2002; among others). The evolution of complexity research as applied to organizational studies established different typologies of complexity approach:

1. *Algorithm complexity*, based on mathematical simulation of organizations and social systems (Prietula *et al* 1998);
2. *Deterministic complexity*, deals with chaos theory, based on deterministic mathematics, attractors, bifurcation and chaos (Kauffman 1993). Thus fractals, self-referential patterns with invariable scales, that are useful to explain pos-modern concepts. This is generated the chaordic organization theory (Van Eijnatten and Putnik 2004, among others);
3. *Aggregate or relational complexity*, deals with relationships and attempts to access the interaction of system components: processes, internal structures, environment, information exchanges, learning and memory, resources, and energy. The framework is based on visible relational interaction (explicit, measured) and invisible relational interaction (tacit: the locus of the relationality inquiry – sense making).

3. Learning Organization

The question of Learning Organization (LO) became a classic subject in the Theory of the Organizations from the ends of the 70' decade, as a metaphor, focusing more in conceptual than pragmatic discussions (Schon, 1971). With Peter Senge (1999), LO concept was popularized. Senge proposes an organization characterized by continuous learning. He identifies the five disciplines of a LO: personal domain (self-knowledge), mental models of the members of the organization (rooted ideas), shared visions (common

objectives), team learning (collective one) and systems thinking (relational vision). These elements are hold together and create an organization that facilitates the learning and continuously transforms itself. Despite the studies developed by diverse theorists regarding LOs, a consensus does not exist (Baumard 1995). Real-life examples of LO are Canon, Ernst & Young, General Electric, Hewlett-Packard, IBM, McKinsey & Company, Microsoft, Nokia, Royal Dutch/Shell, Siemens, 3M, Toyota Motor, among others.(KNOW Network).

3.1 *Learning Organization and the Complexity Approach*

How does complexity approach allow a better understand of Learning Organization?

The study of complexity paradigm and LO is thus based on two major ideas, which have to be clearly distinguished: the first one refers to the recognition that learning organization should be a complex organization. In that way, the complexity principles can be applied to it. The second idea is that learning organization and its work system design must be seem as a result of a different view of reality, not as a product of a traditional reductionism thinking. It implies to consider humans in organizational design, with focus on well-being and professional development. The approach is systemic, insisting on the variety of agents and phenomena involved in the learning and innovation processes. Modes of interaction is thus important (between them and other systems, including inter-organization, national and international systems). LO could be conceived according to *relational complexity*, based on interactive and integrated constructs, and on its recursive processes.

LO is a dynamic complex system that can self-renew, and requires continuous and integrated flows of energy, information and resources. In this sense, the work perspective is integrated too. In some moments, organization experiences stability. In others, creation and innovation can emerge (continuous non equilibrium dynamics), creating new routines (incremental innovation process) or new system configuration (transformation innovation process). It implies that organizations move through a cycle of gradual evolution, stagnation, radical upheaval, and self-organization. (MacIntosh & MacLean,1999). In change process, new rules are generated by experimentation, interaction, and nonlinear feedback: some of them are amplified, while some of the others are damped down.

There are different levels of learning: individual, group, organizational, inter-organizational, and societal learning. LO can only be conceived as complex system of interaction among individuals, networks and organizations, according to an organic metaphor. The effective organizational learning is based on motivation, and collaboration, that are built upon mutual interdependence and trust. An important success factor is to provide *public spaces of learning*, where tacit knowledge may be transforms in explicit one. Because LO is human-centered, work system design is fundamentally built upon human relationships. Experience and knowledge exchange opportunities are crucial for single and double loop learning (Argyris, 1992).

3.2 *Work System Design in LO*

According to those premises, the work system design in LO is based on a set of characteristics describes below:

1. The work system is not a linear system. Instead, it is a nonlinear dynamic system that continuously change. Thus, learning is nonlinear, discontinuous, sometime a chaotic and fuzzy process, that generates new workers/humans, transforms organization in a new organization (Goldspink and Kay, 2004).
2. The work methods are minimally specified, in order to guarantee free action and decision making, based on common rules and commitment. Essentially, it is a dynamic decision making based on a heuristic competence. Decision making and action process are based on alternatives choice and decision rules that continuously change. Worker response style is creative, not conforming. Consciously creating of conditions in which successful transformation can occurs. According to this, there is not a distinction between prescriptive and real activity. The aims is to build a congruence between different processes and people, based on diversity and consequent different worldviews (Maggi, 2003).
3. Variations on work process must be considered in tasks and activities analysis, in order to promote enrichment of the work. Organizational learning is view as a collective process of creation of *communities of practice* that share common values, believes, rules, and create a clan's notion of the group.
4. Autonomy conducts to a self-directed learning, and self-directed learning conducts to growing of autonomy. A supportive environment that balances direction and autonomy enhances learning. Communication flow are continuous and lateral, in order to guarantee the continuous organization self-renew and learning. It is necessary to design *spaces of learning*, in order to offer opportunities of endogenous and exogenous information exchange, sharing and feedback. Feedback (interaction) makes systems dynamics.
5. LOs allow to promote experimentation, error and introspection opportunities to its workers. Learning occurs informally and incidentally through work, integrated into the doing. Problems resolution, identification, and solving are view as learning opportunities. Conflicts resolution is made by interaction, rather than by superiors (Paul, 1996).
6. Workers are agents that interact with others and systems, according to a participatory ergonomics. They are connected but these connections change over time. It is necessary to engage people continually around organizational strategy and purpose (collective capacity for re-thinking and re-design). Constant change situation and ambiguity can generate stress and anguish in some workers: workers diversity should be considered. In other hand, greater flexibility in working arrangements, overcoming constraints of time and place. LO can promotes health, well being and maneuver margins.

4. Final Considerations

According to a relational complexity, work system design in LO could be understand as essentially based on humans interactive processes. Motivation, feedback, creation and interpretation, integration between action and decision making processes are so important. In organization science, the dichotomization between subject and organization, may be

solved through a relational orientation: dialectical relationship that bridges them both. Complexity gives a base to understand humans in organizations. Because work is conceived as a integrative and relational activity, it is based on *work contents* and *work interactions*. It is not possible to reduce the organization to a sum of its parts. Workers, work system, activities and tasks are interconnected and they are, at same time, product and producers of their reality.

LO is an ongoing process. The main point of this article is to present a new possibility of organization and work understanding. The issues discussed above make evident that there is a need to rethinking the organizations, as they have been conceived until now.

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