



## Complexity and Public Policies:

### Cobcobweb Type

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method that comes from the complexity field, more specifically, based on the notion of "complexity system" It is understood by "public policies"

The solutions that the state give to "socially problematized issues". According with Oszlack and O`Donnell <sup>(1982)</sup> it is understood by socially problematized issues in the following way:

*There is no society that has the capacity or resources to fulfill globally the list of demands and necessities of its members. Only a few the "troubled ones", meaning that certain classes, class fractions, organizations, groups or even strategically located individuals whose believe that "something" can and should be done in their behalf and whose are able to promote their incorporation into the current social problems agenda. We named "issues" to these socially problematized matters (needs, demands) (p 109).*

The aim of this work is to develop a method to design an answer public policies, based in the knowledge of complexity, so that it can fulfill in a satisfactory way the necessities and demands of society.

In order to understand what a "complex system" is; we start from the original meaning of the word complexity. It comes from the Latin complexus, which means "what is woven together" Taking into account the genealogy of the word complexity, we acknowledge Rolando Garcia's <sup>(2006)</sup> definition of complex system, which is:

*... In the "real world" the situations do not appear in a way that can be classified in correspondence with any particular discipline. In this sense we can talk about a complex reality. A complex system is a representation of a cut of this reality understood as an organized whole (from where the system denomination comes), where the elements are not "separable" and, therefore they can not be studied in isolation. (p 21)*

The argumentative strategy is developed as follows:

- **Section I:** The functioning and characteristic of a complex system will be described, which will give a theoretical frame to develop a public policy method that departs from the complexity field, specifically, from the notion of complex system
- **Section II:** Having already a theoretical frame from the complexity field, the cobcobweb method will be developed which comes from the awareness of complex system.
- **Section III:** The cobweb method will be applied to the crime problem in Argentina, departing from the analysis of Burzaco, Garavano y Gorgal <sup>(2004)</sup>.

The fundamental premise that is wanted to be defended along this work is that the methods used to design and fulfill public policies which come from the classic science are not suitable to solve the socially problematized issues, due to the fact that a socially problematized issue is a complex system and the methods to fulfill the public policies which come from the paradigm already mentioned are not developed to solve problems with such complexity. That is why a method which has its genesis in the complexity field is required, more precisely, that its postulates depart from the analysis of the characteristics and dynamics of a complex system.

The main contribution this work seeks to achieve is to develop a public policy method that can solve in an effective way the problem of an increasingly complex society. Although there is not a magic and perfect formula to solve this issues, it is necessary to elaborate the most efficient and effective possible method.

It is necessary to emphasize that this proposal lacks neither of defects or inconsistencies both in theory and empirical application. Nevertheless this does not mean that the improvement of the cobweb method is impossible, not only in its theoretical fundament but also in its empirical function.

## Section I<sup>1</sup>

It is considered in this article that a complex system is dynamic, in other words, it is not in an static state but it is in constant "movement" The above mentioned dynamism can spread out towards the exterior; id est, towards the environment, its interior or towards both sides simultaneously; developing as an adjustment or readjustment of itself. The mentioned movement is called *readjustment process*<sup>2</sup>.

Paraphrasing Piaget (1947), the adjustment processes occur when the balance of the complex system is temporarily broken, either by environmental factors, internal factors or both. This process of accommodation tends to restore the lost balance adjusting the system.

At this point it is convenient to introduce the concept of metamorphosis, which shows the transformation undergone by a complex system in the readjustment. You can make a first approach to the concept, citing Morin (sf)

*What is metamorphosis? The animal kingdom provides examples. The caterpillar which enclosed in a cocoon begins a process of self-destruction and self-construction at the same time; it adopts the organization and the form of a butterfly, different from the caterpillar, but still itself. The birth of life can be seen as the metamorphosis of a physical-chemical organization that reached a saturation point, creating a living meta-organization, which, even with the same physical and chemical constituents, produces new qualities. (P. 1)*

In other words, when a complex system adjusts it reorganizes itself as a whole, while it reorganizes the interactions of its component parts. I. e., the complex system has been modified as the transformation of a caterpillar into a butterfly. Although this complex system has changed it is still the same, as well as the butterfly is still the same caterpillar.

But this confuses several issues regarding the characteristics and dynamics of the complex system that must be explained. More specifically, it is necessary to go on to understand the formation of a complex system, which makes possible the adjustment process, ie, allows the metamorphosis of a complex system.

It will be based on the notion that in the constitution of a complex system opposites terms, eg, disorder and order are not only antagonistic but also "... are organized in a complementary way in the constitution of a whole" <sup>4</sup> (Morin, 1977 p. 141). They need each other in the constitution of a whole. While there is a recursive loop where the whole comes from the parts and the parts from the whole, there is another recursive loop where the antagonistic term comes from the other and vice versa.

It should be noted that within an organized system there are not just opposite elements, but there are also elements that are not antagonistic to each other although they are too, "organized in a complementary way in the creation of a whole." They relate, are organized so that they are in mutual dependence.

Therefore, antagonistic or not terms interact to lead the organization of a system (while this fed back into the elements that gave it rise modifying them) with properties of they own, id est, the organized system properties are different from the properties of the parts, since the properties of a system are not the sum of the properties of the parts that form it, but emerge from the interactions of the parts that result in the system <sup>5</sup>.

<sup>1</sup> The argumentation of this section, more specifically, the topics treated by Edgar Morin, have taken of a previous descriptive work, being this Colella, G. G. (2011). Explorations of the Complexity. Introductory approximation to the complex thought and to the theory of the complex systems. In CIECID (Ed.), Introduction to the idea of organization and complexity in Edgar Morin's thought. (Vol. 14, pp. 16) Available from <http://www.hologramatica.com.ar/>

<sup>2</sup> It will be called as process of readjustment because the adjustment happens only in the genesis of the complex system, that is to say when it "adapts" for the first time towards the environment, towards its interior or towards both. After this first moment all the processes will be of readjustment since as it was mentioned, the complex system is in constant change, that is to say, in constant dynamism. The concept of "readjustment"(adjustment) was taken from the book of Jean Piaget (1947) "Psychology of the Intelligence".

## Concept of Emergency

These organized system qualities are going to be called "emergency," Morin <sup>(2005)</sup>. Therefore, the emergency is not reducible to the properties of the parts, since the emergency has "novelty character" property belonging to all as an organized system. But emergency is also not deductible from the properties of the parts, because, as it was explained emergency is not the sum of the properties of the parts that are interrelated in an organized system.

Id est, the properties of a system are not the sum of the properties of the whole parts 6, but also, they are not the same properties of the parts. Therefore the emergency is irreducible nondeductible. Morin <sup>(2005)</sup> states: "*What is important about emergency is that it is nondeductible of the qualities of the parts, and therefore irreducible; it appears from the organization of the whole.*" (P. 32). It is irreducible because the emergency is the properties that emerge from a system as an organized whole, that is to say, if it is divided into its parts the emergency disappears. It is non-deductible, since the emergency do not arises or depends on the property parts separately, so one can not know the emergency in advance. V. gr. the human being is the result of interactions between cells that comprises it. But human beings do not have the properties of the cells that comprise them. They do not reproduce through binary fission, as an organized complex system the human body has the emergent property of sexual reproduction.

On the other hand, the emergency occurs not only at the whole level, but also, properties can emerge in its component parts, because those properties were absent or in a potential form when the parts were isolated. Therefore, there are properties of the parts that can only emerge in and because of the whole. E. g., man can only learn to read and write through a socialization process that receives as a unit of the complex system that society is.

Therefore, the whole is more and less than the sum of its parts. On one hand the whole is grater than the sum of its parts because, as noted, the emergency introduces the notion of new properties; properties that emerge in and through the organized system. Ergo, an organized system has properties of its own (in novelty character), but also has properties of the parts that has not been inhibited. Besides, the parts that comprise the whole, get new properties in the whole organization that did not have in isolation, so that the part of the complex system becomes more than the part in isolation. In other words, Morin <sup>(2005)</sup> argues

*... The whole is greater than the sum of its parts, because the sum of its qualities or properties is not enough to know the whole ones: new properties or qualities appear, due to these parts organization in a whole, these are the emergencies. (p.31)*

But on the other hand the whole is less than the sum of its parts due to, as Morin <sup>(1977)</sup> argues, within any system there are constraints, repressions, inhibitions about the properties of the constituent parts of the whole. V. gr., "*In the human relation individual-society, the possibilities of freedom in delinquent or criminal ultimately inherent to each individual, will be inhibited by the police organization, law and social order.*" (Morin, 2005, p. 32).

The fact that the whole is at the same time more and less than the sum of its parts, as explicit Morin <sup>(1977)</sup> although the system is enriched by the micro-and macro-emergencies, it is also depleted by constraints.

On the other hand, this also means that the parts are modified when they become part of the whole, that is to say "*A system is a whole which takes shape while its elements are transformed*" (Morin, 1977, p. 139).

## Organization-Interrelation-System

Morin's proposal <sup>(1977)</sup> states that the terms organization-interrelation-system, form a triad, and that these concepts are different faces of the same phenomenon. Although these three concepts are indissoluble, they refer to different things. Thus, the organization refers to the order, (location) that the parts have within a whole<sup>7</sup>. Interrelation refers to the forms and types of relationship (union) that the elements have to each other within the whole and to the whole itself. System refers to the properties and characteristics of a whole interrelated and linked in complex way.

However, it is said that these three concepts are inseparable as they form a recursive loop that not only gives genesis to a system, but also keeps it stable. It should be clarified that the concept of organization does not imply the existence of universal and timeless laws that states in which way will interrelate certain elements to form a system. That is, the interactions that occur between elements that will lead to organizational principles which become in a system occur by chance, at random <sup>8</sup>. Citing an example of Morin <sup>(2004)</sup>

*To form such an atom, it is necessary that, at exactly the same moment, occur the encounter of three helium nuclei, which is a completely random and unlikely event. However, imagine that this meeting occurs, a law begins to rule, a regulation, a strict determination is involved, and the carbon atom is created. Thus, the phenomenon looks random and has a determination look. (P. 7)*

## Organization of the one / multiple- one / different

As mentioned above, we can relate the concept of organization to the order (location) that has the parts within a whole. However, a characteristic of the organization is that it to transform diversity in union without suppressing diversity. This causes the unit to organize diversity at the same time. Therefore there is a recursive loop, in which "diversity organizes the unit which organized diversity." (Morin, 1977, p. 140).

This means that within a complex system, ie within the whole, diversity is created and maintained to create and maintain the unity of the whole.

Morin <sup>(1977)</sup> states:

*The organization is the arrangement of relationships between components or individuals that produce a complex unit or system, endowed with unknown qualities at the component or individuals level. The organization binds in an interrelational way diverse elements or events or individuals which thereafter become the components of a whole. It ensures solidarity and strength on these bonds, as it ensures to the system a certain possibility of enduringness in spite of random perturbations. The organization, therefore, transforms, produces, collects, maintains ... The system is the phenomenal and global character the interrelations adopted whose disposition is the system organization... Any interrelation endowed with a certain stability or regularity adopts an organizational character and produces a system. Thus, there is a circular reciprocity between these three terms: interaction, organization, system. (Pp. 126, 127)*

## Organization and antagonisms

For Morin <sup>(1977)</sup> the fact that the diversity of elements is preserved within a system while the interrelationships between them generate a complementarity in the organization of the system implies that repulsive forces are maintained between antagonistic elements, ergo, the forces of attraction within the system have to be stronger than the forces of dissociation in order to destroy them, or at least leave them in a latent and inactive state 9. In other words, antagonisms are potential carriers of disorganization that is why if the organization of the system cannot suppress them, or at least leave them in a potential state, the system is likely to disintegrate 10. Thus, the existence of antagonism causes the system to generate anti-antagonists forces; which are called by Morin <sup>(1977)</sup> negative feedback. Therefore, the role of negative feedback is to keep the system stable (stability is dynamic as it has rearrangements, ie, "small" readjustment processes) re-absorbing the anti-organizational forces.

But when the restraining forces of repulsion, of separation are weaker than them and the system can, no longer be rearranged, it is in crisis (although it may be a crisis in the system that will weaken the anti-anti-organizational forces) and ends disintegrating itself. This is not an exceptional event, since every system has antagonistic elements within it, ergo, inside it there are forces of disintegration, ergo, every system has within it the seeds of their 11 degradation and subsequent disintegration. This process is called positive feedback. In other words, Morin's positive feedback refers to the adjustment processes mentioned by Piaget, these occur when the balance of the complex system is temporarily broken.

It should be noted that disintegration does not mean specifically cease to exist, but it also means evolution. Returning to the metamorphosis concept, Morin <sup>(2005)</sup> argues

*Positive feedback occurs when the regulatory system is no longer able to cancel the divergences, and these can then be amplified and directed into a runaway, a type of general disintegration, as it often happens in our physical world. But we have seen, following the idea that advances for more than 50 years Magoroh Maruyama, that the positive feedback, that is to say, the widening gap is an element that allows the transformation in human history. (P. 35)*

However, as mentioned before, the role of negative feedback is to keep the system stable reabsorbing the anti-organizational forces. Stability is dynamic, because there is adjustments within it 12. This implies that although there is a negative feedback, the complex system is also in a metamorphosis process, but in a smaller scale and with less intensity than in the positive feedback. This is of vital importance, because it indicates that a complex system is constantly changing, constantly readjusting, ie, constantly suffers "minor" processes of adaptation.

The difference with the positive feedback is that in it the complex system fully metamorphose to readjust (assuming that the complex system that does not disintegrate and "its vital energy ends"). In contrast, a negative feedback the repulsive forces are absorbed or constrained, so the metamorphosis is only a "small" process of adjustment. This may only occurs in one part of the complex system, or in it all, but always with a lower intensity than in positive feedback.

## Order-disorder-Interaction-Organization

As mentioned before, the system organizes various elements, which differ from each other. Because of this, *"The transformation of disorder diversity in organized diversity is at the same time a transformation of disorder into order."* (Morin, 1977, p.157) This order is in a recursive loop with the system organization. The order maintains the organization that produced it while the organization generates order. This organizational order repels internal and external disorganized sources.

Now, returning to the above argumentation, the disorder is not eliminated within the system, it is inhibited or remain in a latent form, *"Since we consider an organized phenomenon, from the atom to humans thoughts, considering the stars, it is necessary to specifically involve order principles, principles of disorder, and principles of organization."* (Morin, 2004, p.7) This means again that any system is temporary because the organization of the system is potentially able to be disorganized. In other words, the organizational order is perishable. And again, this does not mean that the disorder can be canalized and the system constantly reorganized itself, evolves, morphs<sup>3</sup>.

The underlying implication here is that the terms of order / disorder cease to be just antagonistic to become at the same time complementary terms in the organization of the system, because the tensions and adjustment generated by conflict of these terms lead to the constant restructuring of the system when negative feedback is greater than the anti-organizational or disintegration forces (it is necessary to put emphasis, it is also understood as evolution, metamorphosis and not as the end of existence) when the organizational order is weaker than the organizational disorder forces, whether they are external or internal.

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<sup>3</sup> In this respect Carlos Gonzalez Casanova (2004) comments on Claude Shannon's contribution to the information systems " He found that <<order>> and <<disorder>> are linked between each other, with variable possibilities of putting order by means of the information in what it is disordered, or of containing the disorder of the <<established order>>. " (P. 46)

## System

To deeply understand the concept of system it is necessary to think in opposites terms, mutually exclusive, and also complementary in the organization of the system<sup>4</sup>. Thus we incorporate the idea of a system being at the same time a unit and a diversity, "every system is one and many ... they are also one /diverse. Its diversity is necessary for its unity and its unity is necessary for its diversity." (1977, pp. 139-140). For example, regarded the whole system it is a homogeneous unit, while viewed from the parts that comprise it, it is heterogeneous, it is composed of a variety of parts.

The Gordian knot of the problem, in fact the solution of this contradiction is that a system is no longer considered a "basic unit", but it is a "global unity" made up of interrelated elements<sup>5</sup>, interrelationships that can be found between the parts, between the parts and the whole, and between the whole and each one of the parts.

In the words of Morin (1977)

*The complex unit takes density if we presume that we cannot reduce either the whole to the parts nor the parts to the whole, nor one to multiple, or multiple to one, but we need to try to conceive both connected in a complementary and antagonist way, the concepts of whole and parts, of one and diverse<sup>6</sup>. (p. 128).*

It is important to remain clear that although a system is composed of a diversity of parts and that these parts have identity of their own, the fact that they are constituent parts of the system make them to have a belonging common identity to it, ergo, they are submit to their organizational rules.

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<sup>4</sup> Here there is another point that goes against the reductionist principle of classic science, mentioning Morin (2005) In opposition to the reduction, the complexity needs to understand the relations between the whole and the parts. The knowledge of the parts is not enough, the knowledge of the whole as a whole is also not enough, if its parts are ignored; we have to make a come and go in a loop to assemble the knowledge of the whole and the parts. Is in this way how the principle of reduction is replaced with the principle that conceives the relation of whole-parts mutual implication (P. 30)

<sup>5</sup> This does not want to say, in last instance there "elementary units ", on the other hand, it means that we are in a polysystemic universe where there are system of systems. That is to say, a system can be a constitutive element of another system, and this one a constitutive element of another system.

<sup>6</sup> Then a reductionist point of view, which limits to the parts is no longer enough, or an holistic point of view that limits itself to the whole. It is necessary to consider at the same time the whole, the parts in isolation and the interrelationship between the whole and the parts. It is necessary a relationship that recognizes the whole-parts recursive loop where none of the terms is reducible to the other one. Point of view that allows us not to ignore the emergency of the organized system, but on the other hand it allows to see elements or properties of the elements that are restricted by the whole.

## Section II

In the article introduction the Rolando Garcia's <sup>(2006)</sup> definition of complex system was considered, and it states

... In the "real world" situations and processes are not presented so that they can be classified by their correspondence with any particular discipline. In this sense we can speak of a complex reality. A complex system is a representation of a cut of that reality, conceptualized as an organized whole (hence the system name), in which the elements are not "separable" and therefore can not be studied in isolation. (P. 21).

On the other hand, it was said that public policy is the State's response to a "socially problematized issue." Defined by Oszlack and O'Donnell <sup>(1982)</sup> as follows

*There is no society that has the capacity or resources to fulfill globally the list of demands and necessities of its members. Only a few the "troubled ones", meaning that certain classes, class fractions, organizations, groups or even strategically located individuals whose believe that "something" can and should be done in their behalf and whose are able to promote their incorporation into the current social problems agenda. We named "issues" to this socially problematized issue (needs, demands) (p 109)*

From now on, a problematized social issue will be considered (despite the definition above) as a complex system and this "a representation of a cut in the complex reality." Therefore, "it can not be classified by its match with any particular discipline." This means that the elements that interact to form the complex system "are not separable" and thus "can not be studied in isolation". This notion also reminds refers to the term complexus (what is woven together).

From this perspective, the state's answer to a socially problematized issue, ie the development and design of public policy should begin with the consideration that a socially problematized issue is a complex system; so public policy should be developed based on the operation and characteristics of a complex system.

## Cobweb Method

In Morin's definition of a complex system, a characteristic is that the elements that comprise it "are organized in a complementary way in the creation of a whole." Simultaneously, another characteristic is that it is organized and formed by recursive loops, the recursive loop where the whole come from the parts and the parts from the whole, while there is another recursive loop where an antagonistic term comes from the other and vice versa, "A system is a whole that takes shape at the same time that its elements change"; The interrelation-organization-system concepts, form a recursive loop that not only provides a genesis to a system, but also keeps it stable; a recursive loop in which "diversity organizes the union which organized diversity." "The transformation of disorder diversity in order diversity is at the same time a transformation of disorder into order", the order is in a recursive loop with the system organization. The order maintains the organization that produced it while the organization generates order, "every system is one and many ... are also one / many. Its diversity is necessary for its union and its union is necessary for its diversity. "

In short, a complex system is characterized by recursive loops that comprise and organize it, and by elements that are organized in a complementary way in the creation of a whole. These two features imply that in a complex system analysis, the premise "*An hypothesis must have, at least, a dependent variable and an independent or explanatory one*" (Anduiza Perea, 1999., P. 22), is no longer valid. Because the fact that in a complex system the elements that comprise it are organized in a complementary way<sup>7</sup> and that this is composed and arranged by recursive loops, causes that any of them can be considered as "independent variable" and other / s "dependent variable / s", however, all the elements that comprises a complex system become "dependent" variables as one element modifies all the others and all elements changed only one, ie, every and each one of the elements are modified and modified each and every element of the complex system. This hypothesis<sup>8</sup> will be named as "dependent variables hypothesis"<sup>9</sup>.

<sup>7</sup> The idea of a complementary explanation is not foreign to the field of the quantum physics, Fritjof Capra (1975), writes:

Niels Bohr introduced the idea of the complementarity. I consider the idea of particle and wave as two complementary descriptions of the same reality, being each one of them only partially correct and having a limited range of application. To achieve a complete description of the atomic reality both representations are necessary and both must be applied within the limitations imposed by the uncertainty principle. (P. 218)

<sup>8</sup> The concept of "hypothesis" is in use, since it refers to "... a declarative principle that explicitly indicates the relations that are expected to find between the variables" (Anduiza Perea, 1999., p. 20), being in this case the mutual interdependence of the variables in the organization of the complex system.

<sup>9</sup> The idea of the dependent variables hypothesis is that in an analysis it is not possible to explain only B and C (dependent variables) depending on A (dependent variable). On the contrary, it is necessary to explain simultaneously the readjustments of B and A depending on C, A and C depending on B, C and B depending on A. Since, what it is willing to be explain are the interrelationships between the elements that simultaneously modifies all them.

## **Dependent variables hypothesis as a cobweb model starting point**

The dependent variables hypothesis is the starting point of the cobweb model. This model is designed to operate in each unit that comprises the complex system and in the complex system as an organized whole. At the same time it operates on the interactions that occur between the units and the interactions that occur between the units and the whole.

All these factors must be operated at the same time because once the public policy begin to be implemented, the balance of socially problematized issues will be broken, therefore, the adjustment will begin, ie, It will begin to develop the negative feedback or positive feedback processes, that is to say, a metamorphosis will occur in the complex system as a whole, or it will remain a "dynamic equilibrium".

Besides the fact that the balance of the socially problematized issue has been fractured problematized implies that once a public policy started to run, a step back can not be taken about its implementation, seeking that the complex system properties remain the same that at the first moment, since the socially problematized condition would be already adjusted. That is, If you are at point A and moves to point B, but then wants to step back and restart, it will no longer be the point A, but will be the point A \*, because the socially problematized issue will be adjusted due to the implementation of public policy. This entails that if oone takes a step back in the execution of a public policy, it must be reconfigured according to the adjustment that took in the socially problematized issue, because no it no longer possible to start from the same socially problematized issue.

## The emergency concept within this model

In line with the above discussion, the concept of Emergency makes it necessary that public policy operates in the complex system as an organized whole, in each part that comprises it and in the relationship complex system / units that comprise it. The following arguments must be thought over.

The whole is more and less than the sum of its parts. On one side the whole is greater than the sum of the parts, since the emergency introduces the notion of new properties. These properties emerge in and because of the organized system. Ergo, an organized system has properties of its own (in novelty way), but also has properties of the parts that have not been inhibited. In addition to properties that emerge in the parts of the whole in and through it, so that the part becomes greater than the part in an isolated state.

On the other hand, the whole is less than the sum of the parts, because, within any system there constraints, repressions, inhibitions on the properties of the constituent parts of the whole.

If public policy is applied only in the organized system as a whole, it would be used only on the macro-emergencies. If public policy is applied only on the units that comprises the organized whole as if these were in an isolated state, it operates only on the properties of the units. If the public policy is applied in the relationship organized whole/units that comprise it, it only operates on macro-emergencies and on the properties of the units that have been constrained.

For these reasons, the cobweb method acts simultaneously on the complex system as an organized whole, on the units<sup>10</sup> that comprise the complex system and on the relationship between organized whole/ units that comprise it. I e. it acts over the macro-emergencies, the micro-emergencies, the properties of the parts that haven been inhibited and on the properties of the parts that have been constrained<sup>11</sup>.

At this point it is relevant to give an explanation. When analyzing and / or working at different levels (complex system as an organized whole, the subsystems that are interrelated in the formation of the complex system and in the whole / parts relationship) it must be taken into account, to paraphrase Rolando García <sup>(2006)</sup>, "phenomena scales", ie, the organizational logic of the complex system, of the interrelationships between the parts and of the interrelationships between the parts and the whole. At the same time it should be taken into account the "time scales", ie, a factor that temporarily fracture the balance of the complex system can develop on a time scale in the complex system as an organized whole, in another time scale in the relationship whole / parts and in a different time scales in the various subsystems that comprise the complex system. In short, the "phenomena scales" and "temporary scales" that occur at different levels of the complex system are other reasons why public policy should operate on the complex system as a whole, on the interrelated subsystems that comprise it and on the interface whole / parts.

<sup>10</sup> It is important to notice that, quoting García (2006):

The Elements of the system used to constitute "units" also complex (subsystems) that interact among each other. The relations between the subsystems acquire fundamental importance not only because, at it had been said, they determine the structure of the system (that - once again - is given by the set of relations, not by the elements). (P. 50).

Then, the complex systems are constituted by units that also are complex systems, therefore, we find complex systems formed by the interrelationship complex subsystems in the organization of the organized whole.

<sup>11</sup> Actions will be over constraining the properties of the units if the inhibitions of these properties are the cause or part of a socially problematized issue.

## Need of the interdisciplinary in a complex system

As it was explained, a complex system consists in a heterogeneousness of interrelated units (complex subsystems). But in the organization of the whole, the conversion of diversity in unit does not constrain diversity. Recall the following recursive loop "diversity organized the unit, which organizes diversity." I.e., the diversity is maintained and created to create and maintain the unity of the whole.

This implies that the approach to a complex system (in this article the socially problematized issue is a complex system, therefore, it must be addressed by public policy, conceived as a complex system) should be from different disciplines, ie, in an interdisciplinary manner. Interdisciplinary<sup>12</sup> *"is the integration of different disciplinary approaches, so it is necessary that each member of a research team to be an expert in their own discipline"* (García, 2006, p. 32).

Note that the notion of interdisciplinary is consistent with the dependent variables hypothesis. In other words, the hypothesis of the dependent variables suggests that there is no independent explanatory variable, either precedent, intervening or of control.. Otherwise, each and every one of the variables is modified and modified each and every one of the variables of the complex system. Therefore it is necessary an investigation which does not give primacy to a particular variable, but that unifies the approaches of different disciplines to produce an analysis of the interrelationships between the various subsystem that comprises the whole, between each subsystem and the organized whole and between the organized whole and every subsystem that comprises it<sup>13</sup>.

In Rolando García's words

*In the case of interdisciplinary the different approaches integration is in the definition of the problem. This means to conceive any problem as a system which elements are inter-defined and its study requires the coordination of disciplinary approaches that must be integrated in a common approach<sup>14</sup> (p. 33)*

<sup>12</sup> Unlike a multidisciplinary research, in which, the researchers remain constrained their discipline without having contact with others ones, so there is no integration of approaches of different disciplines, but, a sum of approaches.

<sup>13</sup> It is necessary to make it clear that this point is not located in the fight of interests that shape the form that the socially problematized issue will have (See Oszlak, Or; O'Donnell, G. (1982). State and state policies in Latin America: towards a strategy of investigation. Venezuelan magazine of Administrative Development, 1.), though it is necessary to bear in mind that this struggle of interest will shape, to a great extent the solution that is believed to be pertinent for a socially problematized issue. On the contrary it departs from the moment in which the socially problematized issue has already been defined.

<sup>14</sup> García (2006) adds that an interdisciplinary research not only needs a shared conception of the object of study. It is also necessary that the researchers share the same conceptual and methodological frame, deriving this from a mutual conception of the science – society relationship. This relation depends on the epistemic frame in which the researchers took position; being this understood not only as the conception of the world that the researchers have, which influences over the questions that they make about the reality subject of their investigation and, also as the hierarchy of values that the researchers share.

## The State and the Cobweb method

Nicos Poulantzas (nd) defines the State as "the condensation of a power relationship between classes and class fractions" crystallized in the "bosom of the state." That is to say, "... the State is composed- divided all through by the contradictions of class ... The class contradictions comprise the State, are present in its material frame and structure in this way its organization." (Poulantzas, nd, p.59) Later he adds

*Within the State, classes' contradictions have the form of internal contradictions between the apparatuses and branches of the State and within each one of them, according to directional lines both horizontal and vertical. (Poulantzas, nd, p.159)*

This implies that the various branches and apparatuses of the State represent the interests of the different "fractions of the power bloc," which have their seat of power in each one of them.

All this means that the State is a whole interrelated and linked in complex ways, with properties and characteristics of its own. It is conformed the various apparatuses and branches that have a specific place in it. And being these interrelated with each other in different ways in the whole organization of the whole and the whole itself.

As it was explicit before, an organization characteristic is that by turning the diversity in union it does not suppress diversity. This causes that the union organizes the diversity organizes the unit. In relation to the constitution of the State; this refers to the fact that, although the various apparatus and branches form a unit, this does not eliminate the uniqueness of the different parts of the state. Rather, it organizes and the specific competencies of the different apparatuses and branches on issues that are specific to it, so in this way the diversity organizes the state as a complex whole.

This means that when planning a public policy from the cobweb method and in its subsequent implementation (if you reach this stage), public policies remain uncoordinated between the different branches and apparatus of the State, and between national , provincial and municipal<sup>15</sup> areas if the anti antagonist forces are not able to absorb or constrain the repulsive forces, Or if the complex system, in this case the State does not completely metamorphosed through positive feedback, in order to readjust.

How to eliminate or constrain (if that is possible) the class power relations ie, the power struggles within the state that are crystallized in the "cracks of the state" exceeds the interests of this article. However, it is pertinent to insist again in the fact that to make public policies development and implementation possible, the State depends on a negative feedback or a metamorphosis process so that the various apparatus and branches of the State and the national, provincial and municipal areas can plan and implement the public policies in "harmony".

On the other hand, the coordination of national, state and territorial municipal level, and the various branches and apparatus of the State is a sine qua non condition for the creation of an interdisciplinary team capable of developing and implementing public policies.

<sup>15</sup> This division may vary if the country that develops and implements the public policy is federal or not. In any case, the important thing is to support the idea of the disarticulation in the development and implementation of the public policies.

**Section III**

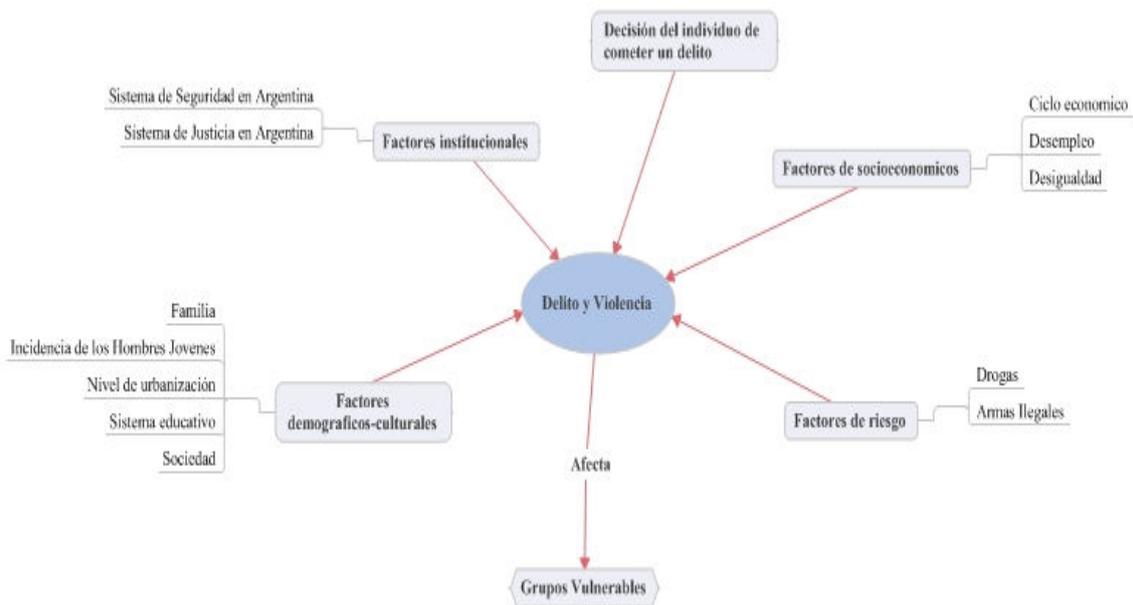
Broadly speaking, Burzaco, Garavano and Gorgal <sup>(2004)</sup> argue that the social phenomenon of crime is not a non-causal, but a multi-causal phenomenon, id est, you can not understand and / or explain the social phenomenon of crime from a reductionist analysis. On the other hand, this leads to the implementation of inaccurate public policies.

Therefore, for the proper design of public policy on crime, it should be noted that, to quote the authors <sup>(2004)</sup>

*The phenomenon of crime is a multi-causes social phenomenon, ie, a set of variables that affect in different degrees of impact over time on the rise in crime. Only if we understand the complexity of this problem (...) we can embark on the design and implementation of effective and efficient public policies, for minimizing the consequences of crime in the community. (p.26)*

For authors, the determinants of crime are: the individual decision to commit crime, risk factors, as, drugs and illegal weapons, institutional, which can be divided in security system and justice system, socio-demographic and cultural, divided these into family, incidence of young men, urbanization level, educational system, society, and finally socio-economic factor, composed of, business cycle, unemployment and inequality.

This idea can be graphed as follows:



Moreover, Gorgal, Garavano and Burzaco (2004), identified the following factors to be consider in developing a comprehensive policy of public security against crime: situational prevention, social prevention, police prevention law enforcement, criminal investigation, criminal sanctions, detention and criminological treatment, surveillance and post-prison assistance.

This idea can be graphed as follows:



It is beyond the purpose of this work to analyze in detail each of the determinants of crime and each of the factors to consider at the develop of a public policy against crime (see Burzaco, E.; Garvano, G.; Gorgal , D. (2004). Mano Justa. Argentina: El Ateneo.) The work is limited to mention that although the design proposed by these authors is based on a relational design, it is not satisfactory, because it relates the factors in an improper way.

**Cobweb method implementation in the design of public policy against crime**

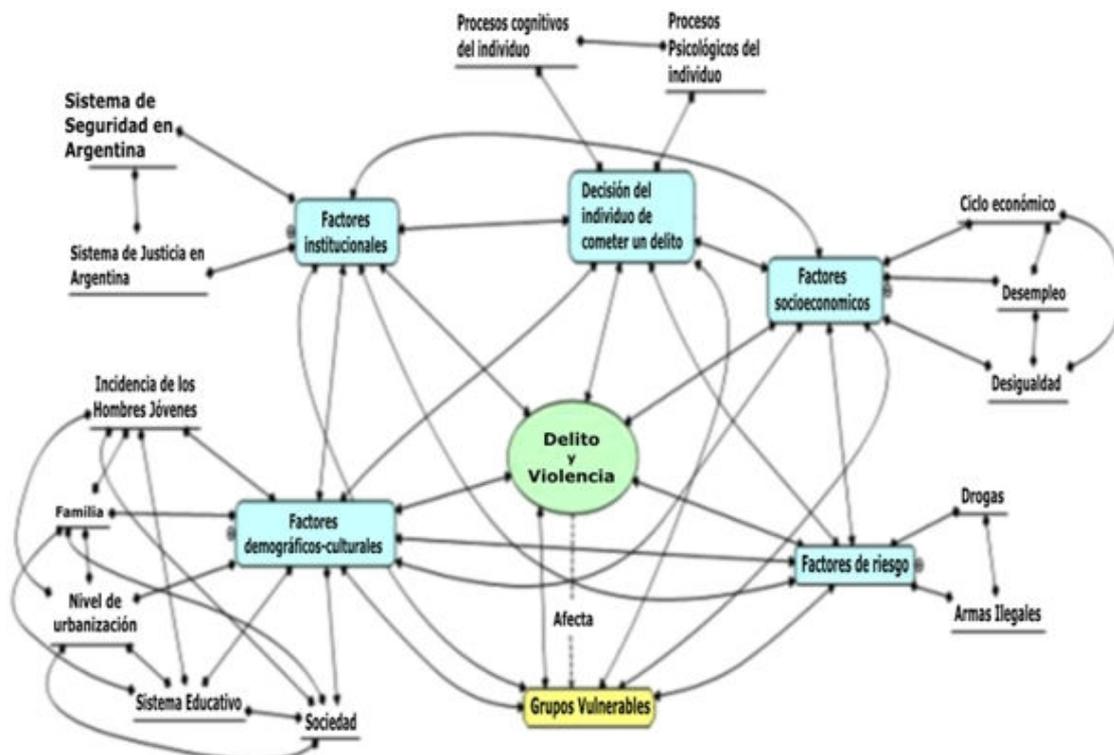
Next, we are going to use the determinant factors and each of the factors to be considered in developing public policy against crime, mentioned above, to make the design of a public policy against crime based on the cobweb method.

### The crime as a complex system

To begin, the socially problematized issue addressed in this section is the social phenomenon of crime. As it was explicated, the socially problematized issue is considered a complex system, id est., "A representation of a cut in the complex reality." This means that elements that comprise it interact with one another, so they are not separable. Consequently, the determinants factors of crime<sup>16</sup> can not be analyzed or understood in isolation.

Due to the fact that the determinants of crime "are organized in a complementary manner in the constitution of a whole" and that the recursive loops that occur between them and between them and the complex system as a whole, modify, at the same time, the determinants crime factors and crime as a complex system, it is necessary that both the subsystems that comprise the complex system, as well as the complex system as an organized whole, were considered as dependent variables. That is to say, on one side, the individual's decision to commit a crime, risk factors, institutional factors, socio-demographic and cultural factors and socioeconomic factors are interrelated (mutually modifying interrelationship) in the organization of the socially problematized: crime. On the other hand, the recursive loop, where the determinants crime factors changed the crime, while this change to the factors that determine it, it does not allow any of these variables to be considered as "independent."

This idea can be graphed as follows:



Double arrowed lines refer the interaction ideas in the whole organization and the recursive loop.

<sup>16</sup> In this scheme the determinant factors of the crime turn out to be the subsystems that comprise the complex system crime. At the same time these subsystems are formed by other subsystems.

**The develop of Public policy based on cobweb model**

To continue with the development of a public policy on crime based on the cobweb method there will be used the factors a identified by Gorgal, Garvano and Burzaco as relevant in developing a comprehensive public security policy against crime.

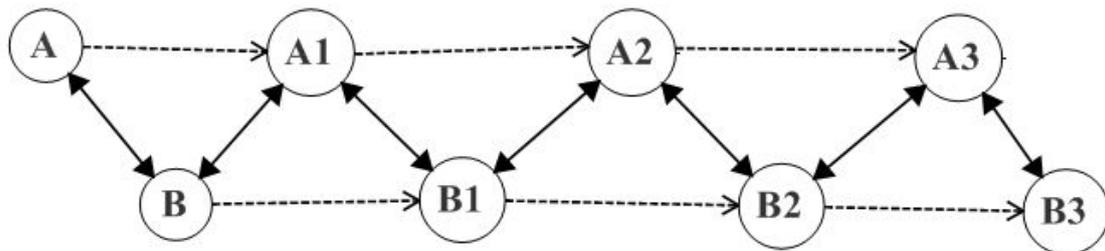
The fact that all the factors were taken into account is not enough, but it is also not enough to take them simultaneously into account. It is necessary to consider how they interrelate in the organization of public policy; how they interact with the complex system as an organized whole and how each one interacts with the whole. This is because the factors do not operate in isolation; they operate interrelated with the other factors that comprise the complex system.

Therefore, the factors not only readjust because of the crime, but also they readjust based on the interactions between them within the organization of the complex system, in the interface of each of them with the complex system and the interaction with the complex system as an organized whole.

Summing up, the implementation of public policy makes the crime to adjust at the same time the readjustment of crime will make the public policy to adjust so that it could provide a solution. In turn, parallel to this process, the determinants of crime factors readjust due to the interrelationship that exists between them within the organization of the complex system, between each of them and organized whole and between them and the complex system. Simultaneously, as it was argued in the previous paragraph, there is a similar process within the complex system "public policy against crime".

Ultimately, the socially problematized issue:" crime" is evolving, metamorphosing itself, therefore, for the public policy to be effective and efficient, it must be evolving, metamorphosing simultaneously based on the adjustments of crime.

In a didactic way (even though simplified) this notion can be graphed as follows:



Letter "A" represents public policy against crime.  
Letter "B" represents crime's socially problematized issue.

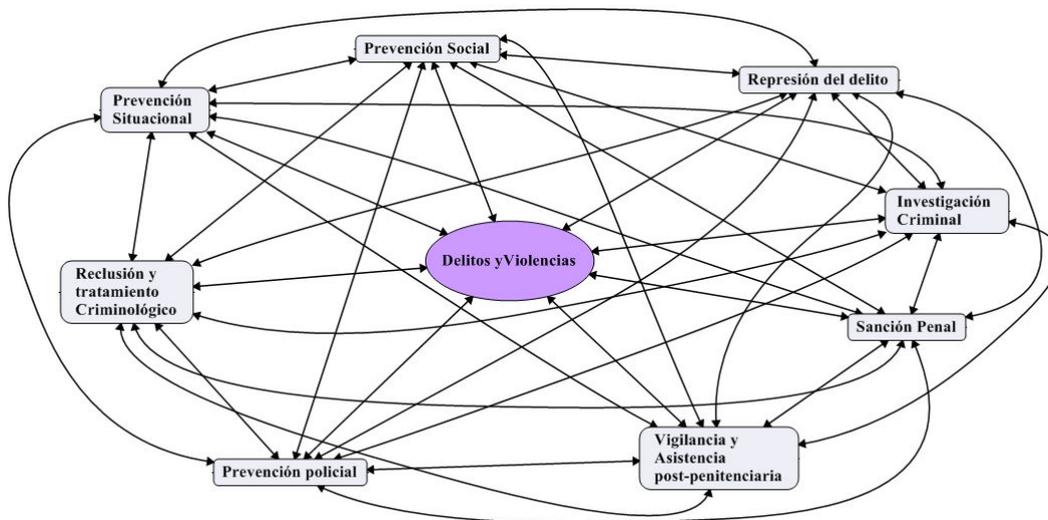
It is not casuality that the double-arrwed lines represent the interaction that causes the simultaneous readjustment between the two complex systems. While the dotted lines which represent the evolution, metamorphosis of public policy and crime have a single address, because, they represent the temporal irreversibility; both of the socially problematized issue, as well as of the public policy. Due to the fact that this issue was already discussed above we are not deepen over it in advance.

However, even when the readjustments and temporal irreversibility of complex systems are taking into account, there is an issue left to consider that is not minor. This is the "phenomena scales"

and the "time scales". This implies that, returning to previous arguments, a factor that temporarily fractures the balance of the complex system can be developed on a time scale in the complex system as an organized whole, in another time scale in the interrelation whole / parts and at different time scales in the different subsystems that comprises the complex system. This implies that the complex system crime and the complex system public policy move at different time scales. Moreover, the determinants crime factors and factors to consider when developing a public policy against crime also move at different time scales. In short, when adjusting the public policy it must take into account all these time scales. The failure in doing so causes that the readjustments in public policy were made too late or too fast.

On the other hand, what acts on the complex system crime are not only the novel character of the properties of the complex system as an organized whole, ie the complex system macro-emergencies 5 "public policy against crime." id est, but also, at the same time act the properties the factors had before they enter at the complex system: the micro-emergencies, id est., the characteristics the factors obtained in the organization of the complex system and finally, the properties of the factors that have been constrained or inhibited in the organization of complex system.

These relationships can be plotted as follows:



Finally, as discussed above, the time scales and readjustment of the of complex systems as an organized whole as well as the factors that comprised them, make it necessary that public policy acts at the same time on the whole and on the parts V. gr., if public policy acts only on the determinant factor of the crime risk, or only readjusts considering this factor, it will only act on the isolated properties of this factor. Therefore, it will ignore the macro-emergencies, micro-emergencies, the constrained or inhibited properties and the ones that were not (of the other factors of the social phenomenon crime). In short, it does not act on virtually any property of the complex system. On the other hand if it only readjusts based on this factor, despite the fact that it act on other factors, public policy will be obsolete, because it will be acting on an earlier stage of socially problematized issue.

After all, it is necessary that public policy acts on the factors that interact in the organization of the complex system crime, as well as on the whole as an organized system. Similarly, public policy must be readjusting based on the readjustments of the socially problematized issue, but considering the time scales in both the whole and in the parts level.

## Readjustment of the State and the cobweb method

This point does not need much treatment. "How" departments and institutions should readjust is beyond the purpose of this work. We will only recapitulate the argument already outlined. If the departments and / or institutions responsible for developing and implementing public policy do not work in a coordinated manner it will not be possible to implement an effective public policy against crime. If the prison service, judicial power and police forces do not readjust simultaneously to the readjustments of the socially problematized issue they could not be neither effective nor efficient. Because, the individual readjustment is not enough, E. g., the police can increase their effectiveness in preventing crime, but if the Parole Board does not make a proper monitoring of ex-convicts and in the judicial power only the 27% of the Human Resources are officers or magistrates and the 74% of solved cases are because they are filed without finding the guilty ones<sup>17</sup>, the public policy implemented against crime will not be effective and efficient<sup>18</sup>.

Moreover, as said, the coordination of various national levels, is also a necessary step. If there is a national public policy on crime, there is another at the provincial level and at the municipal level. Although they do not overlap or contradict, it is likely that they are ineffective. Let us take the example of car dismantlers. When they became a socially problematized issue in the province of Buenos Aires, they moved to the capital city. When they become a priority in the Capital City they moved to the province. In short, it is necessary a link between the different areas so that the public policies developed could have satisfactory results.

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<sup>17</sup> The percentage data has been taken of Burzaco, E.; Garvano, G.; Gorgal, D. (2004). Fair Hand, (Mano Justa). Argentina: El Ateneo.

<sup>18</sup> It is necessary to make clear that this is an example simplified for didactic purpose since as, we have been arguing, all the factors must be noticed.

## Interdisciplinarity in the development of public policy against crime

We will not stop to study the disciplines necessary to outline a policy of the kind treated, because it is beyond the purpose of this work. Neither we, also will not stop to analyze the characteristics that the interdisciplinary must have, since it was already discussed in the previous section.

If the Interdisciplinarity were highlighted required for a public policy against crime, you must not be limited to the police force, judicial power and psychologists. The multiplicity of factors and their interrelationship, make that, at least sociologists, anthropologists were necessary. As well as officials and specialists working in education, in the prison service, community neighbours, labour relations specialists, economists, lawyers, etc. At first glance one may object the impossibility of achieving the interdisciplinary connections necessary to form an interdisciplinary group due to the variety of disciplines mentioned. But Piaget has already showed in *Psychology and Epistemology* <sup>(1985)</sup> the possibility of carrying out interdisciplinary connections necessary to form an interdisciplinary team with a high variety of disciplines, the key point is that they share the same epistemic approach and use logic.

Still, there is not a small task to organize an interdisciplinary group and that it agrees on the central points. Not only because of the need of the same conceptual framework, but also for the need to share the same epistemic framework. On the other hand, to paraphrase Kant, the present impossibility does not imply the impossibility in the future.

In sum, although the gathering of an interdisciplinary group is not easy and leads several problems, it is necessary to outline and implement a public policy. The multiplicity of factors and how they are interrelated causes that "complex system elements were not" separable "and therefore they can not be studied in isolation. So, an interdisciplinary group is definitely necessary.

To conclude, while this paper attempts to cover different dimensions with respect to the study, design and implementation of public policies, has displayed only "the tip of the iceberg." Issues such as the "hypothesis of the dependent variables," the temporal dimension, the behaviour of the adaptations of the departments of State, the relationship between the readjustment of the socially problematized issue and the readjustments of public policy, etc.; has only been outlined briefly. The deepening study of these subjects should be the matter of subsequent works. This is only the first step, which is to put these issues on the table to begin to be examined.

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