

Sociological Complexity Theory: From Epistemology to Empirical Methodology

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This study, through a re-conceptualization of sociological complexity theory's epistemological sources, specifically in Edgar Morin's formulation, sheds light on the theoretical models as well as empirical methodologies of sociological analysis of today's complex, interconnected, diverse and globalized society and global disorder. Complexity theory leads to a shift in perspective and a transformation of the epistemological status of social sciences with an in-depth intervention of disorder, contingency, case, singular, and non-repeatable in the sociological analysis. The notion of dialogic interplay is placed at the paradigm level and stands out at the heart of the concepts, analyzing the social system as auto-eco-organizer. Similarly, the notion of 'emergence' at macro-micro levels imposes itself as complex, logically requiring overcoming simple, linear thinking and model of explanation to adopt the perspective of organizational rotativity in which the product retroacts by transforming the one producing it, by conceiving a circularity of co-production between individuals and society through interactions. Declining epistemology and sociological complexity theory in the empirical methodology setting, the complex sociological approach is phenomenon-, event/information- and crisis-centered, privileging observation, participation-intervention, and 'live inquiry'. The open, in-depth and possibly non-directive interview is part of clinical sociological methodology, raising the question of the observer-phenomenon-observed relation.

Keywords: complexity sociology theory and methodology, social system, emergence, micro-macro analysis, participation-intervention

Introduction: Complexity, Organization, and Social System

Morin's conception of system differs from previous definitions of system, as Morin links the idea of system to notions of complexity and organization. The first systemic models were developed in the biological sciences in the late 1930s to explain the functioning of complex structures such as organisms, against which simplified descriptions in the traditional sciences were inadequate. Emery (1969) stated that many of the 'gestaltic properties' common to the different organizational levels of living matter (from bacteria to human societies) are not captured by the traditional ways of conducting scientific investigation, hence there is a demand for a logic that goes beyond the model of causal analysis usually associated to classical sciences.

According to Morin, in many cases theorists of system theory, while recognizing 'interrelation' and 'wholeness' as the main features of the system, place emphasis from turn to turn on the aspect of global unity or the relational aspect (Maturana & Varela, 1972).

The General System Theory, provided universality to the idea of a system, considering it as a whole that cannot be traced back to the parts and formulating the notion of an open system (von Bertalanffy, 1950; 1968). However, the idea of complex unity and the idea of organization remain dissociated and disconnected from the organizational interaction. The notion of a properly organizational entity or unity is either suggested by Jacob's concept of 'integron' (Jacob, 1970) or is sought by Koestler with the concept of 'holon', although this notion emerged marginally in Koestler's theory (Koestler, 1967). Atlan attempts to elaborate the idea of organization itself (Atlan, 1974). The notion of complexity is introduced into the definition of system by Ladrière (Ladrière, 1973, p. 686).

Moving beyond these formulations, Morin sees organization as the crucial question to which all roads of contemporary science lead and as a complex issue that requires overcoming classical science, which bases its principle of explanation on order and simplification. According to Morin's theory of complex dynamic systems, the social system, as a system, possesses the characters of organized global unity: emergence at different levels, constraints and inhibitions at the micro level of the parts, complementarity, antagonism, complexity, and as a sociological reality has original characters compared with other systems (for review see Contini, 2013; 2017; 2019).

The sources of Morin's methodological thinking are von Foerster's 'order from noise' (1960; 1984), Atlan's principle of 'organizing causality' (1972; 1974), von Neumann's theory of automata (1966), Prigogine's thermodynamics (1985), Serres' 'order from disorder' (1974). References also go to the work of Maturana and Varela (1972; 1980; 1985), Jacob (1970), and Monod (1970), overcoming the positions of these authors and proposing a complex dialogic of organization and self-organization.

One of the features characterizing the transformation of the epistemological status of social sciences is the in-depth intervention of the disorder, the contingent, the singular and the non-repeatable (Ceruti, 1985; 2014). Von Foerster (1984) pointed out that those properties which were considered elements of nature in modern science turn out to be properties of the observer in twentieth-century science. Disorder, unpredictability, and case are rightfully part of scientific analysis.

From a constructivist perspective, necessity results from the scientist's ability to make infallible inferences, while case results from the inability to make infallible inferences. This means that necessity and case reflect some of observer's abilities and inabilities, not nature's characteristics and ways of functioning (von Foerster, 1984, p. 186). A whole series of notions that are fundamental to the living sciences in the twentieth-century, such as the notions of 'integron', 'holon', 'stratified determinism', 'hierarchical system', reveal their observer-dependent nature (Koestler, 1967; Allen & Starr, 1982). See, for example, the system concept, which in contemporary science is redefined on the basis of an awareness of a plurality of operations in its building matrices: there are no 'natural' boundaries between system and environment, as there are no 'natural' hierarchies of systems and subsystems, but boundaries and hierarchies are always established by an observer, whose operations and decisions involve multiple levels in the process of constructing a system (Morin, 1977; 1984; 2018).

By transferring these concepts to the sociological analysis, the social system is defined as a self-eco-organizing system, which implies the deep and multifaceted intervention of disorder. Morin defines society as a 'complex organized unity', involving not rigid characters of immutability and stability, but elements of mutability and instability, as a capacity for continuous adaptation, in moving from situations of imbalance and disorder to situations of balance and order and vice versa. 'Non-equilibrium structures' or

‘dissipative structures’ coincide with irreversible loss of energy but can also become sources of order and constructive events, which generate increased complexity. Systems equilibrium can be defined as ‘equilibrium by fluctuations’ (Prigogine & Stengers, 1979, p. 80).

Dialogic Interplay of Order, Disorder, and Social Organization

In this view, Morin conceives order, disorder and organization according to a dialogic connection, which arises through interactions. Organization requires interactions, interactions need encounters, in turn encounters requiring disorder, that is, turbulence. Encounters are random, but the effects of these encounters, on well-determined elements/individuals under given conditions, become necessary and ground the order of ‘laws’.

The greater the diversity and complexity of interacting phenomena, the greater the diversity and complexity of effects and interactions caused. Interaction connects disorder, order and organization in a complex and recursive ring of mutual co-production. By doing so, Morin places the idea of dialogic at the paradigm level. Conceiving the dialogic of order and disorder means to consider a complex and complementary relation. Disorder and order/organization are two concurring and antagonistic processes (Morin, 1977). Morin, with reference to the principle of ‘order from noise’ formulated by von Foerster (1960; 1984), names this relation ‘organization from noise’, meaning the principle of organization through disorder. Similarly, Prigogine’s thermodynamics shows that vortex-shaped structures can arise from perturbations and brings out the idea that organizing phenomena can originate from thermodynamic disequilibrium.

B énard’s vortex example shows experimentally that certain thermal flows, under conditions of fluctuation and instability, i.e., disorder, can transform into ‘structure’ or organized form. In other words, it shows that deviance, perturbation and dissipation can generate structure, that is, organization and order at the same time. Similarly, von Neumann, seeking to understand living organization from the point of view of its internal mechanism, discovered in his self-reproducing automata investigation that the great originality of the ‘natural automaton’ is its functioning with the disorder (von Neumann, 1966). Atlan (1972; 1974) drew from von Neumann’s insights the fundamental notion that permanent disorganization/reorganization is a constitutive character of living self-production and advanced the ‘organizing case’ hypothesis.

Order and organization, born with the cooperation of disorder, are able to withstand a large number of disorders and gain ground on disorder. Organization and the new order connected with it, though they are the result of minority interactions from the innumerable game of interactions in disorder, have a strength of cohesion, stability, and resistance that privilege them. Organizational closure, structural stability, and internal order constitute an inseparable conceptual whole that accounts for the system’s resistance to destructive pressures from both inside and outside. Selection favors the complex, because the advantages of complexity counterbalance its fragility. By complexifying, the organization loses in cohesion and rigidity; it gains in plasticity, in the ability to regenerate, to use the event, the case, perturbations. Similarly, selection does not play into the game of one form of organization, but it plays into the game of associations, of systems of systems, of very diverse forms of organization, it plays into the game of the organization itself.

Morin relates the idea of social organization to the concept of complex unity. The organized complex social unity consists of organizational interrelations between individuals, actions or other complex units. According to Morin, the organizational character of the organized complex unity was highlighted by Atlan, who stated that organization is a complex of variety and repetitive order (Atlan, 1974).

Morin conceptualizes complex unity organized according to the trinitarian macro-concept system/interaction/organization (Contini, 2013; 2017). The organization of a system is characterized by interrelationships. The notions of system and the one of organization complement each other. Organization is the internalized aspect of the system—interrelations, interconnections, articulations, structure; the system is the externalized aspect of the organization—form, wholeness, emergence. The notions of interrelation, system, and organization, though inseparable, are relatively distinguishable, as the notion of interrelation refers to types and forms of connection between elements or individuals, between these elements/individuals and the whole. The idea of system refers to the complex unity of the interrelated whole. The notion of organization refers to the arrangement of the parts ‘in’ and ‘with’ a whole.

Micro-Macro Levels of Sociological Analysis: ‘Emergence’

The macro-concept system/interaction/organization is a tool for analyzing both physis, from atom to bacterium, and human society (Morin, 1977). The concepts of interrelation and system are connected by the one of organization (Ashby, 1962). Organization is the arrangement of relations between components or individuals that produce the complex unity, endowed with qualities unknown at the level of components or individuals. Organization interrelationally connects different elements, or events, or individuals which, as a result become components of a whole. It provides a solidity to such ties and ensures that the system has some chance of durability despite random perturbations. Organization both forms and transforms the system, involves its own rules and constraints.

The main effect is the establishment of a global form that retroacts on the parts/individuals by transforming them, that is, the production of ‘emergent qualities’, both at the global and parts levels. Morin, in line with the ‘superadditive composition rule’ principle developed by von Foerster, considers the system as a whole that presents qualities or properties; Morin names ‘emergences’, that have new characteristics compared to the individuals or parts considered in isolation or differentially organized in another system (Morin, 1977; for review see Contini, 2006; 2013; 2017; 2019). The notion of ‘emergence’, is not reducible to concepts of ‘superstructure’ and ‘wholeness’ (Morin, 1977).

‘Emergence’ is a product of the organization which, although inseparable from the system as a whole, manifests itself at the global level but also at the level of individuals. There are systems in which macro-emergencies retroact on the parts in the form of micro-emergencies.

Specifically, in human society, with the construction of culture, individuals develop their inclinations to language, craftsmanship, and art. The richest individual qualities emerge within the social system. Within the complex system the whole is more than the sum of the parts/individuals and the individual is more than the part/individual. Emergence is a new quality with respect to the constituents of the system and is presented as a logically non-deductible ‘event’ and a ‘fact’ (for review see Contini, 2006; 2013; 2017, 2019). In complex unity, the whole is irreducible to the parts/individuals and the parts/individuals are not reducible to the whole, in the same way that the unit is not reducible to the diverse or the multiple, nor the diverse to unity, but the whole, the parts/individuals, unity and diversity stand in a dialogical relation. Emergence is produced by the organization and is inseparable from the system.

Micro-Macro Emergence: Complex Interplay Between Individuals, Culture, and Language

Emergence occurs both at the level of the overall system (macro-emergence) and at the level of its

components/individuals (micro-emergence). In this model, the whole is both more and less than the sum of the parts, just as the part/individual is, in the whole, more than the part/individual considered individually. The organizing social relation produces constraints on parts/individuals that inhibit the manifestation of certain properties/capabilities of elements/individuals. Morin generalizes Ashby's assertion that the presence of organization among variables is equivalent to the existence of constraints on the production of possibilities (Ashby, 1962). In particular, in anthropo-social organizations both the principle of emergence and the principle of constraint occur clearly (Morin, 1985).

For example, in social organizations legal, political, military, economic and other constraints inhibit or repress greatly the potential of individuals. At the same time, the organized whole is more than the sum of the parts/individuals, since it brings out qualities that would not exist without such organization. They are 'emergent' qualities in the sense that they are empirically advisable but not logically deducible. Such emergent qualities practice feedbacks on the level of individuals and may stimulate them to express their potentialities.

At a first level of complexity, the world of culture, language, education—all properties that can only manifest at the organizational level—interact on the parts and enable the development of individuals' mind. A second level of organizational social complexity is manifest in the dimension of centeredness and polycentrism. Simultaneously, social organizations are a-centered in so far as they function through spontaneous interactions, poly-centered as characterized by numerous centers of control, and centered in that they have a center of decision-making (Morin, 1985).

The Morinian explicative model goes beyond the reductionist explanation of a complex whole in the properties of elements/individuals and general laws governing these elements. The sociological complex theory aims to overcome reductive explanation that disarticulates, disorganizes, and decomposes organization and complex unity and ignores emergent qualities and antagonisms.

At the same time, the sociological complex explicative model departs from 'holism' in applying the proposition that 'the whole is also less than the sum of the parts'. Such a model does not annihilate the whole by the parts/individuals, nor does it annihilate the parts/individuals by the whole. According to Morin, systems theory responded to the limitations of a reductionist explanatory model 'in' and 'with' 'holism', aiming to overcome reductionism. In doing so, it effected a reduction of the elements to the whole, losing sight of the parts as such and ignoring the organizational complexity of the global unit. Also Stengers pointed out the closeness of what she terms 'two enemy brothers', namely 'reductionism' and 'holism' that aim to make a phenomenon simple and intelligible (Stengers, 1985, p. 75).

Unity-Diversity: Self-Eco-Social-Organization

The sociological complex theory conceives a dialogical interplay between unity and diversity. Diversity is required, preserved, created and developed 'in' and 'through' the systemic unity which it develops. The interplay between unity and diversity, between repetitive order and unfolding diversity, is complex and should be understood as complementary-concurrent-antagonistic. Organization reliability is assessed in terms of the system's survivability (Atlan, 1974). The system is unity that derives from diversity, connects diversity and brings in diversity, organizes to produce diversity. Essentially, the developments of difference, diversity, and individuality within a system, the richness of its emergent, internal, and global qualities, and the quality of global unity all go hand in hand.

Morin to describe living and, especially, social organizations develops the complex concept 'self-eco-organization'. Self-eco-organization enables conceptualization of regulatory retroactions, disorganization processes, correlation between disorder and antagonism, and permanent reorganization. Organization is considered both as transformation and formation. Anti-organization is explained as necessary and antagonistic to organization, meaning the system, since organization involves internal antagonisms.

In this sense, the theory elaborated by Morin goes beyond classical systems theory, though it came across the idea of antagonism, e.g. L. von Bertalanffy in *General System Theory. Essays on Its Foundation and Development* (1968, p. 66) states that 'every totality is based on the competition between its elements and presupposes the struggle between its parts', or E. Trist in *Organisation et système: Quelques remarques théoriques se rapportant plus particulièrement aux recherches d'Andras Angyal* (1970), writes that 'the theory of open systems has no basic difficulty in understanding harmony and conflict'. Nevertheless, classical systems theory does not formulate the inherently organizing character of the principle of antagonism.

Antagonism manifests itself both at the level of connections and integrations, which presuppose and neutralize antagonistic forces, and at the level of the organization of difference and diversity whose organizational constraints create and repel antagonisms. Antagonism also appears at the level of complexity of active and reorganizing organizations, in which antagonistic actions and processes operate in the dynamics of internal and external interactions and retroaction, contributing to the organization. Open systems are characterized by active organization and anti-organization. The organization tolerates a range of fluctuations which, if not kept below a certain threshold, would develop disintegrative outcomes in the form of positive retroactivity. Negative retroaction is an antagonistic action on an action that itself actualizes anti-organizational forces.

The question of antagonism is decisive for any sociological theory, as organizational/anti-organizational antagonism lies at the heart of the problematic of human societies in which complementarities and antagonisms are unstable, oscillating between actualization and virtualization. Reorganization is possible in a system that is open to its environment, from which it draws at least energy. A system is durable if it has a regenerative and/or self-reproducing principle that allows it to perpetrate itself. It is an open self-organizing system, and the notion of self-organization implies self-production, self-perpetuation, self-generation through obstacles and contingencies.

The self-organizing system is itself self-eco-organizing, as its environment participates in its organization, and self-eco-organization presupposes permanent reorganization, as the organization needs to regenerate itself incessantly to counterbalance the growth of entropy aroused by its work. The organization of the self-eco-organizing system presupposes the multifaceted intervention of disorder. According to Morin, to understand the complex system it is necessary to not isolate the self-organized system from its environment (for review see Contini, 2006; 2013).

Sociological complex theory connects the notions of self-organization and eco-organization in the key notion 'self-eco-organization'. Similarly, the notion 'autonomy' implies a theory of both open and closed systems. A system that performs work needs new energy to survive, which it draws from its environment. This means that autonomy is based on dependence on the environment. Complex sociology conceives a relation at the same time of complementarity and antagonism between the notions of autonomy and dependence. An open system needs to be both closed and maintain its individuality and originality. It is, Morin states, a conceptual issue of complexity. In the universe of 'simple things' it is required 'that a door to be either open or

closed', while in the complex universe it is required that an autonomous system is both open and closed (Morin, 1985, p. 54).

In systems based on permanent reorganization, disorder is 'diverted' and attracted, without being eliminated, and disorganization becomes a constituent of the organization. The more complex the organization becomes, the more its disorder is mixed with disorder, and antagonisms play their role in the system and the organization.

The originality of social structure-organization consists in its complexity, heterogeneity, singularity. Generative organization preserves, renews, reproduces the originality, complexity, heterogeneity, singularity of such systems. The social system is negentropic, meaning that it is able to renew and 'negate' the growth of entropy within the system (for review see Contini, 2006; 2013; 2017). Negentropy is related to a recursive generative mechanism within the self-organizing system. Human societies are characterized by permanent processes of disorganization/reorganization, 'socializing' disorder.

Declining Sociological Complexity Theory in Empirical Methodology

Declining the level of epistemology and sociological complex theory in the empirical methodology setting, the complex sociological approach is phenomenon-, event- and crisis-centered, privileging observation and intervention.

The Event-Information: Observation-Intervention

Phenomenon is what emerges in the social system as 'data' or set of 'data' relatively isolable from an empirical emergence, for example an event. From a sociological perspective, the event is the one that does not fit into statistical regularities; it is the new information. The event-information disrupts the rationalization that strives to grasp a relationship of intelligibility between the researcher and society (for review see Contini, 2006; 2013).

The event generates questions and lacerates the rationalizing structure. The event-information enables an understanding of the nature of the structure and functioning of the system, that is, the regulatory process of integration or rejection of information and of the change made in and through the system. Complex sociology does not aim to analyze only balanced systems within social reality, but it seeks to capture the permanent dialogic between tendencies towards the establishment of balanced systems and unbalancing countertrends (Morin, 1984).

The two methodological poles of interest for event analysis are: attention to the processes of modification and reabsorption caused by the event and attention to the emergence of other events and new processes (Morin, 1984). Complex sociology does not reject the event and crisis by considering them irrational, but integrates them into the understanding process of social reality. Morin describes complex sociology as 'clinical sociology', which is opposed to the reductive sociological method aimed at eliminating and delimiting the event to formalize regularities and repetitions.

Complex and clinical sociology focuses on direct observation of the crisis, the event, and what happens by case, and considers what disrupts the structure or system extremely significant. Morin's sociology opposes a mechanistic and normalizing sociological method that eliminates disorder and imbalance.

The contraposition extends to the level of research techniques and methods. Complex sociology privileges 'live inquiry' which emphasizes the full use of observation, participation-intervention, and raises the question

of the observer-phenomenon-observed relation. In this view, the sample questionnaire can be a verification tool at certain superficial levels.

Clinical sociology assumes a new meaning in understanding the subject (researcher) and the subject-object (of research) and the mutual contamination of the subject-object pair. The presence of the researcher at the phenomenon-event under investigation poses the possibility of using observation by employing recording techniques and multiplying observation points through *équipe* work. Moreover, the intervention is inscribed in a prior dynamism and thus likely to engage the inquiry in a peri-experimental path. The field inquiry requires self-correction and self-regulation, initiative and flexibility within work *équipe*.

Interview

Morin considers the role of the interview in social research very rich. The interview constitutes an intervention aimed to the communication of information. There are aspects in the interview that go beyond information, meaning the psycho-affective phenomenon constituted by communication itself. Extending the use of interviewing in the human sciences involves challenging methodological work that leads to the development of interviewing in different branches.

Extensive interviewing is questionnaire-based; it is conducted on representative population samples and results in statistical processing. Intensive interviewing seeks to delve deeper into the content of communication. The closed interview is characterized by quick querying in which the answer matters more than the person, and it allows the findings to be treated statistically. The in-depth interview involves complex responses, in which the people, interviewer and interviewee, assume considerable prominence. The open, in-depth and possibly non-directive interview is part of any clinical methodology.

Between these two branches of interview development, a series of intermediate interviews have been formed, such as the non-directive interview, the open-ended interview, the centered interview, in which the interviewer conducts the interview very freely to allow the interviewee to express his or her experience. A variety of disruptive factors may occur in the interviewee, related to the wording of the question, the psycho-social situation, the interview climate, inhibition, attention and inattention mechanisms, the tendency to rationalize one's point of view, exhibitionisms. Perturbing factors arising from the interviewer include how he or she appears in the eyes of the interviewee, his or her attitude during the interview that may influence responses.

Interviewing in the media can be distinguished according to the level of communicability. The interview-ritual marks events, ceremonies, official meetings and emphasizes the purpose of having the voice heard and authenticating the event. The anecdotal interview is characterized by complacent conversations in which interviewer and interviewee stay away from any commitment. The dialogue interview in which interviewer and interviewee collaborate in releasing a truth related to the interviewee's personal experience or a problem. Neo-confessions, in which the interviewer steps aside in front of the interviewee who dives inward, reconnecting with the interview in depth.

Conclusions

Complex sociological theory and methodology emerges as knowledge able to grasp the complexity of today's interconnected, diverse and globalized society. The globalization processes, the ever-increasing fluidity of borders made evident by international migration, and the interconnectedness associated with the digital revolution, the increasingly tight economic, political and cultural interdependence among the various regions of

the planet, diversity as a feature of today's societies (Antonsich, 2014), and the multiple identity intertwined (Wellman, 2001; Bussu & Contini, 2021) break down the prerequisites of order at the basis of modern science analysis (Boudon, 1985; Giddens, 1994), as well as the sovereignty of 'state-nation' (Beck, 1999; for review see Contini, 2017; 2019).

Deep society's transformations lead to the discovery of levels of reality that cannot be framed in the classical view of science. Chance, contingency, singularity, locality, temporality, and disorder reveal the inexhaustibility and multiplicity of the architectures of the cosmos and society in the planetary and global era (Morin, 1985; 2020a; 2020b). Global dynamics that cut across local dimensions and community ties, communications that depend on individual, family, social, and political choices and less and less on social distance complexify the social and communicative landscape. The widening of interactions and communications between diverse people is mirrored in the mechanisms of identity formation, which are structured in a composite and dynamic way, through connecting different territorial, cultural, religious, national, supranational spheres (Ashmore, Deaux, & McLaughlin-Volpe, 2004; C. W. Stephan & W. G. Stephan, 2000; Contini, 2012).

The complex sociological method places dialogicity at the heart of the epistemological status of the social sciences. Morin introduces complex logic into the heart of concepts, in the sense that it puts disorder into the concept of order and order into the concept of disorder, according to a dialogical correlation. What in the classical sciences model seemed like the unscientific residues of the human sciences, through the complexity paradigm become a rightful part of scientific knowledge and specifically of sociological method (Morin, 1985, p. 49).

The new notion of 'emergence' pushes to complexify models of explaining social systems and relation between micro-macro levels of individuals and social organizations and institutions. Emergence imposes itself as a complex notion that logically requires abandoning the simple, linear hierarchy between infrastructure/texture and superstructure/texture in favor of an organizational rotativity in which the product retroacts by transforming that which produces it. In the complex interplay of order, disorder, and social organization, interactions between mutual actions modify the behavior or nature of individuals. Complex sociology conceptualizes a dialogic interplay (complementary-concurrent-antagonistic) between unity and diversity. The organization transforms diversity into unity, without erasing diversity, and to create diversity 'in' and 'through' unity.

Declining epistemology and sociological complex theory in the empirical methodology setting, the complex sociological approach is phenomenon-, event/information- and crisis-centered, privileging observation, participation-intervention, and 'live inquiry'. Complex sociology conceptualizes the phenomenon as new information that breaks into both the social system and the sociologist's mental system. The open, in-depth and possibly non-directive interview is part of clinical sociological methodology, raising the question of the observer-phenomenon-observed relation.

Sociological complex theory and methodology offers new conceptual and empirical tools for thinking and analyzing today's complex societies and global disorder.

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