

Chaos Theory and Modern Jurisprudence: An Essay on Deconstruction of Parameters' Order and Linearity

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ABSTRACT

Chaos theory is a new approach model which has filled an important gap in the analysis of disorder and nonlinear behaviors of dynamic systems. It has recently been noticed to present a fairly useful theoretical and methodological framework for social sciences as well as physical sciences. Accordingly, this study aims to perform a theoretical analysis regarding the contributions of chaos theory to modern jurisprudence in terms of disorder and nonlinearity parameters. As a result of this theoretical examination, chaos theory was found to become a new theoretical model developing in the scope of postmodern paradigm which can be an alternative to pro-order, linear and deterministic character of modern paradigm. It was also analyzed the possible availability of some chaos theory basic principles such as butterfly effect, bifurcation, entropy and irreversibility in examining what kind of legal problems.

Keywords

Chaos Theory, Modern Jurisprudence, Postmodern Paradigm, Disorder, Nonlinearity.

ÖZET

Kaos Teorisi ve Modern Hukuk Bilimi:**Düzen ve Doğrusallık Parametrelerinin Yapı Sökümü Üzerine Bir Deneme**

Kaos teorisi, dinamik sistemlerin düzensiz ve doğrusal olmayan davranışlarının analizinde önemli bir boşluğu dolduran yeni bir yaklaşım modelidir. Son zamanlarda teorinin fen bilimleri gibi sosyal bilimler için de oldukça kullanışlı bir teorik ve metodolojik çerçeve sunduğu fark edilmiştir. Buna istinaden, bu çalışma kaos teorisinin düzensizlik ve doğrusal olmama parametreleri bakımından modern hukuk bilimine olan katkılarının teorik bir analizini yapmayı amaçlamaktadır. Bu teorik incelemenin bir neticesi olarak kaos teorisinin modern paradigmanın düzenden yana, doğrusal ve determinist karakterine alternatif olabilecek postmodern paradigma kapsamında gelişen yeni bir teorik model olduğu saptanmıştır. Çalışmada aynı zamanda kaos teorisinin kelebek etkisi, çatallanma, entropi ve geri dönüşsüzlük gibi bazı temel prensiplerinin ne tür hukuksal sorunların incelenmesinde olası bir imkan olduğu analiz edilmiştir.

Anahtar Kelimeler

Anahtar Kelimeler

Kaos Teorisi, Modern Hukuk Bilimi, Postmodern Paradigma, Düzensizlik ve Doğrusal Olmama.

1. INTRODUCTION

Chaos has become one of the most popular concepts, nowadays. It brings to mind some words such as “randomness”, “anarchy” from colloquial language when it is first pronounced. Conversely, in science, it is considered as a new discipline describing unpredictable complex behaviours in dynamic systems. Originally, because the term of chaos represents “disorderliness”; it, in an interestingly way, is expressed as “order of disorder”. Theoretical physicist Jensen, who presented the best description about the subject according to Gleick, describes chaos as “disorderly and unpredictable behavior of complicated nonlinear dynamic systems”¹. Parallel to these, chaos theory is assumed to be born for being explained of disorder, complex, random and nonlinear changes occur in cosmos’ transformation which is disregarded from modern paradigm that move towards a new paradigm shift, which emphasizes the possibility of aforementioned. Hence, chaos has gained a considerable reputation with the multivariate deterministic explanation of nonlinear dynamic systems. Additionally, chaos dealt with the cause and effect of disorder and putting forward the notion that small shifts at initial point may cause great results, namely, butterfly effect. In this context the theory of chaos, described in the framework of postmodernity that emerged on the basis of the critique of the modern paradigm, has brought a whole new perspective for the science the value of the review has been observed in this study.

These revolutionary ideas on chaos emerged at first in natural sciences such as notably physics², mathematics³ meteorology, computer science⁴, engineering and biology⁵ made a tremendous impact in other disciplines, as well. That kind of developments characterized as an important step on behalf of science, made their presence felt in social sciences areas including sociology, psychology, economics⁶, education, management⁷, and political science⁸. Chaos provides great facilitations for social sciences; this is because society is a complex structure, composed of many factors interacts including natural events. Hence, it is substantially functional in examining disorder,

1 GLEICK, James, **Chaos**, (Trans: F. Üçcan), TUBITAK, Popular Science Books, Ankara, 1995, p. 16.

2 **Chaos Theory Simplified**, <http://www.physicsplanet.com/articles/chaos-theory-simplified>, (Access date 1.11.2015).

3 **Chaos Theory**, <http://www.scienceclarified.com/Ca-Ch/Chaos-Theory.html>, (Access date 11.1.2015).

4 LETT, Margaret, “A Case for Chaos Theory in Nursing”, **Australian Journal of Advanced Nursing**, Year: 2001, Volume: 18, Number: 3, (pp. 14-19), p. 14.

5 PAMUK, Nihat, “Determination of Chaotic Time Series in Dynamic Systems”, **Journal of Balikesir University Institute of Science and Technology**, Year: 2013, Volume: 15, Number:1, (pp. 78-92), p.79.

6 KIEL, L. Douglas/ELLIOT, Euel W. (Eds.), **Chaos Theory in the Social Sciences, Foundations and Applications**, University of Michigan Press, Michigan, 1997, https://books.google.com.tr/books?id=K46kkMXnKfcC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false (Access date: 1.11.2017).

7 AKBABA, Sadegül/ALTUN, Arif, “Chaos and Management”, **X. National Congress on Educational Sciences** (7-9 June 2001), Abant İzzet Baysal University, Bolu, 2001, p.1.

8 PLAZA y Font/JOAN Pere/DANDROY, Regis, “Chaos Theory and its Application in Political Science”, **IPSA-AISP World Congress**, (9-13 July 2006), Fukuoka, Japan, 2006, <http://hdl.handle.net/2078.1/176425> (Access date: 19.11.2017).

complexity and nonlinear functioning due to numerous factors influencing societal life. Yet, as suggested by Rockler many human systems are the best explained by chaos theory⁹. Amongst the social sciences, many things have made legal science as an outstanding subject for chaos theory.

Legal science is an umbrella term which is named in different terms at the same time. In this study, legal, modern legal discipline and mostly synonym of them “modern jurisprudence” stamped out by the modern science paradigm, which is based on the thought of enlightenment are preferred. Among the reasons for using of this philosophical concept of modern jurisprudence, there are also based on a social and cultural foundations. Besides, it is possible to see the similar usage in the Penner and Melissaris’s McCoubrey & White’s Textbook on Jurisprudence. Therefore, here, the contributions that the chaos theory will provide into the modern jurisprudence via post-modern critique of the law will be evaluated¹⁰.

Firstly, modern jurisprudence’s deterministic structure offers the possibility for discussion of chaos theory. The significance of this study is based on this opportunity. For this reason, exploring the application possibilities of chaos on the basis of modern jurisprudence, is of great importance. Accordingly, this research aims to determine the functionality of chaos theory in modern jurisprudence. Secondly, modern jurisprudence and legal systems search for a solution to disorders in society by starting point of order assumption. To find whether chaos is useful framework for modern jurisprudence, in order to observe disorders in society refers to another important target of this work. Thirdly, it is also intended to discuss the validity of nonlinearity for legal systems in the context of chaos theory. Briefly, this study aims to research the conditions that regulate societal relations and maintain order benefits from chaos theory in legal. But it will be beneficial to deal with the significant outlines of chaos theory at first.

1.1. The Significance of Chaos Theory for Modern Jurisprudence

Chaos theory is a fairly new subject in modern legal discipline. The reason of relatively late entry of chaos theory into modern jurisprudence is possible to base on its wrong perception; namely, chaos is considered as a stray disordered and impaired structure. In fact, chaos theory is a theoretical model aiming to find the disorder created by order and cannot be separated from the notion of order. In another words, the concept of order is not rejected by chaos theory but the establishment of an ordered system-organization after the emergence of disorder. Despite that one must accept the fact that disorder and instability dominate the relations in society rather than order and balance. If it is not accepted so, it would be ignored its existence purpose of legal in the society or its function within the societal system. Then, in order to analyze disorder and instability at the theoretical and practical platform chaos theory must be considered by

9 AKBABA, Sadeğül/ALTUN, Arif. **2001**.

10 PENNER, James/MELISSARIS, Emmanuel, **McCoubrey & White’s Textbook on Jurisprudence**, 5th Edition, Oxford University Press, Oxford, 2012, p. 250.

the modern jurisprudence. Accordingly, Scott suggests that all systems including legal systems are unpredictable and unstable. Chaos theory at the beginning level means the acceptance of instabilities and disorders in our legal system¹¹. More clearly, since a legal system or legal order, which is completely abstracted from disorder, is out of question, only lesson worth learning is that searching for a just legal order is a false hope and chaos is inevitable, as Scott stated. However, chaos theory has an extremely deep and powerful insight¹². Then, in some situations, where order and disorder coexist, mutual friend of chaos and justice can be said that is order. By means of chaos theory, modern jurisprudence may obtain an opportunity to examine the variable nature of the system by accepting the existence of disorder and contradictions in legal system. Thereby, it can have a new order understanding, which flourishes on a balance that is shaped by (dis)order, complexity and uncertainty.

What kind of order emerges from disorder or which sort of disorder creates orders that are questions can answer the reasons of modern jurisprudence 's utilization of chaos theory. Then, the existence of order is the only possible dialectic platform distinctive for chaos theory and with the shift towards a new order by organizing current order factors within disorder. At this point, order, which is left in the arms of a mysterious uncertainty, arises not as a result of disturbance or an aimless progress but as a result of a secret transformation towards a new structure with inner consistency. "Like the order that miraculously appears from the disorder of nature, so too, a deep structure exists in legal"¹³. Scott, who states that justice paradox is like overly repeated no identical patterns of an oscillating pendulum¹⁴, emphasizes that each pattern different in scale and dimension is a dynamic system that is similar to former but different in scale. According to him, the phenomenon of pattern shaped by unpredictable and disorder human behaviors, are the reality that makes it easier for us to accept the inevitability of paradox in justice. In this respect according to Scott, who reminds us not to lose our hope, justice has fundamental contradictions and legal paradox that keeps our justice system alive is dynamic. Repeated patterns that teach us ourselves as a society, order in chaos are a major transformation process¹⁵. Order creator or regulator function of the legal is still protected despite current pattern facts shaped by disordered human behavior and justice paradox.

One of the issues started to be discussed in the modern jurisprudence with the chaos theory is the notion of nonlinearity. Thereby, modern jurisprudence, like the other social sciences tends to face nonlinear functioning because of the complex nature of societal relations. Moreover, as Scott mentioned, legal is not a linear transformation

11 SCOTT, Robert E., "Chaos Theory and the Justice Paradox", *William and Marry Law Review*, Year: 1993, Volume: 35, Number: 1, (pp. 329-351), p. 348.

12 SCOTT, 1993, p. 349.

13 SCOTT, 1993, p. 349.

14 SCOTT, 1993, p. 350.

15 SCOTT, 1993, p. 350-351.

process, this equation cannot be solved. In order to overcome new dilemmas, it goes back, transforms and redefines old concepts. This nonlinear situation is a tendency close to the description of chaos theory, which is seen as it was drafted almost together with justice paradox¹⁶. Likewise, this tendency can be observed in the nonlinear interaction processes between input and output transformations in contemporary legal systems. Because, this kind of systems are legal orders of complex societies, in which diverse and fast socio-economic and technological developments interact in a nonlinear feedback process.

Chaos theory, in which predictability and therefore controllability decrease, characterizes unpredictability of results at least for a while as a result of the imbalances between input and output processes in nonlinear dynamic systems and feedback. Likewise, Scott¹⁷, characterizes of chaos as the idea of inability to predict what will be the laws of physical world. Uncertainty or unpredictability resulted from nonlinear relations in legal area may happen in two separate dimensions: First one is the obscurity of what kind of a course will relations of legal have at the level of system with societal structure. The second is the unpredictability of what kind of effects will practice of rules and decisions have on society. Because predictability, a function of linearity, is a result of simple determinist relations' analysis; both uncertainty conditions, which are the results of nonlinear relations in modern jurisprudence, can be analyzed within the scope of chaos theory.

2. METHOD

In this study, chaos theory is approached as a new theoretical both model and method that can present important clues to modern legal discipline in examining order of disorder and nonlinear possibilities. In order to determine the contributions of chaos theory to modern jurisprudence, data obtained from current literature and a rational inference method, in which induction and deduction levels were used together and benefited. Because, it is a known fact that there is a mutual connection between induction and deduction, both of which we think must be used together in rational inference analysis. Thus, deduction is composed of the phases of induction of general principles from observations first and then deduction of observations based on general principles when examining nature. In other words, deductive method is one of the valid scientific inference methods used generally in systemizing all appropriate results in order to infer in a more consistent manner after the accumulation of empirical data and interpretation of that empirical data in a theoretic manner¹⁸. The study, in which a circular course was followed in using both levels of approach, was conducted in a framework that completes two different dimensions of rational inferences.

16 SCOTT, 1993, p. 350-351.

17 SCOTT, 1993, p. 330-331.

18 **What is Deduction, Deduction Types, and Historical Development**, <http://www.baktabul.net/felsefesosyoloji/131665-tumdengelime-deduksiyon-nedir-tumdengelime-cesitleri-tarihsel-gelisimi.html>, (Access date 1.11.2015).

Rational inferences based on deduction were carried out by availing of two inference methods of direct inferences -composed of one premise and one result propositions- and indirect inferences -two premises and one result propositions-¹⁹. Direct inferences are reasoning's that mind performs by directly inferring without any proposition other than the first one. For example, a mind can infer the result of "some livings are human" without requiring any intermediary proposition against the proposition of "every human is living." Indirect inferences are the reasoning way when a mind benefits from another proposition after the first one; therefore it is composed of minimum two premises and one result proposition. For example, it characterizes as such, "human are mortals", "Socrates is human", and "therefore, Socrates is mortal"²⁰. In this study, where main principles of chaos theory and nonlinearity with order principle are tried to be transferred to modern jurisprudence via rational inference, two main goals, which follow each other incrementally, are pursued: The first goal of this study is to determine the contributions of chaos theory, which opens up a new and different horizon to legal discipline in 21st century's science understanding. The second one is to examine the shifts occur in approach styles regarding order and linearity of modern jurisprudence within the scope of chaos theory. Generally, in the line with these main goals, what kind of innovations does main concepts of chaos bring to justice, how it can be used in solving theoretical and methodological problems of modern jurisprudence and how does the shifts chaos theory caused in order and linearity approaches reflect to legal discipline can be regarded as the questions, whose answers are searched. In order to search for the answers of aforementioned questions, it was tried in this study to analyze primary problematic of legal discipline within the scope of main principles of chaos theory in a descriptive manner.

3. A BRIEF HISTORY OF CHAOS THEORY

Although chaos theory looks like a discovery of this age, has a long history, whose roots reach to Ancient Greece. The etymology of chaos word, which is used to describe the not complexity but "flexible space" before cosmos, goes back to the stories of Hesiodos' Theogonia in Greek Mythology of 8th centuries B.C.²¹. In this mythology "Khaskein" means "space, openness, flexible space" in terms of derivative, was explained as a space and huge abysm before world order, -cosmos-²².

19 (What is Deduction, Deduction Types, and Historical Development).

20 (What is Deduction, Deduction Types, and Historical Development).

21 AKALIN, Esin, "Chaos in Mythology", II. National Symposium on Chaos, Logic, Mathematics and Philosophy, (21-24 September 2004), İstanbul Culture University Publications, Number: 49, İstanbul, 2004 (pp. 21-30), p.21-22.

22 DÜRÜŞKEN, Çiğdem, "An Etymological Analysis of Chaos and Cosmos" II. National Symposium on Chaos, Logic, Mathematics and Philosophy, (21-24 September 2004), İstanbul Culture University Publications, Number: 49, İstanbul, 2004 (pp. 5-11), p. 5-6.

The entry of chaos theory into modern science history happened²³ in the 18th century²⁴. The studies contributed to the development of chaos theory at first were related to physics, mathematics and space sciences. As an early proponent French mathematician J. Henri Poincaré contributed to chaos with interaction amongst three planets about gravitational laws in the 1890s²⁵, as well as topology and dynamic systems²⁶. In 1898 Jacques Hadamard, developed a mathematical model named geodesic flow²⁷; in his influential study Hadamard's Billiards. Later studies on the topic of nonlinear differential equations were carried out by G. David Birkhoff, Andrey N. Kolmogorov, M. Lucy Cartwright and John Edensor, Littlewood inspired by physics, except for Stephen Smale. Even though there have been some initial efforts on chaotic behaviour before; thanks to some early chaologists American physicist Mitchell Feigenbaum, the Polish-born mathematician and inventor of fractals Benoit Mandelbrot, American mathematician James Yorke and the American meteorologist Edward Lorenz, "chaos" became formalized in the twentieth century²⁸.

Although Poincaré, renowned for his work on dynamic systems, is accepted as the father of chaos, it is suggested that meteorology professor Edward Lorenz of MIT made the most important contribution²⁹. Edward Lorenz, known as early pioneer of chaos was working on weather predictions in 1961³⁰ and also³¹ discovered the fundamental principles of chaos theory, such as the butterfly effect³² likewise, attractors by giving graphic description of his findings using his computer. Contemporaneously, Benoit Mandelbrot started to his studies in 1963 but it published in 1982 *Geometry of Nature* became a classic of chaos theory³³.

23 KENDİRLİ, Selçuk, "Chaos Theorem in Portfolio Management." **İstanbul Culture University Journal of Physical and Engineering Sciences**, Year: 2006, Volume: 4, Number: 2 (pp.171-180), p. 173.

24 YARDIM, Funda E./AFACAN, Erkan, "The Simulation of a Chaotic Communication System by Using Lorenz-based Differential Chaos Shift Keying (DCSK) Model." **Gazi University Journal of the Faculty of Engineering and Architecture**, Year: 2010, Volume: 25, Number: 1 (pp. 101-110), p. 102.

25 **Chaos Theory**, <http://www.scienceclarified.com/Ca-Ch/Chaos-Theory.html>.

26 **Chaos Theory**, <http://www.referenceforbusiness.com/management/Bun-Comp/Chaos-Theory.html>, (Access date 1.11.2015).

27 OESTREICHER, Christian, "A History of Chaos Theory", **Dialogues in Clinical Neuroscience**, Year: 2007, Volume: 9, Number: 3 (pp. 279-289), <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3202497/>, (Accessed date 1.11.2015).

28 **Chaos Theory**, <http://encyclopedia2.thefreedictionary.com/Chaos+theory> (Access date 1.11.2015).

29 ÖGE, Serdar, "Order or Disorder (Chaos)? An Evaluation for Sustainability of Organizational Integrity" **Selçuk University Journal of Social Sciences**, Year: 2005, Volume: 13 (pp. 285-303), p. 287.

30 URAL, Şafak, "Chaos of the Cosmos." **II. National Symposium on Chaos, Logic, Mathematics and Philosophy** (21-24 September 2004), İstanbul Culture University Publications, Number: 49, İstanbul, 2004 (pp.353-363), p. 356.

31 **Chaos Theory Simplified**, <http://www.physicsplanet.com/articles/chaos-theory-simplified>.

32 **Chaos Theory**, <http://www.referenceforbusiness.com/management/Bun-Comp/Chaos-Theory.html>.

33 OESTREICHER, 2007.

Another major contributor to chaos theory Mitchell Feigenbaum a physicist, offered the scenario as known "period doubling to defining the transition between a regular dynamics" on chaos at Los Alamos National Laboratory in 1974³⁴. M. Feigenbaum with his proponent article "Quantitative Universality for a Class of Nonlinear Transformation" also described logistic maps. Following, The New York Academy of Sciences organized the first symposium on chaos attended by the Belgian physicist David Ruelle -coined the term "strange the scenario as known "attractor" by studying this figure-³⁵, Robert May, James A. Yorke, Robert Shaw and the meteorologist E. Lorenz, in December 1977. Besides, Ilya Prigogine, winner of the Nobel Prize in 1977 and Isabelle Stengers in their famous book, *Order Out of Chaos*, were discussed unexpected synthesis of order and chaos in classical science³⁶.

James Gleick, a French mathematical physicist, published in 1987 *Chaos: Making a New Science* introduced the general principles of chaos theory as well as its history to broad public. This new theory has led to the emergence of an anti-modern paradigm upheld by Gleick³⁷. Another theorist, John Briggs in *Fractals: the Patterns of Chaos*, discusses chaos science and fractals mechanically interacting fragments driven by mechanical laws, but a world that is alive, creative, and diversified³⁸.

4. MUTUAL FRIENDSHIP ZONE OF CHAOS AND LEGAL: (DIS)ORDER

Chaos is associated with disorder as of its word meaning and because it is expressed as the "order of disorder", it can be said that it has a complex relation between chaos and order. Thus, five fundamental propositions, characterized chaos theory regarding the order, are mentioned in current literature:³⁹

1. Order creates disorder.
2. There is an order within disorder course as well.
3. Order derives from disorder.
4. Reconciliation and dependency of the new order show themselves briefly after the shift.
5. Generated new order develops towards and unpredictable direction via a process that is organized by itself.

In the hypotheses above, order and disorder are explained as processes, which cannot be considered separately and in fact complete each other. The expression "chaos is in order, order is in chaos"⁴⁰ emphasizing a direct interaction between chaos and

34 **Chaos Theory**, <http://www.referenceforbusiness.com/management/Bun-Comp/Chaos-Theory.html>.

35 OESTREICHER, 2007.

36 PRIGOGINE, İlya/STENGERS, Isabelle, **Order out of Chaos, Man's New Dialogue of Nature** (Trans: S. Demirci), İz Publishing, İstanbul, 1998.

37 GLEICK, James. **Chaos: Making a New Science**. Penguin Books, New York, 1987.

38 MACKEY, Linn, **Is Chaos Theory Postmodern Science?**, <http://reconstruction.eserver.org/Issues/044/mackey.htm>, (Access date 1.11.2015).

39 KENDIRLI, 2006, p. 173.

40 **Chaos Theory, Part 1**, <http://members.tripod.com/MustafaCemal/Articles/KAOS/Kaos1.htm>, (Access

order which can coexist in the same system, are accepted as interpenetrated situations. In other words, chaos expresses the order in disorder. Hence, instead of the denial of order in chaos, it is possible to find the transformation, expressed as the order of disorder. On the other hand, as Laszlo contacted as well, shift of chaos into a kind of order in most of the complex systems⁴¹ is witnessed. Accordingly, no matter how big a disorder and complexity arises in a structure, consequently it is emphasized that either progress towards a new order, in which new elements occurred in the process organize or shift towards a new order as final are possible. Namely, chaos points to an order based on a sensitive balance rather than disorder; it cannot be characterized as the symbol of a drift that is disorganized and moves towards an uncertainty without any goal. Overlooking the secret meaning or initial condition of this shift, disengagement from the past occurred in the system and swift progress towards an unpredictable point can be said to be an effective factor in perceiving as a drift towards disorder. In other words, chaotic shift occur in the system does not happen in a disorganized manner but acts in accordance with a secret goal and inner consistency.

Because there are not so many things that lessen since the creation of cosmos -at least physically-, it would not be wrong to think that new and old factors constantly replace each other, which means all factors fulfill their creation duty in accordance with their already coded creation goals during the renewal process. Operating through reorganization of all factors that act in accordance with the purposes attributed to them in order to create a new order can be qualified as the most obvious proof of this. It is seen in this respect that the terms attractor and fractal, which has an important place in chaos theory, are extremely useful conceptual tools in explaining the interaction between order and shift. Because attractors are the creations that emerge during the process of shift and function as power groups that leads shift to way hard to predict. Considering the fact that the term fractal characterizes the repetition of all disorder piece and pattern in the cosmos in unlimitedly waning scales, when each of those replaced pieces enlarged they give the entirety of the object, it can be seen that chaos organization is not a disorganized and disorderly structuring at all. Therefore, this principle based on harmony and similarity between part and whole, is accepted to be notably functional in explaining the order in chaos.

Justice is essentially associated with rules and societal order aimed to establish by these rules. In an explicit manner, justice is accepted as the representative of the rules in effect in terms of institutions and assurance of peace and trust environment. It can be said that justice must strike at two dimensional balance in societal life, namely restoring the public order and protecting individual rights and freedoms. Because of justice's attention on order, it must be expected to be the first institution that will be engaged in chaos in that it brings a new alternative point of view to societal order. Forwhy

date 1.11.2015).

41 LASZLO, Ervin. **Die Neugestaltung der Vernetzten Welt: Global Denken - Global Handeln**, (Trans: İ. S. Canbolat), 3rd Edition, Nobel Publications, Ankara, 2004, p.52.

as Mitrović stated, chaos theory is a notably young discipline that aims to research and explain disorderly behaviors such as discovering order in disorder. Chaos theory is skeptical towards the settled beliefs and scientific assumptions about only order rules to the world and therefore, it does not deny order due to disorder and examine the order in the nature of disorder via special, fundamental mathematical methods and computer programming techniques. Such a goal of chaos theory may be easily accepted in justice, because disorder behavior and disorder processes are available in a remarkable manner in justice along with the ordered behaviors and processes. Thus, chaos theory is a fact and system especially benefited by justice for research and practice⁴². Accordingly, in order to develop an ordered societal structure and individual behaviors, justice is required to benefit from chaos theory in examining the disordered ones. Chaos theory seems to a good theoretical model that by understanding the nature of disordered, anomalous and criminal behaviors contributing to modern legal discipline in discovering possibilities of order in disorder or reasons of disorder in order.

Opportunities for legal discipline to benefit from chaos theory as Mitrović stated, can be expressed as a whole when it is understood that chaos is not the same thing with imbalance and this chaos may imply the existence of organization and order. Therefore, chaos does not only mean the impairment of a fact, a system or an organization, but also means the establishment of a system organization by means of randomness and disorder⁴³. According to Aronne, who presents a similar approach, despite the fact that chaos is sensitive to system's beginning conditions that were originally coded, other less intense scientific elements that construct respective action and discourse that uncovers it, chaos contains the notion that it has a determined structure a priori⁴⁴. Thus, as stated before, chaos and order, which is an inseparable couple, are not partners with complexity and imbalance but with order. In this respect, chaos focuses on the research for possibilities of a transition from disorder to order. Moreover, disorders cannot be shown as the main reason of chaos. As Aronne emphasized, chaos may emerge from determination and it can be observed that variations in such cases derive from the abundance of subject⁴⁵. Consequently, even during the times, when all systems have a determined structure, the possibility of their chaotic tendency is emphasized.

According to the fundamental approach of chaos theory, almost everything in the cosmos is chaotic. Even a number of facts and incidents, whose linearity and predictability are considered precise, may show a chaotic display in time. Moreover, as stated before, it is not an easy task to determine the direction of shift in chaotic systems. Even in the situation where all the components of a system can be known, not the direction of

42 MITROVIĆ, Dragan, "The New Path of Law, from Theory of Chaos to Theory of Law", **Law and Politics**, Year: 2001, Volume: 1, Number: 5 (pp. 605-612), p. 605.

43 MITROVIĆ, **2001**, p. 607.

44 ARONNE, Ricardo, "An Introduction to the Juridical System, Private Law and Chaos, Summary Prisms of a Research on Civil-constitutional Law", **IX. International Chas Conference**, 2006, <http://bdjur.stj.gov.br; https://core.ac.uk/download/pdf/15997192.pdf>. (Access date 1.11.2015), p.13.

45 ARONNE, **2006**, p. 13.

a possible chaotic shift but in which possibilities it will move can be predicted. However, this time, uncertainties in the infinity of this shift's happening possibilities are faced. Power groups that lead to transform in a certain direction to these chaotic systems, which moves in accordance with various possibilities instead of precise rules as stated before, are "attractors". These attractors in question provide an opportunity to have information on the path shift will follow as well as determination of centers that leads shift. According to this approach of chaos theory on shift, justice, which provides a relatively linear and determined system structure can show a chaotic shift. As is known, legal rules are accepted as relatively stable and slowly changing elements in society because they are based on norm and values structure of society. Moreover, a shift, disorder or complication occurred in societal structure and relations can reflect directly on legal structure. In other words, even the occurred complexity is not a problem regarding directly legal structure; it can turn into an issue that interests it through the general structure of society and inter-institutional relations. At this point, it can be said that the outcome of justice can be determined as the result of shift groups mentioned above in other words leading possibility of it by attractors and predictions on how a path of shift will follow.

5. FROM ORDER FRIENDLY LINEARITY TO NONLINEAR LEGAL ORDER

Chaos is a formation that has meaning in the nature of nonlinear systems. Because a harmonized relation between cause and effect in linear systems supports order, there is no need to worry about a chaotic situation. However, there is not a simple linear relation between input and output processes of nonlinear, complex systems and possibilities of either chaos or order take place in a relatively less complex platform because there is a circular relation. In other words, it is not possible to precisely predict the results because there is not a simple and linear function of obtained results and used inputs⁴⁶. In a nutshell, according to chaos theory, it is not possible to precisely predict the conditions in past or future because of the nonlinear relations⁴⁷.

Then, it doesn't seem possible explaining the unpredictability of shift, which is complicated because of the relations in nonlinear systems, with classical determinism, either. Hence, it is obvious that uncertainty or unpredictability in nonlinear systems created by imbalance of input and output processes in the system and linear structures with their periphery will lessen the prediction and control power of modern paradigm. In that regard, because legal systems constitute one of the best examples of linear systems, chaos theory is thought to have significant theoretical and methodological principles in explaining its location within nonlinear relation systems that is formed with societal environment.

46 ÇORBACIOĞLU, Sitki, "Socio-technical Systems which is Self-adapted the Changing in Their Environments and Disaster Management" **TODAI**, *Journal of Contemporary Local Governments*, Year: 2005, Volume: 14, Number: 2 (pp. 43-60), p. 10 cited from URI, Merry, **Coping with Uncertainty**, Praeger Publication, Westport, 1995.

47 ÇORBACIOĞLU 2005, p. 10 cited from KOÇEL, Tamer, **Business Management**, Beta Printing Inc. Company, İstanbul, 2003.

Determinism, explicating a world governed by a lawful order with the predictability in modern science⁴⁸, gained a whole new dimension by means of butterfly effect principle among the priorities of chaos theory. The butterfly effect, known as sensitive dependency to initial condition, is represented by a metaphor for the wing flap of a butterfly in Beijing affecting the weather in New York. This model developed by Lorenz, requests to be gone beyond the determinist understanding in comprehending the incidents of physical world. This tenet of chaos is considered almost everything briefly the cosmos with a whole new point of view⁴⁹. This different determinism understanding seems like an approach style that can be easily applied to the theoretic and practical problems of law. For example, according to Scott, explicit application of the butterfly effect, tiny differences in initial variables may cause major shift in final results principle, makes it clear that even tiny differences in case realities would wildly separate case results from each other. Disorder is inevitable in both conditions⁵⁰. Likewise, it can also be mentioned that initial conditions that seem insignificant during drafting a constitution and legislation processes may cause unpredictable and striking results on subsequent times and conditions. On the other hand, legal qualifications, practice difficulties and suitability for societal structure of constitutional provisions and laws, which are shaped in accordance with initial conditions, may cause unpredictably major shifts in the society at oncoming times. Predictions regarding which direction will that shift occur or what will be the direction can be envisaged to be made through bifurcation possibilities.

The reason of the fact that modern paradigm relatively allows the analysis of linear relations as well as the almost strong determinist nature of legal systems may have caused the dismissal of nonlinear dynamic systems in legal area. This condition in question, as Aronne mentioned, proves the mistake of obvious simplification in all modern sciences by traditional theory. The intellectual effort of modern jurisprudence is only the official parameters of consistency. This condition arose as a result of Kant's and metaphysics' direct effect⁵¹. In other words, this simplifier approach has limited the modern jurisprudence into engaging with only linear functioning as well as other disciplines. The linearity principle in modern paradigm is used widely in system analysis in this respect but in real life, as as Gleick point out everything is not linear as we are thought⁵². Beyond this, Aronne argues that nothing is linear. Moreover, linearity is tried to be obtained with difficulty in certain condition⁵³. Justice is similar to life. Its linearity is naturally recognized with difficulty. Linearity is a model that is common in an

48 WILLIAMS, Christopher R./ARRIGO, Bruce A., **Law, Psychology and Justice, Chaos Theory and the New Dis(order)**, State University of New York Press, Albany, 2002. (Access date 1.11.2015), <http://www.sunypress.edu/p-3467-law-psychology-and-justice.aspx>, p. 20.

49 URAL, **2004**, p. 356.

50 SCOTT, **1993**, p. 348.

51 ARONNE, **2006**, p. 18.

52 GLEICK, **1995**, p. 67.

53 ARONNE, **2006**, p. 18.

environment isolated from others. For example, laboratories and legislation activities⁵⁴ are the most obvious examples of this. While legislation work performs in a relatively controlled environment with certain conditions, societal relations, which are the subject of justice, occur in a relatively uncontrolled, nonlinear and dynamic environment. Therefore, it is obvious that chaos theory will fill an important gap in legal area with the opportunities that provide for the analysis of interaction between the nonlinear systems and dynamic relations.

Chaos theory was born as a product of postmodern reasoning, which emerged with the criticism of modern⁵⁵ science⁵⁶. In other words, it has emerged a whole new post-modern legal understanding that is substantially different from modern legal reasoning with the chaos theory. As a matter of fact, according to T.R.Young, routines, rationality and uniformity gained importance in functioning of modernist judicial systems within the scope of "nonlinearity" principle. According to modern justice, irrationality and disorder is strong during nonlinearity. Postmodern judicial systems, which are based on chaos and complexity include creativity and diversity during both legislation and entry it into force⁵⁷. It is impossible to see nonlinearity as the fundamental reason for disorder and irrationality in modern justice as well as stated by Young to objectifying orders and rationalities modern judicial system requires⁵⁸. As a matter of fact, just as there are not two criminal cases completely identical to another, there are not two police officers, who will respond to a job in an identical manner. There are not two judges, who will give the same verdict on the same problem. Likewise, there are not two jury members, who will reach completely the same judgment on a murder, rape and theft action as well as there are not two prisons that will deal with a convict completely in accordance with the court. Therefore, diversity is a piece of human life process and a type of modern judicial system with rationality requirements is possible⁵⁹. Even though they are sure of what they are doing, these are not special conditions that change the trial. It is not that sameness and similarity is impossible although they are impossible. It is rather that mercy, forgiveness, clemency and acceptance are larger, more powerful recourse to transcending justice⁶⁰. In this respect, the thing that contradicts to linearity is the condition of some criminals doesn't respond to mercy and forgiveness. All criminals will act in an irrationality of helping the society such as weakness and exploitation possibilities

54 ARONNE, 2006, p. 17.

55 MACKEY, (Is Chaos Theory Postmodern Science?)

56 ERDEMİR, Erkan, "The Effects of Postmodernism on Business Management: A Conceptual Analysis", **e-Academy Journal**, Year: 2006, Volume 52 (June), <http://www.e-akademi.org/makaleler/eerdemir-1.htm> (Access date 1.11.2015).

57 YOUNG, T. R, **A Constitutive Theory of Justice: Architecture and Content**, The Red Feather Institute, Year: 18 September 1996- 26 June 1997, <http://www.critcrim.org/redfeather/journal-pomocrim/vol-1-intro/004constjustice.html> (Accessed date 1.11.2015).

58 YOUNG, 1996-1997.

59 YOUNG, 1996-1997.

60 YOUNG, 1996-1997.

sooner or later. Such a nonlinear respond in the discourse of forgiveness and rescue would still be appropriate most of the time for many people. Parents, friends, police, judges, wardens, teachers and the other obligors will make social control such nonlinear responses with good effect to the human project⁶¹. Despite this nonlinear creativity and diversity of postmodern justice practices, modern justice showed an approach, which is independent from societal institutions and values, functions as an unbiased, mechanical tool and rejects diversity with its rationality and is strongly opposed to nonlinear condition. Because, modern justice wishes the sustainability of a uniformed structure, in which laws are applied in a relatively rational manner. Therefore, determinist structure, which is based on relatively linear relations in making and applying legal, will be protected. Thanks to the advantages provided by determinist structure in terms of simple linear relations between incidents and their results, prediction and control claims of the system are sustained.

Diversity, which is rejected by linearity, contains variety between different systems just as the multiplicity of nonlinear systems within themselves. Similarly as Murphy stated⁶², there doesn't need to be a single set of laws binding everyone. In any event, such a system never existed. Hence, cohabitation of different systems is suggested to be possible by means of "nonlinear feedback" of chaos theory. As Young emphasized, chaos theory has another one of the most valuable lessons that propose the construction of postmodern legal and justice systems in a distinct manner, which is most diverse systems may engage in the same area in terms of time and place, only if the feedback among them are not linear. For example, in the USA, one can find to some seven or eight parallel and very different systems of justice; religious, political, economic, medical and psychological. While it may seem redundant and inefficient to have parallel justice systems and, may in fact, be so, still the possibility of co-existing justice systems is the best meets the human need for redemption, reparation, restoration and rehabilitation⁶³. In this respect, one of the interesting examples of nonlinear feedbacks in legal is related to the area of design-defect law, which can be evaluated within the scope of consumer rights. It is suggested that cohabitation of a vast diversity of design-defect tests used by state courts makes American products appear like chaos in liability justice. Because the states failed to develop a strong agreement on design-defect legal tests⁶⁴. It has emerged to different practice and decision making types as there is not a unity or agreement among states on proof measures and how they reflect on decisions regarding whether a product has design-defect. Complexity arisen from the diversity and relativity of these standards used in design-defect is characterized as chaos in

61 YOUNG, 1996-1997.

62 MURPHY, Robert P, **Chaos Theory, Two Essays on Market Anarchy**, Ludwig Von Mises Institute Publishing, Auburn, Alabama, 2010, https://mises.org/system/tdf/Chaos%20Theory_2.pdf?file=1&type=document, (Access date 1.11.2015), s.14.

63 YOUNG, 1996-1997.

64 VETRI, Dominick, "Order out of Chaos: Products Liability Design-defect Law", **University of Richmond Law Review**, Year: 2009, Volume: 43, Number: 4 (May), (pp. 1373-1457), p. 1373-1374.

design-defect law. Approach type in question, can be seen as a natural reflection of a point of view that adopts uniformity of modern paradigm.

As Young stated, modern justice presumes converge of all cultures toward one universal culture contained within a global political economy. The rich cultural inheritance of French, German, Japanese, Inuit and Russian blended and melt into one common ubiquitous culture in the modernist scenario. Given a modernist legal theory and justice system, that effort at sameness is constituted. In the pre-modern scenario, one religious tradition triumphs and all others are relegated to the dustbin of history as myth and superstition. It is not so in an affirmative postmodern architecture of justice. Thus, postmodern world tend everything to deregulation and privatization⁶⁵. Competing, contradictory and coterminous neighbour systems of marriage, politics, religion and economics can maintain their structures. It means to apply the different rules to different peoples as long as nonlinear feedback is honored for a five moments of practice. The emphasis on each moment can vary within a given social-life world as the degree of nonlinearity. Still, given nonlinearity, we might see Islamic peoples living side-by-side with peoples who embody Christian, Hindu, Buddhist and Jewish religions⁶⁶. In this respect, the condition that many different justice systems coexist for the linear systems are accepted as possible in nonlinear systems, which are defended by chaos and complexity theories.

Linear system in modern jurisprudence can be relatively functional for societal and legal order of the same kind. However, the presence of heterogenic groups of that have diverse belief, value and socio-cultural qualifications in postmodern societies requires that diverse justice systems' coexistence in certain conditions, thus it may cause lack linear functioning not to be functional. Because, as Young stated, modern and pre-modern justice systems insist upon one and only one way of doing marriage or gender. Given nonlinearity in a justice system, traditional marriage forms can exist side by side with very different forms of intimacy. If we use chaos theory to constitute our theory of justice and to make laws, we can retain the richest diversity, the rich legacy of ethnic and national cultures⁶⁷. Besides these advantages provided by chaos theory in analyzing nonlinear functioning, it also teaches the prediction and control efforts, which gets weaker and unsuccessful as more chaotic regimes appear. The vast effort to control the effects of racism, gender violence, class inequality and corporate hegemony over the production and distribution of essential social goods are, if social processes are indeed nonlinear, these efforts are doomed to failure⁶⁸.

Even though, modern legal systems are assumed to have a relatively determined structure, it is possible to evaluate the determination in functioning of these systems

65 BAUMAN, Zygmund, **Postmodernity and its Discontinuents** (Trans: İ. Türkmen), Ayrıntı Publication, İstanbul, 2000, p. 25-26.

66 YOUNG, **1996-1997**.

67 YOUNG, **1996-1997**.

68 YOUNG, **1996-1997**.

within two separate dimensions namely theoretical and practice. Since as Mitrović stated, legal presents a determined system, when, for instance, available series of rules on various legal actions is created. However, justice is an undetermined system during practice, because only a part of written things are actually practiced⁶⁹. Similarly, Aronne also suggests that law inoculates periphery's legal system the practice of ideal conditions laid down in the law text when the law is within a closed system. According to him, this law tries to construct itself as a sub-system in an entropic manner⁷⁰. In brief, it is point out that there have been significant differences between the theoretical conditions at the time of law making and the current conditions at the time of law's practices. Differences in question bring about an obvious diversity in practice. As Aronne emphasized again, there are causative variations even against the most determined jurisprudence. Such variations are possible at a macro level point of view. Nothing can be predicted and nothing is determined in current case law⁷¹. According to this, it cannot be said that fundamental assumption that modern justice systems have a relatively determined and uniformed structure is not validated at least in terms of law practice. Diversity resulting from the practice of a certain law on similar conditions shows that practical conditions of the law are not mechanical and predictable. Moreover, if a feedback between a society and justice system which is seen determined in theory but undetermined in practice happens in a nonlinear form, it may cause the fact that justice does not meet the expectations of society and therefore, it might cause an inconsistency between the justice system and society, and increase in society's disorders. Return of demands, which are sent as input to the systems by the society and cannot be met, back to the society again in the next step as output may create a turbulence effect in the undetermined legal system.

6. A CONTRIBUTION FROM TENETS OF CHAOS TO NONLINEAR LEGAL ORDER

Turbulence position which describes the dragging of a proper functioning linear system into a disorganized and overly disorganized structure or vortex can be observed under two separate categories namely structural problems in justice and extralegal practices. Structural problems in justice can be restricted when society is dragged into an overly disorganized structure by a number of malfunctions, which occur within both the structure and practice of legal system in force. Constitutional problems, difficulties in legislation and its practice, imbalances between crime and punishment⁷², dissuasive nature of punishments and malfunctions occurring in punishment system can be included within this category. All the activities which reject current judicial system and act against the

69 MITROVIĆ, 2001, p. 608.

70 ARONNE, 2006, p. 12.

71 ARONNE 1996-1997, p. 4.

72 PIPER, Barnabas, "A Justice Paradox: Sandusky's Conviction Doesn't Ease the Pain." **Byfaith**, Year: 2012, June 28, <http://byfaithonline.com/a-justice-paradox/>, (Access date 1.11.2015).

fundamental judicial principles such as rights, justice, equality and freedom or are conducted out of current judicial system can be arrayed under extralegal practices. A number of arbitrary judicial and political practices, which are out of the forms approved by current legal system and surpass their limit of authority, constitute good examples of extralegal practices. As the governments change in democratic societies, it is common for the activities within both legislative and executive approaches and activities to give such results. In other words, problems carried by system are referred with the structural problems in judiciary and practices against the system or out of system is referred with the extralegal practices. Problems in both categories may cause a legal system to go into turbulence at an unexpected time. The effect of turbulence may arise when legal institutions cannot meet societal inputs and demands in terms of aforementioned problems as well as with the legal regulations as a result of abolition of a number of dominant dynamics in societal structure. For example as Young stated, it well may be the case that the degree of uncertainty embedded in the number of attractor basins available in legal codes defeat the human need for change and renewal in that they forbid options which, in times of uncertainty, answer better to the human project than behaviors sanctioned by legal codes⁷³. At the same time, social policies which drive a society into deep chaos may well increase uncertainty so much that collective responses to common problems are displaced by privatized, short term responses such as theft, robbery, genocide, fraud and other behaviors hostile to human agency. For instance, the case of the IK people in north-east Uganda serves as point. They were forbidden to hunt game by the government which used their ancient hunting grounds as game preserve to attract tourists and foreign currency. The IK society collapsed; children abandoned or prostituted, elderly people were expelled, marriage forms collapsed⁷⁴.

Bifurcation concept, in terms of scientific use stands for sudden direction change for the evolution of systems. In the theorem of dynamic system, it is an environmental shift in the behaviors of mathematically designed systems during the move of an attractor group towards another. For example, a specific model created by the mobile situations around airstrip represents bifurcation⁷⁵. Bifurcations emerge from the drawing complex systems under excessive burden and order breaks down beyond sensitive spot in the system, which is relatively orderly so far and shows a periodic oscillation, and systems develop on chaos⁷⁶. In his work "*Die Neugestaltung der vernetzten Welt: Global Denken - Global Handeln*" Ervin Laszlo likens bifurcation to double-edged sword; one side is the source and reason of creative chaos and the other side alike the sword of Damocles hits to everyone in the way. Laszlo⁷⁷, who lists the forms of up-down in human communities that are not uncontrolled like in the nature as new life form,

73 YOUNG, 1996-1997.

74 YOUNG, 1996-1997.

75 LASZLO, 2004, p. 51.

76 LASZLO, 2004, p. 51.

77 LASZLO, 2004, p. 52-53.

alternative behavior model, ecological movements, pro-peace and other movements, states that as the confidence in dominant order decrease, these movements increase largely and become important factors that shape the future of society in short time⁷⁸. Similarly, according to Young, bifurcations in variables which trigger gender violence, racist crimes and crimes against workers and/or customers by corporations are case in point. If uncertainties in employment or income are key words to racist crime and gender violence, then in order to prevent these from exploding to fill the social space available to them, an affirmative postmodern justice system would, in the first instance, see to policy which stabilizes these at minimal value⁷⁹. Therefore, the possibility of prevention such bifurcations observed in linear legal systems by means of social policies come up. Moreover, Hubler's work at University of Illinois has shown, in principle, that even non-linear regimes can be controlled. It requires a light touch at the right time but, given wisdom and judgment, such intervention in the life of a family, in the routines of a school, in the habits of police officers and in the policies of a business may prevent large changes in juvenile delinquency, in ethnic violence, in vandalism or in consumer fraud⁸⁰.

Bifurcations also may occur within the complex nature of systems and decrease of harmony relationship of legal and societal systems with the progress of legal system and incidents towards disorder by exceeding ordinary functioning limit through suddenly changing directions. For example, it is probable for a number of serious bifurcations to occur in societal structure in certain conditions of unable to strike a balance between the weight of committed crimes in judicial cases and given punishments, which is better known as lack of dissuasive manner in punishments and decrease of legal's sanction power. Legal regulations on terror, blood feud, violence against women, honor killings and division of property in marriage in Turkey can be displayed as improvements recorded by bifurcation of a number of societal problems. However, intervention by political authority to judiciary may cause a bifurcation within legal system. Getting ahead of equality principle of law by social class factor can be displayed as another bifurcation precedent. Similarly, according to Laszlo, in our world, where interdependency technological progresses prevail, there are so many things in danger that we cannot let coincidence take its course for the results of bifurcations. If future bifurcations are not predicted and directed in a conscious manner, they can ruin the whole humanity. They can lead to more injustice, asymmetrical interdependency and tiny controversies may spread the giant fires all over⁸¹. Therefore, in order to protect current legal order, it seems obligatory to consider bifurcations on essential legal concepts including right, equality, freedom and fundamental human rights that will remove the tensions to prevent society from dragging into chaos. Failing to prevent impairments caused by bifurcations

78 LASZLO, 2004, p. 53.

79 YOUNG, 1996-1997.

80 YOUNG, 1996-1997.

81 LASZLO, 2004, p.52.

in legal system or control them intensifies the possibility of impairment of legal systems increasing the possibility of direction towards an entropic order.

Second Law of Thermodynamics (entropy), accepts that in due course, all systems left by their own in natural conditions in the cosmos will move towards disorder and impairment in a directly proportional manner. For example, when a car is left in the middle of a desert and its condition is checked after some months it would be observed that it has flat tires, broken glasses, rusted hood and rotted engine. Second Law of Thermodynamics, also known as Entropy Law, is the measure of disorder in physical equations and calculations. Entropy Law accepts that the whole cosmos always moves towards a structure irreversibly a more disordered with no plan⁸². As the entropy increases, predictions become harder. As the entropy decreases; predictions become easier. When entropy is equal to zero, it becomes certain and therefore predictability of results increases⁸³.

As stated above, entropy uncontrolled or left on their own, progressively stop working properly, through proceeds towards a more disorder and disorganized structure in time. As in other systems, legal systems may proceed in accordance with entropy law as time passes. Because, it has talked about many number of legal systems that live and die with great states during the history of civilization. Just like the organic systems, legal systems born; die and eventually disappear have a life span. At this point, Entropy Law may provide a number of clues to be beneficial in determining the life spans of legal systems and the conditions pushing these systems to break down. In this respect, entropy may also consider as a useful theoretical basis for studies on legal systems' past, present and future and their historical and integrated analyses. Besides, following the constantly to satisfy changing needs of society and reform the fundamental legal structures is an obligation for law. Humane legal systems are dynamic systems, which cannot be possibly left on their own uncontrolled for a long time. Corrosion condition in question is not only against the time but they can be subjected during interaction or dealings between positive and ideal law and among the most fundamental matters of law. As a matter of fact, what the most suitable to constantly human nature is an interaction process that completes or renovates two different aspects of a system that is in between of positive law and ideal. It does not seem possible for a legal system to resist Entropy Law in long term with such an interaction between them.

One of the fundamental principles of chaos theory connected with entropy is the legal incident with no possibility of irreversibility. Irreversibility can be useful to examine the conditions, which have no possibility of turning back to the initial conditions in certain incidents and practices within a legal system. Accordingly, based on irreversibility principle, which is characterized by the one direction nature of time, irreversible nature of any occurred criminal case or punishment, i.e. death sentence, can be talked about.

82 **Evolution Theory and Law of Entropy, The second Law of Thermodynamics Invalidates Evolution Theory**, <http://www.bilimarastirmavakfi.org/evrim/evrimentropi.html>, (Access date 1.11.2015).

83 EREN, Ercan, **Common Grounds in New Economics**, Year: 2010, <http://www.ikt.yildiz.edu.tr/RePEC/yil/makaleler/eren0013/pdf>, (Access date 1.11.2015).

The event happens and finishes in a subjective and singular manner. Repetition of the same event and punishment is not possible. Likewise, according to an example given by Handler⁸⁴, three youngsters, who called 911 emergency lines, are lost in the sea due to their location could not be found. This incident, which caused a chaos, rallies congress, community and people related to many industries to force emergency call centers in establishing a wireless call system⁸⁵. However, some technological obstacles, deficiency of wireless E-911 initiative and lack of any administrative organization that holds oversight authority during the whole process as well as unable to remove distribution barricade within the judiciary of states caused a irreversibility loss in the incident⁸⁶.

According to all mentioned above it can be considered that legal's consideration of irreversibility principle regarding the protection of human and societal life would gain a new number of developments for this discipline. In this respect, Prigogina and Stengers is also the calculation of initial condition that will enable a creature, which holds the power to control a dynamic system, to move to a certain situation in a certain time on its own⁸⁷. At this point, it is necessary to draw attention on the need for evaluation of coexistence irreversibility of legal cases with entropy. As a matter of fact, there is no possibility of initial condition's repetition as the same way for the irreversible legal events. Therefore, it seems as a strong possibility that reversibility possible to have a relatively less entropic nature because of the possibility of turning back to initial conditions but irreversible events proceed towards breakdown during the process in a subjective manner without being abstracted from time and location.

According to all evaluations mentioned above, chaos theory seems to be notably functional for legal discipline. However, despite some important developments in this field, practice possibilities of chaos theory are still considered as a utopia. In particular, as emphasized before, it is considered that dominant determinist nature of justice restricts the utilization possibilities of chaos theory. Moreover, it is increasingly possible to encounter some efforts on benefiting chaos theory in legal science. For example, Mitrović tried to put forth that utilization of chaos theory in justice is not a utopian project by applying chaos theory into three typical legal models by means of a computer. According to Kelsen's Legal Concept Model is applied by means of a computer and widely known as "Pure Theory of Law", there is not a thorough order because of the tendency towards disorder within order. This disorder is present when it is not observed, either. This shift from order to disorder does not skip towards unknown but even there is an order because of the possibility to explain gradual progress towards the increasing disorder of order, disappearance of law completely. Secondly, there is not a complete disorder within the Custom Model because disorder has a tendency towards

84 HANDLER, Darren, "An Island of Chaos Surrounded by a Sea of Confusion: The E911 Wireless Device Location Initiative", *Virginia Journal of Law & Technology*, Year: 2005, Volume: 10, Number: 1 (Winter), (pp.1-15), p. 2.

85 HANDLER, 2005, p. 2.

86 HANDLER, 2005, p. 14.

87 PRIGOGINE/STENGERS, 1998, p. 95.

order in itself. This disorder is present when it is not observed, either. This is because chaos organizes itself by itself. Self-organization does not happen suddenly but there is an order even when it is possible to explain of a correct transition towards increasing disorder to order and the emergence of tradition norm, which is one of the patterns of order. Thirdly, according to Legal Model, order and disorder cannot be excluded from each other but they exist by themselves by completing and penetrating each other in a dynamic balance. Type and level of this balance depends on whether state and justice is qualified. On the other hand, if sudden disturbances occur in a system, law is pushed into complexity; for example, arise of official legal revolution become necessary for emergence of a new legal system based on a completely different ground⁸⁸. These three characteristic legal models, which demonstrate the computed analysis of three important idea of chaos theory, prove the fundamental idea that chaos theory is useful for legal researches as a social fact. Therefore, it is also possible to form legal model at diverse levels and forms that can be examined with computers. However, the possible computed examinations for legal researches are not the answer for everything. It is because of the use of computers in legal researches, in particular necessity to bear increasing restrictions and risks emerge within a person's mind as a result of the interpretation of these results in particular⁸⁹. Hence, the connection between chaos theory and legal theory is not a utopian project but this new approach, both in terms of epistemology and practice, is confirmed with modeling and computed examining of characteristic legal models in the light of chaos theory, but still subject of the modeling and its computed examination may contain any aspect or any part of legal⁹⁰.

7. CONCLUSION

Chaos theory brought a new and alternative viewpoint that is about the possibilities of order within disorder, which can contribute jurisprudence to realize its goal of order by contributing to the understanding of disordered and anomalous human behaviors. Moreover, characterizing sudden shifts occur in societal structure and relations, uncertainty or disorders caused by these during the process of transition from old to new as complexity may be considered as the reason of identifying chaos with the imbalances of system. It can be suggested that chaos may provide a number of important contributions to legal discipline in regulating societal structure and relations because in reality, chaos represents reorganization of a system not system-organization impairment created by an imbalance in the system.

The theory took place in legal by means of postmodern jurisprudence due to its growing within the scope of postmodernism. "Nonlinearity" principle, which has a great importance within postmodern paradigm, found a relatively comprehensive opportunity to be utilized with chaos theory. Previously, modern jurisprudence is based on a

88 MITROVIĆ, 2001, p. 609.

89 MITROVIĆ, 2001, p. 610.

90 MITROVIĆ, 2001, p. 611.

rational legal functioning as a independent mechanic tool which caused standing by linearity principle against the difficulty of controlling nonlinear conditions. On the other hand, modern jurisprudence foresees the unification of all cultures and legal norms within these cultures around a universal form in spite of the fact that they have diverse qualifications. However, this unification does not happen in a way that produces a new culture by melting the cultural heritage of all societies in a common pot but it happens by imposing a dominant culture to others or with the acceptance of a relatively more dominant culture. Therefore, this condition of modern legal theory and justice system in question creates affinity and thereby uniformity.

Conversely, postmodern justice systems, which are based on chaos and complexity theories, are grounded on creativity and diversity in all legal processes from theoretic and practice levels. Postmodern jurisprudence does not consider nonlinear polymorphism and creativity against uniformity as an expression of disorder. It even accepts diversity, which is rejected by linearity as primary factor. While modern paradigm gathers societies around a universal culture, postmodern understanding act on the diversity resulted from groups that have different belief, value and norm systems living in the same society and culture. Because, adopting current diversity a priori for the societies of global world function in a multi-cultural environment within their own national borders and international arena became both a richness and obligation. Parallel to coexistence of diverse legal systems in heterogenic structured modern societies represents a great opportunity to reform and reproduce humanity and societies by supporting creative disorder and diversity against routine and rational modern legal systems. Therefore, sharing a common time and location depending on the nonlinearity of feedback among diverse legal systems, brought about the need for development of postmodern jurisprudence and justice systems.

It is possible to exemplify the operability of chaos theory's aforementioned fundamental principles in legal discipline occur on legal cases in individual forms. Any case process may bear qualifications that can be solved within the scope of chaos theory from the initial stage to the end. As a matter of fact, a vast majority of cases processes come with uncertainties even from the beginning. Evidences presented to the court within the scope of these uncertainties may be evaluated in accordance with the principle of sensitive dependency on initial conditions. Namely, the progress and ruling processes of the court are shaped in line with evidences that can be evaluated as initial conditions. Each one of the factors that affect a judge's ruling process including all evidences, clues and witnesses that can later be included to the case process may create an obvious bifurcation. The fact that laws and court precedents, which can be utilized as a base in ruling, being not qualified and modern enough to analyze a current case may show entropy effect. A significant part of the rulings taken as the result of the case can bear an irreversible qualification for other cases not to constitute to subject or precedent. Moreover, since a case process is not shaped by simple, unidirectional cause and effect relations, all cases has the qualification of nonlinearity. Following factors of

being unable to produce a solution to a certain societal issue, uncertainties emerge within this process entering into legal process again or constant involvement of a certain law article to new case processes support the feedback principle of chaos. Resulting of case rulings in a way that is not enough to relieve public conscience or unable to produce a solution to an issue that interests a wide range of society or mass may both create turbulence effect within society. When availability of all these disorders within a legal system and uncertainties on what kind of a shift or system wait for you after that process come together, you will hear this word in unison: CHAOS.

Finally, because the articulation of chaos bears a striking qualification and attributed meanings to it bears a mystical qualification, which makes chaos theory remarkable and promising, there is not a finalized decision on what extent it is useful, where and how it will be used. Yet, chaos is appears like a formation at the stage of intellectual envision. There is not a consensus on the concepts yet. Despite the talks about the need for a new paradigm or science, there is not yet any precise judgment on whether chaos is that expected paradigm or where will chaos take place in this new paradigm. Moreover, it is necessary to state that the answer to the question whether chaos is a pathological or an ordinary condition is a significant aspect that can shape the attitudes towards chaos. Considering to chaos as a sort of disease occurred within the system may make the approaches towards it negative. On the other hand, perception that chaos is ordinary and normal to be observed in every system may create a positive and meaningful effect on the development of this approach. This can sustain or stop the development of chaos theory. Therefore, it is possible to say that the location of chaos within a new paradigm search may depend whether the value attributed to it is positive or negative. For that reason, while the future of chaos still has many of uncertainties, it is considered necessary to be patient and cautious and leave it to time regarding when it will gain the ability to steer the future of science.

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