Available online at www.elixirpublishers.com (Elixir International Journal)

Management Arts

Elixir Mgmt. Arts 55 (2013) 12856-12861

ISSN: 2229-712X

Chaos Theory and its Complexity and Role in the Analyzing of Policy Networks

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ARTICLE INFO

Article history:

Received: 15 January 2013;

Received in revised form:

2 February 2013;

Accepted: 4 February 2013;

Keywords

Network,
Policy Networks,
Chaos,
Butterfly Effect,
Dissipative Structures,
Rational choice and Analysis of Network.

ABSTRACT

Network approach for policy-making emphasizes on dependence of government, organizations, groups and people who are in policy-making domain. This essay wants to explain the concept of networks and policy networks and analyzes the effect of chaos theory and its complexity and role in policy networks, too. The chaos theory learns us; organizations which are in border of order and chaos, are more successful. Organizations will be destroyed when they have a lot of order and don't have any flexibility. Organizations which are in the border of order and chaos can increase their flexibility by making changes in work's methods and using of different work's shapes and this flexibility lets them for compatibility with environmental changes. Finally, this essay will consider three kinds of future orientations in policy networks which consist of; rational choice, analysis of network and case study.

Introduction

Traditional approaches of public policy-making state that policy-making processes should be centered and hierarchal. This view conflicts with becoming grow needs of today's development and departmental governments for participation of organizations, groups and people in policy-making process. The various flows make fast and underlying changes in economic and political life of different societies and have necessitated making changes in traditional systems of policy-making. The most important of these flows consist of;

1. The changing of nature and concept of space which facilitates to make changes between whole societies and nations.
2. Increasing of changes' rate because of fast improvement technology which makes many challenges in front of traditional and bureaucratic methods of policy-making.
3. Formation of complicated and connected such as; business and environment.
4. More emphasis on equality of generations' concept in policy-making decisions.
5. Making of world which there are various actives within it and often the role of nonpublic actives is more important which have made operational and participatory gaps in policy-making.

Operational gap makes when policy makers and public organizations don't have any information, knowledge and essential means for facing with complicated parts of policy-making and also the lack of abilities of non public actives and their participation in policy-making process make participatory gap [14].

According to this historical background, we cannot claim that technical and policy-making knowledge have been made and become management in best way by hierarchical structures specially most of bureaucratic structures in private part change to self-regulating networks for conducting of complexities which are made by reciprocal dependence. Rational approach will not have any efficiency concerning existent pressure. According to some authors "governments cannot lead societies from top position, without people and by unlimited power like mythology gods. Government is a part of society and is only one of effective factors on public policy-making process." [16].

Policies should be made by central power such as; government or parliament but today, policies are shaped by processes which have involved vast participation of private and public organizations in an environment full of changes and chaos.

Definition and characteristics of policy networks

In recent year, networks are used not only in political sciences but also in most of other sciences. Microbiologists qualify cells as information networks. Ecologists describe environment as network systems. Experts of computers' sciences expand nervous networks with self-determination and self-learning. New social sciences have studied networks as new shapes of social organizations for sociology, economic sciences and technology, network industries, network technologies, managing of business and public policy-making. According to this, it seems, the world of network is new paradigm with complicated architecture [5]. Networks and their concept have attracted experts' notice of public policy-making. Public decision making is complicated subject; hence, researchers and analysts use networks because they are appropriate metaphor which can identify important aspects of policy-making process. Briefly, this concept focuses on relationship between powerful people who work in public and private organizations and conduct a specific domain of policy-making such as; health or education. Bureaucrats, politicians, experts and delegates of interested

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groups usually argue with each other about public issues and problems and present solutions for solving them. Gradually, these relationships make networks of interrelationships and same expectations. These networks partly have border and partly separate from other networks and partly exit from sight and attention domains of people. Researchers usually ascribe set of rather stable characteristics such as; types of exchanges and or set of values to each network and they are different according to considering domain, for example, policies of health are different from educations or agriculture [20]. There are several and various definitions about networks but many researchers of public management and policy-making patently have defined the word of policy networks. First, Otood defined networks as inter dependence structures which have been made between organizations or different sections. His view indicates rather structural stable between networks and network connections which have been fastened by organizational glue. Later, Kickert and his associates describe policy-making networks as rather stable models which are made by relationship between dependent actors for considering of policy-making problems or programs. Kenis and Schneider studied networks. They were third groups and defined policy-making networks as networks of rather firm relationships and running which collect scattered resources and move them for organizing collective (parallel) work along solution which is same common policy. Later, Borzel described policy-making networks with a more complete view. According to his definition, policy-making networks are set of rather firm relationships with non hierarchical and dependent natures and connect with kinds of actors who have common benefits for a specific policy and exchange own resources for accessing to these common benefits and state that cooperation is a best way for obtaining of common goals. Kantzentein defined policy network as a political structure which adjust various forms of inter cession of interested groups and government and make relationships according to coexistence between government and society in policy-making.

What is chaos theory?

Chaos theory is a branch of mathematics and physics. It is about systems which their dynamics indicate very sensitive behavior against change of initial amounts so that their future behavior aren't foreseeable. These systems name chaos systems which are a kind of dynamics and nonlinear systems. Best examples for them are butterfly effect, aerial flows and economic period [1].

This theory was developed by works of Henri Poincare, Edward Lorenz, Lebrut and Michael Feigenbaum was first person who proved three germs subject (e.g. sol, earth and moon) and chaos subject are insolvable. Other branch of chaos theory uses in quantum mechanics and its name is quantum chaos. It is said; Pierre Laplace or Omar Khayyam discovered this phenomenon before Poincare. In past twenty years, in new physics and mathematics domain has been made a scientific way and new and attractive theory names chaos. Chaos theory considered very complicated dynamics systems such as; atmosphere of earth, crowed of animals, flow of liquids, throb of mans' heart, geology procedures and suchlike. It is key speech of chaos theory that there is an order in each disorder. It means we shouldn't search order only in one scale. A phenomenon may seem no foreseeable and entirely accidental in local scale but becomes foreseeable and entirely stationary in global scale [8].

There are similar points between chaos theory and statistics scientific. Statistics searches order within disorder. The result of shooting of one coin is accidental and no evident in each time because has local scope but prospective results of this phenomenon are foreseeable and stationary when shooting repeats frequently.

This order becomes constant the gamble industry otherwise capitalists don't invest in this industry. Indeed gamble is accidental and chancy phenomenon for gamblers because it is in local scale and is foreseeable and stationary for owner of casino because it is in global scale, therefore this phenomenon has order [1]

Here, we can refer samples of this theory in liberal arts domain. Most of historical events may seem entirely accidental and disorder in 20 years scale but they may possess specific alternative period and or a kind of order in causes in 200 years, 2000 years and 20000 years scales. Other alternative subject which has been stated in chaos theory is its emphasis on dependence (or sensitiveness) on initial situations, in the other word; partial changes in initial amounts of a process may conduce to underlying differences in destiny of process. Following example may be attractive.

If one traveler delays 10 seconds to bus station, he cannot take a bus which pass from this station each 10 minutes and go toward metro which pass a train from there each an hour and go toward airport. Daily there is only one flight to destination of this traveler; therefore, he loses one day for delaying of 10 seconds. Most of these natural phenomenons have sensitivity to initial situations. A stone which is on top of a mountain may fall to south or north valleys by a little movement toward right or left, whereas, next million years, it can transfer myriad kilometers by geology procedures and forces of water and wind. Hence, we can understand a little movement toward right and left can effect on destiny of this stone. Other clear example is physical and mental dependences of people to fecundation conditions and genetic subjects [6].

There is chaotic dependence to initial conditions in most of sociology events (such as; revolutions) and psychology and suchlike but there isn't especial attention to this subject in a domain. It is often said a phenomenon has same weight in its life against effect of internal and external factors whereas according to chaos theory, initial conditions play key role. Edward Lorenz famous scientist of meteorology stated his own famous sentence last years and later it was famed to Butterfly Effect. He said "very little chaos which be made by clashing of butterfly's wings in a dynamic system such as; atmosphere of earth, can make storm in a continent scale." We can consider simple and rather value factors instead of very complicated factors in most of political and sociologist events and achieve correct analysis for that event. It seems, studies of Froid in psychology science are most researches which have been done according to chaos theory in liberal arts domain. Froid believed that childhood period (initial conditions according to chaos theory) effects on all behavior of person in his life. He analyzed behavior of person by analyzing of childhood period [1].

Also, chaos theory opens new door for discovering of order in phenomenon by tendering of fractals theory and new concept of physical dimension and concepts such as; Self-similarity and self-tendency which can be used seriously in liberal arts domain.

Chaos Theory and its Complexity and Role in the Analyzing of Policy Networks

Chaos theory which has developed in physics science in past two decades shows that we can use rather simple rules for explaining and interpreting of complicated phenomenon and

behavior. This theory which has predominate on natural science from Newton's period on, makes underlying change in usage of simple and liner theories according to view of reducible. But chaos theory has had little usage in social and liberal arts except economic science (Owen, 1995, p.35).

What relationship is between analyzing of policy and complexity theory? Analyzing of complexity includes considering of complicated and dynamic systems which discovering and predicting of their results are impossible by considering of all building blocks. Incalculable results aren't made only by external factors but they are made by characteristics of systems.

Policy networks and also policy societies are complicated systems as it is said, we cannot reduce characteristics of system to characteristics of all building blocks but network is made by their connection. Now, it is necessary, considering specific characteristics of policy networks and use of simple and correct rules for discovering of this fact which why do some policy domains have powerful and cohesive groups and networks but others have weak and powerless groups? Or why do some actors have key roles in procedures but others have marginal roles? I n this attitude, technology, ideology and or social factors make new groups and networks and change them [23].

It is impossible analyzing of networks by smaller building blocks then how can we tender a meaningful interpretation? Analyzing of complexity is not only one theory but it has been formed by combination of some theories which tender remarkable facilities in new ways for using of existent theories in political science.

Holland uses consistent complicated systems for referring to networks of actors who have relationship with each other and each agent acts constantly with other actors and consequently nothing is constant in their environment. This constant capacity of learning and change in behaviors mean that consistent complicated systems change constantly, new opportunities make permanently and it is possible, using of these opportunities by members of group and or external members. This interpretation of consistent complicated systems is very good metaphor in policy-making process. According to Holland "management of these systems is scattered and if there is dominant behavior, it makes from competition or cooperation between members of system [21].

Complexity theory says, organizations are more successful which are in the border of order and chaos. Organizations will be destroyed when they have a lot of order and don't have any flexibility. Organizations achieve essential motivations for making of systems with order and disorder when they have little dependence to each other and all of members benefit by making of network. Indeed, complexity theory isn't pluralism. This theory assumes that members don't have equal rights and also doesn’t deny the role of government. Consistent complicated systems may include many actors but their powers aren't equal. Government can get notable independence in its activities and also interested economic groups can obtain remarkable power and influence whereas consumers and interested groups of environment have less power. These authorities and power of government and interested powerful groups cause to make increaser return or positive feedback as other aspect of complexity theory indicates that this fact makes power of self-strengthening for actors [18].

Economic theories are according to base of reducing output for more than two centuries but Arthar said; "some of industries meet increasing output" specially industries and products which need to enormous capitalization for production in research and development unit such as; information technology whose prices always decrease by increasing of production and profit increases. Also, Arthar indicated that organizations and products aren't ameliorated by improvement of performance. Small events and making opportunities, accidental visit with buyers and ambition of management can interfere in improvement of organizations [12].

In policy networks domain, we can see organizations which use from network more than others, can obtain remarkable profits against actors who are outside of network (where government lets them for influencing on references and or inter cooperation improves by dependence on common references.

Interdependences and trust are increased between network members by developing of organizational and personal relationships and networks connect to each other consequently, it is too difficult, entrance of other interested groups to them. Analyzing of complexity shows that we cannot make the definite border between power and influence [22].

Initially it seems, change in policy-making networks is very important subject according to Smith who said; "the concept of policy societies is static concept. Duty of a policy-making group is maintenance of dominant interested groups' need by deleting of their benefits minatory. Smith described three theories of change which consist of; postindustrial/post fordism (it means postindustrial period can refer to period of post Ford), political change and pluralism. However, he said; "there are many and variant factors for making change and amount of changes depend on nature of group or network." Cohesive group with rather few members have more resistance against external forces than rather cohesive groups with many members. This fact specially occurs when political authorities are divided between several units of government [16].

Thus, aren't networks and policy-making societies, dynamic structures which change can occur for them in all times? Smith used from Kohn researches about change of dominant paradigm in sciences for indicating that, how did policy-making programs change?

Change in policy-making networks often are made by external challenges, change in political conditions, challenges among different networks and change in partial power of members in networks and societies. But networks are dynamic parts of this process which influence on it as get effect from it. A policy- making network may voluntary select change in definite times. There aren't the same needs among members even in small cohesive networks and they constantly try to get harmony and agreement [21].

The concept of dissipative structures helps us for explaining that, how can systems harmonize with evolutionary and revolutionary changes? Initially, Prigogine used this concept for describing of systems with physical and chemical reaction and indicated structures which can absorb appropriate changes and repel unsuitable and minatory changes [15].

Darvin has quoted of Kaufmann "networks which has been located on the border of order and chaos can obtain flexibility by gathering of effective change of shapes which let them for harmonizing with environmental changes. Most of changes and evolutions in these parallel systems make small results and its reason is stopper nature of system. Indeed some of changes can make most of secondary changes. Therefore it is resulted,

parallel systems are gradual adapted to environment but they can act quickly when they need [19].

For example, underlying change in policy-making process (such as; private-making program in 1980 year) can change related policy-making networks but these changes aren't classical and underlying change and evolutions which are made by changing of policy-making networks to thematic networks. Dissipative structure theory seems very important. Policy-making networks have many capacity and talent for adapting with changes. They can use changes for providing their own needs and benefits and even changes can become vital factor for maintaining of system's living [11].

Complexity theory basically emphasize on difficulty in studying of complicated systems' behavior. Computerize similar-making shows that it is possible, producing of several results even in some situations and it is impossible that we can anticipate which event will happen. But we can distinguish occurrence probability of a specific event by considering initial conditions' set. There are set of probable results in complicated systems but it doesn't mean happening of each event is possible. There is combination of logic and irrationality in these systems and we can name it as limited rationality [18].

What is said indicates some methods for usage of complexity theory in policy-making networks and especially in related to concept of change in policy-making networks. It is necessary, use of appropriate typology for effective usage of this theory in analyzing of policy-making process. Following list is along this view.

Type of government: weak or powerful (syndicalism or pluralism)

Political factors of government

Weak/powerful (number of majority, units of party, personality of prime minister)

Ideology (obvious definition of objectives, variable priorities)

Distance of popular election

Structure

Number of actors

Partial power of actors (control of resources, access to key decision-makers, ability of actors for trouble-making in policy-making process and amount of their importance for implementation of specific policy)

Independence of actors for doing their works (can they work only?)

Effectiveness of actors (can they use their own power efficiently?)

Process of policy-making

Constant

In situation of frequent and small changes

In situation of underlying changes

Special factors

Factors which effect on special kinds of policy-making

Accidental factors

Personal relationship between key actors

Visit and other accidental events

External factors

Environmental changes (new problems, crisis, technological changes, making change in society, and related issues with postindustrial and suchlike)

Actors who are outside of network or policy-making society

Policies in domains which influence on noted issues of domain

But it should be said, the importance of above-mentioned factors isn't same in all cases and times [13].

Future orientations of policy' studies

Peter John analyzed the investigative lacks in policy domain by considering of variant approaches of authors and researchers in policy networks domain and also considering of difference between done studies in American and European literatures. He selected three future orientations in policy networks which consist of; rational choice theory, analysis of network and case study (John, 1999).

Rational choice

According to Dowding, haggle model and games theory can use effectively for understanding of policy networks' nature. Researchers may consider institutes where create a kind of liquidation for participation of members and also effects of games on actors' preferences as networks are resulted from strategic relations and haggle. Games are very complicated and cannot indicate into two or some persons. Language of games can use metaphorically for understanding of relations inside of domains and it is most probable result in rational choice study of policy. This approach doesn't test the model and we understand directly what happens.

Analysis of network

Analysis of formal networks measures occurrence or frequency of network members' relations. This term is a branch of mathematic and its name is graph theory which analyzes characteristics and structures of networks. It is the result of research that network structure-inside or outside of network- is determined without networks and it has importance because influences on information flow and distribution of power among social organizations. This fact has chiefly happened in study of elite local or central networks in 1970 year. It seems, studies in formal networks of policy domain have been leaded by a group of American sociologies in 1980 year. Laumann and Knoke presented classical study which considers the differences of policy networks according multidimensional scale and differences between actors of health and energy units in United States of America. Against, Hinz and his associates found the lack of nuclear axle for networks in elite's studies of Washington. Critics correctly indicated limitation of investigative means and their usage. But there is other criticism, too. It isn't clear what is considered by networks and also understanding of some facts are impossible such as; do these researches make symbolic, formal issues, operational implementation and alternatives of policy? It is possible; networks only reflect instability of politics instead of indicating of important relations and eliminating of political power. Also, the border of networks is indefinite specially policy networks. It seems, used exact criterion analysis of networks impose simple judgment in complicated world. It is other criticism that analysis of network usually performs cross-sectional and only gives instantaneous picture from very flowing sets of relationships. The determining of relations' kind in networks will be difficult if criterions of networks change rapidly. Nevertheless, many of above criticism aren't reasonable. Real world is messy and investigative means are defective. Researchers know these limitations; therefore they use sensitive investigative methods and techniques instead of blindly usage of computerized networks. Researchers must pay attention in recognizing of networks, their borders and temporal changes and use their knowledge about networks for judgment. Recently, set of essays have been issued in theoretical policy journal and their title is model-making of policy networks which consist of essays about formation of policy networks and usage of power and

maximum-making of policy for decision making in Amsterdam. Various studies and their notable results don't show that this subject is mentally stagnant.

Case study

The sense of policy process, complexity of personal and expertism relations and multilayer relation's character among people have been forgotten in some of policy networks' reports. Therefore, some studies superficially consider decision making, recognition of basic participants and change in policy and indeed new decision making needs approach which can consider complexity of these connections and indicate that how personal connections can influence on policy results. Briefly, researchers need to lead these theories to rational choice and model-making of network's analysis. Simplification by model-making and hypothesis testing must be conformed to qualitative views.

Conclusion

Traditional limitation of public management is centered and restricted sovereignty and bureaucratic and hierarchal structures on administrative system but in current conditions there isn't other way for continuance of life in public management because of broadness and complexity of government activities without partnership and unison with citizenry in a participatory structure. Public missions and activities are performed effectively by partnership of citizenry. Structural models of government must change for access to this result and hierarchal and ineffective methods must experience life in internal and global networks and forget hierarchal view. Indeed, hierarchal thought must necessarily change to network thought and public management must learn administration's way of these networks and find itself as active factor in networks [2]. Now, policy networks have made appropriate conditions for sovereignty of network thought in public policy-making system. In recent years, the subject of policy networks have found remarkable situation in this area and political science and public management theories. Policy networks don't limit to theoretical domain in most of countries and have been used in micro and macro levels in practice area. Using of policy networks is a step for making partnership and improvement of policy-making system according to citizenship basis.

Change in policy-making networks often are made by external challenges, change in political conditions, challenges among different networks and change in partial power of members in networks and societies. But networks are dynamic parts of this process which influence on it as get effect from it. A policy- making network may voluntary select change in definite times. There aren't the same needs among members even in small cohesive networks and they constantly try to get harmony and agreement [21].

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