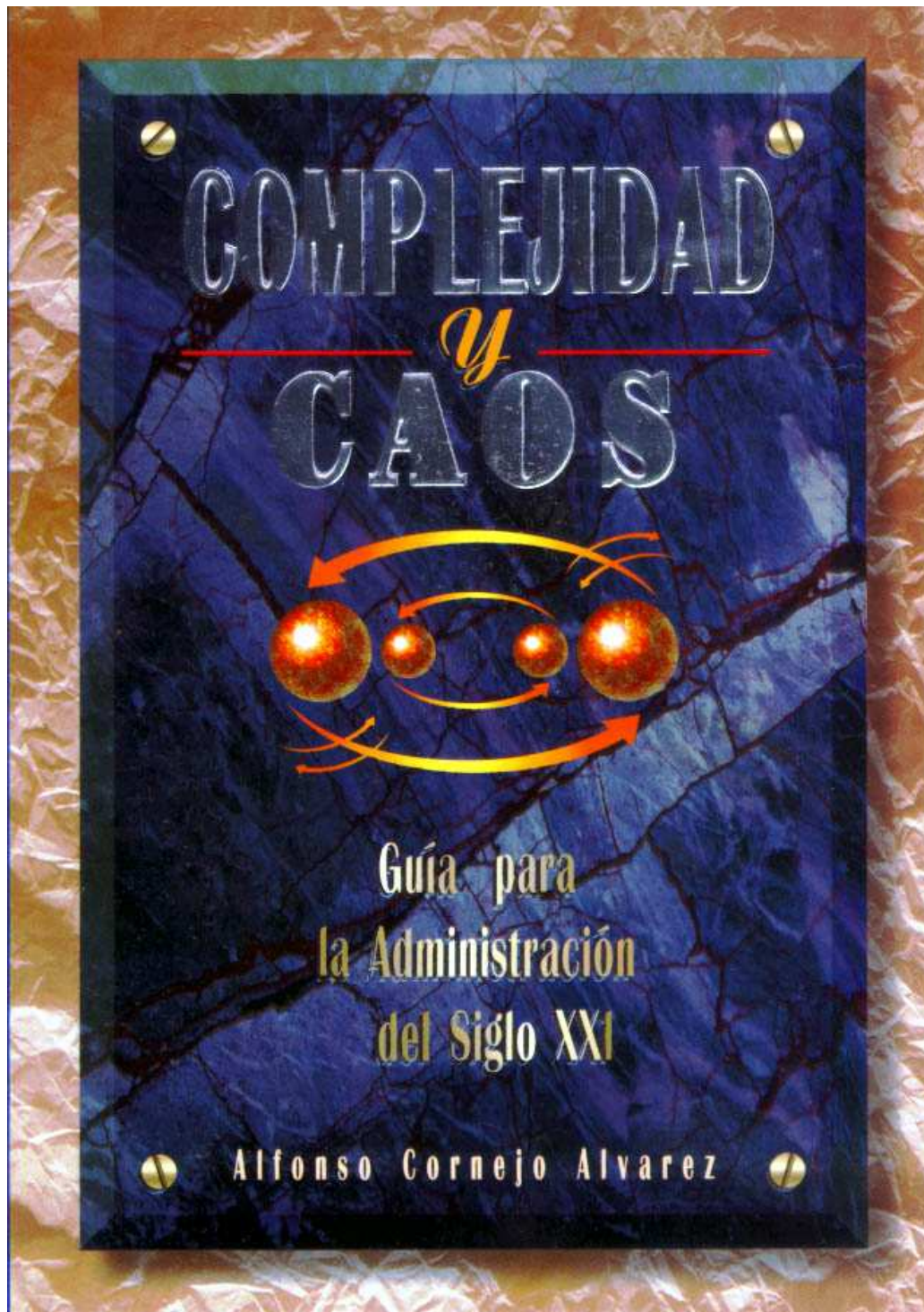


**Book Review**  
**"Complexity & Chaos:  
Guide for XXI Century Management"**  
By Alfonso Cornejo



**"Complexity & Chaos:  
Guide for XXI Century Management"  
By Alfonso Cornejo Alvarez**

**THE SUMMARY IN BRIEF**

Today's organization is being trapped within past paradigms that prevent it to be more flexible and dynamic. Recently, in past years organizations have unsuccessfully sought the formulas that would allow them to survive in a competitive environment which is every day more dynamic and disorderly. However, changes have been partial and organizations haven't been able to adapt the business essence according to the new and incremental environmental demands. In spite of everything, we know the 21<sup>st</sup> Century organizations should learn to evolve and adapt their structures in this new environment if they want to stay within the competition arena.

The Process-Structure Model will allow us to understand and modify the complex internal organizational dynamics, identifying the structures that generate the spread of dissimilar conducts and events. In the *Complexity and Chaos* book, the tool of *Management Complexity* is also presented, an ideal support for those organizations trying to design or redesign structures in order to reach the conducts and learning that would guarantee the adaptation to their environment. The process of organizational change could be accomplished in learning cycles considering the essential structure in order to reach a sustained and healthy growth.

In this book some ideas that allow us to be optimistic about the future awaiting the organizations are presented, because instead of feeling at the mercy of what is happening, we begin to discover the principles that rule the complex conducts of business. The organizational complexity and chaos is never going to end, it will always be there. In greater or lesser degree, the 21<sup>st</sup> Century challenge is to learn how to manage them.

Alfonso Cornejo's interest in complexity and chaos began since 1991, having lived through several experiences in organizational *Change Processes* that awoke his interests. Since then, he started a personal search trying to discover the patterns that rule the disorder and complexity of the situations surrounding us which we face every day. He has had the opportunity to exchange viewpoints with researchers of these theories like Fritjof Capra, author of several books as "*The Web of Life*" and "*The Turning Point*" among others, and Margareth Wheatley, author of "*Leadership and the New Science*" and "*A Simpler Way*" at the Seminar about Self-Organized Systems (Chaos Theory Application, Complexity and Organizations' Change Processes) which took place during July 1996 in Salt Lake City, Utah.

## **THE SUMMARY**

The tools that have been developed along modern management history in order to improve the effectiveness are good, but as usual, in the same way, we have fallen in the trap of a partial approach. This hadn't bothered us as much as in recent years, where we have tried to improve business companies, which are based on conventional tools, and there we have the results, we know them very well. But in moments where changes are experiencing an acceleration process which involve all the organizations, we are going to deal with decisions which if not taken correctly, either by opportunity, by lack of information, slant approaches, or for other thousand reasons. If they are not the correct decisions we can make the organization start its own decadence process.

The desperate search of definite and magical solutions has been fed by a more dynamic and changing environment, which effectively tends toward a growing complexity. However, we also live inside vivid and adjustable systems to which we have made too little trying to understand. Those systems to which we belong, as society and organizations, are born, grow, develop and finally die. They count on their own rules and internal Self-regulation and control mechanisms. They evolve into higher complexity levels without staying static; live in an environment that surrounds them, and at the same time is threatening them and demands adaptation. And at the end, the environment is the result of the changes generated in the systems within.

This is the theme for this essay. We will watch the organizational system with new eyes in order to understand its conduct, knowing its structure, its processes and interactions that as a living organism evolves together with its own environment. For our own surprise, the complexity of the world in which we are living does not demand additional approaches, it suggests us to apply the correct approach.

### **The Cellular Organization Genesis**

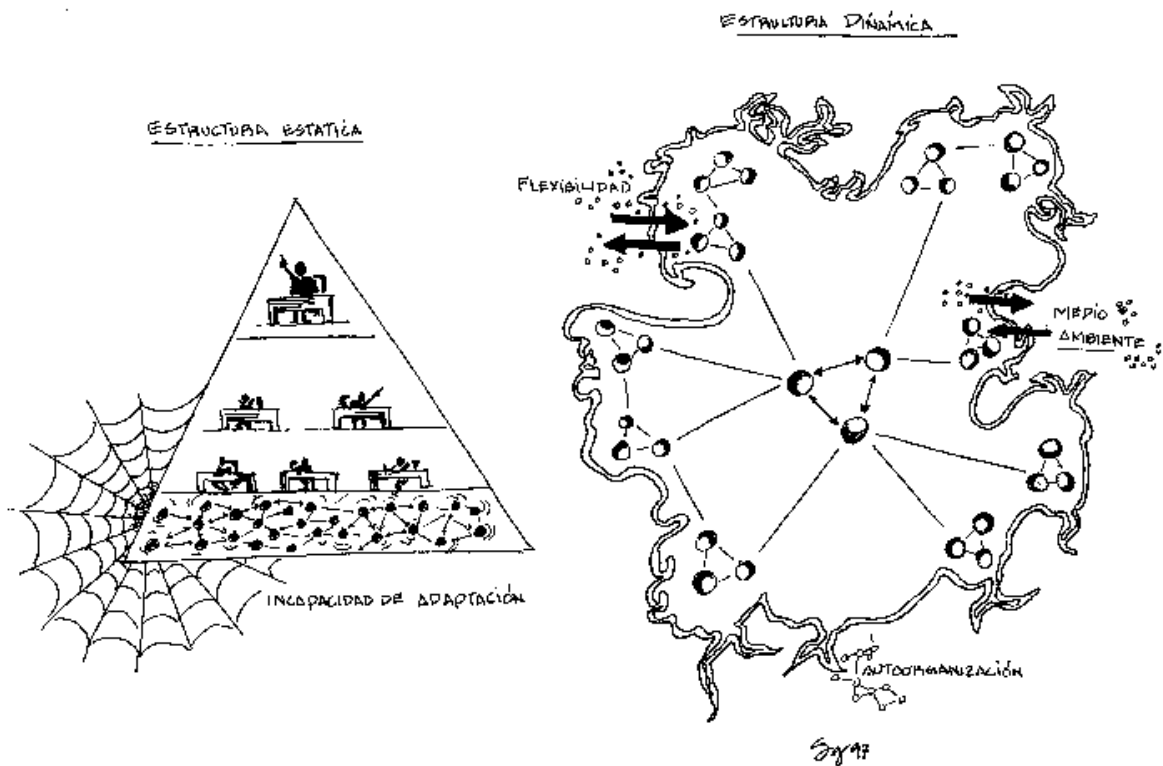
Up to date the organizations have worked obeying the laws of operation, which were conceived in the mass production era. Even inside this Model, organizations have evolved and they have been reconfigured to adapt to the environment changing situations; this has allowed them to increase their quality, productivity, and adjust their products and services to the market. Nevertheless, the thinking process that has made possible achieving the changes inside the company is nearly to be stopped by the feasibility limits within the criteria to improve the organization. And it is because the accelerated change that the organizations require to live is going to demand greater adaptation and reconfiguration speed.

John Bessant mentions in his book (Managing Advanced Manufacturing Technology), the theory of "The Great Waves" from the Russian economist Kondratiev. Here is mentioned that the economic development that we have observed in the last centuries is remarkably correlated with four waves characterized by the following items:

- 1) They are characterized by a bunch of technologies that allow economic opportunities of growth and expansion.
- 2) Each cycle ends when the technologies reach to a limit and eventually to a fall in the economic growth.
- 3) The economic growth is bolstered by industries which can make use of that bunch of technologies, which in turn put products at society's disposition that allow its growth. Such is the case of the steam engines' charcoal in the second wave, or the petroleum in the fourth wave.
- 4) At the beginning of each wave, new enterprises start to develop in the embryonic stage that utilize innovative techniques and principles that eventually will become the technological motor of the next wave.
- 5) Each wave is dominated not only by technological bunches, but it carries associated to it characteristic organizational forms, which establish the rules for the business management and functional structure.

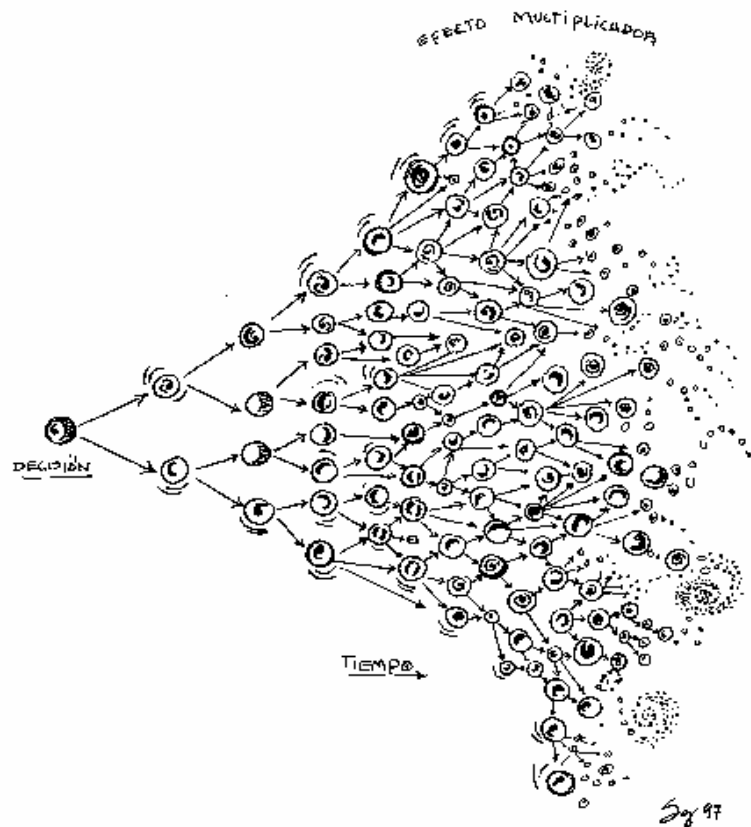
Each wave ending also brings married with it new forms for structuring the organization as a technology function, once the predominant organizations and technologies have shown their ineffectiveness to survive in the new environment. While on the other hand the organizational anchors that don't allow the organization to adapt at a greater speed are:

- 1.- Bureaucracy
- 2.- Short-term management
- 3.- Casual and linear thinking
- 4.- Organizational paradigms



## Complexity

The complexity and chaos that is lived within the organization is not a dice game, the situations leading to chaos are perfectly predictable if we pay close attention to those variables that tend either to increase or diminish them. We will mention a typical situation: One company acquires a new and numerous standardized truck fleet from only one supplier for the delivery of their products. To accomplish the repairs, parts handling, and spare parts control, it requires ability and learning development that must be accumulated by the team of people that is in charge of the product distribution technology.



Two years later, due to the obligations that a top executive has, a great amount of units is bought again, but from a different supplier. Comments are not needed to know that the required effort within the organization for the management, tracking and control of, although apparently two similar technologies, needs an abundant waste of energy, an additional talent display and a more complex management for a situation that had already been stabilized.

This simple example, very common and specific in the organizational context, falls within a series of situations which are presented everyday within any company. The complexity, understanding it as the number of variables and their relations, was increased and could have been prevented. From this approach we can classify the Complexity that is given in the Organization in three types:

**A) Origin Complexity.-** Due to the technology, product and infrastructure characteristics naturally demanded by the organization. The design complexity type is that which emerges from the organization basic components and their interrelations in order to operate.

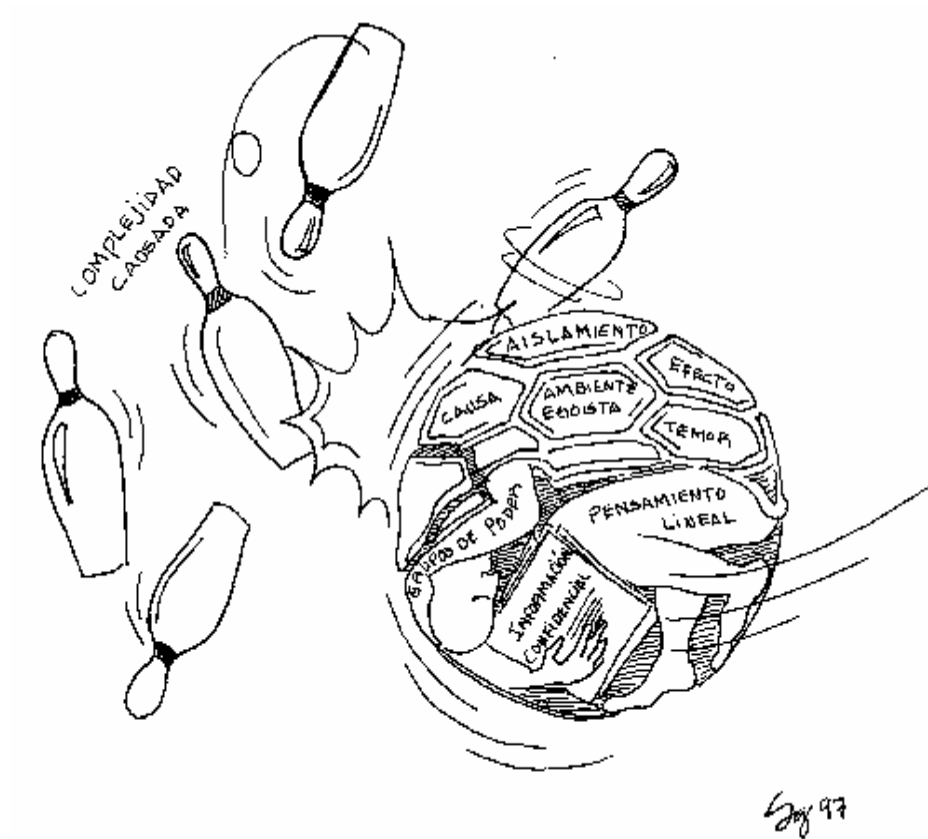
**B) Residual Complexity.-** The non-managed complexity type begins at the moment in which the demanded variety exceeds the system's variety and which generates a cumulative differential. Complexity resulting from the normal processes within the organization; conflicts in decision making, out of control processes, production programming, customer claims, etc.

**C) Provoked Complexity.-** Complexity resulting from phenomena non-attributable to normal situations, such as power groups which unconsciously make decisions within the organization for their own benefit. Besides this kind of complexity is generated by slant decisions and partial information.

We may also mention that other factors that increase the complexity level within the organization are:

- The number of variables and their relations
- Lack of information

- Schedule time pressure
- Centralization

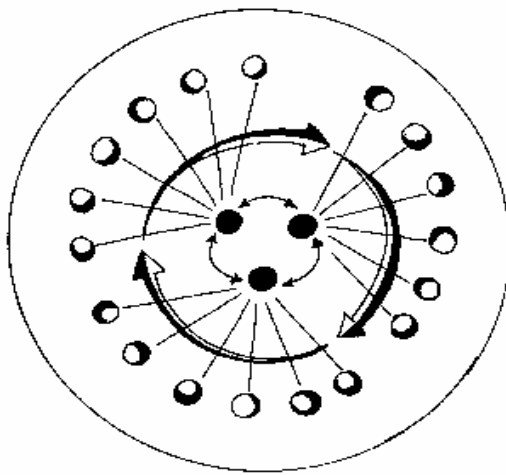


### System Capacity to Manage Complexity

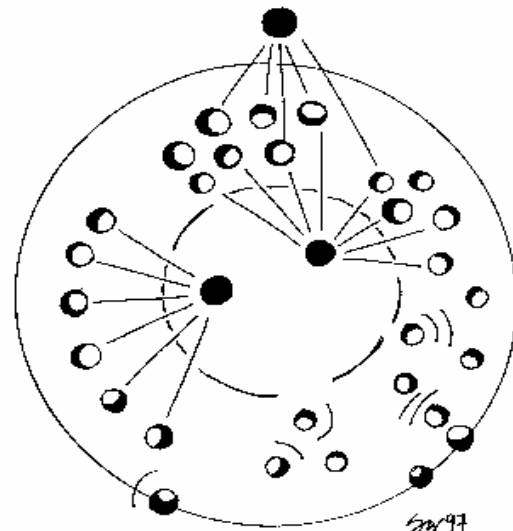
Everything that happens within the organization consumes energy and it must be taken into account that the energy must be dosed and not be used indiscriminately. Making efficient and effective use of the resources is translated in the capacity to properly manage the complexity of the situation.

- In order to manage complexity the proper capacity is required (Variety and Ability) from each element to attend the system demand.
- The System Capacity is optimum when the emergent properties are properly made use of.

- When the system components do not fulfill their roles and their functional expectations about them excess pressure is generated in the system which manifests itself in an efficiency and effectiveness loss, reducing the parts' orientation because of the secondary effects that are provoked.
- Complexity is a very particular situation reality that we must understand and manage. Its proper management requires several observers (which form part of the complexity) that share the "Shared Map" reality in order to understand and manage it.



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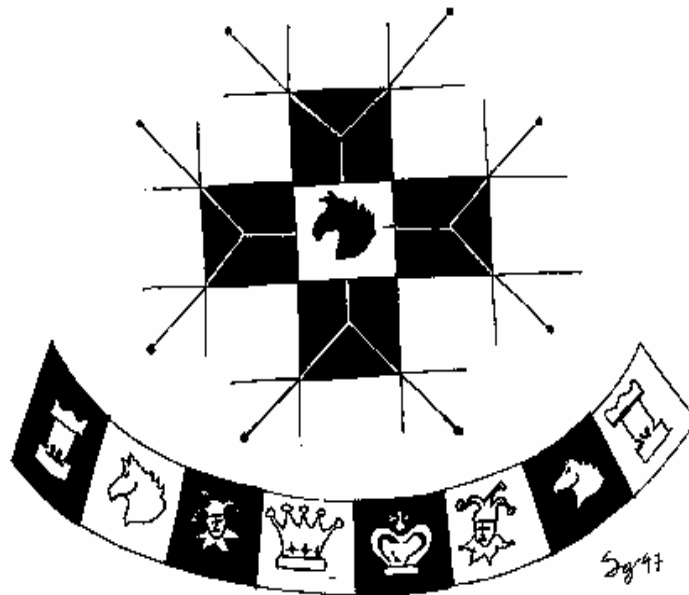


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### **The Structure-Process Model**

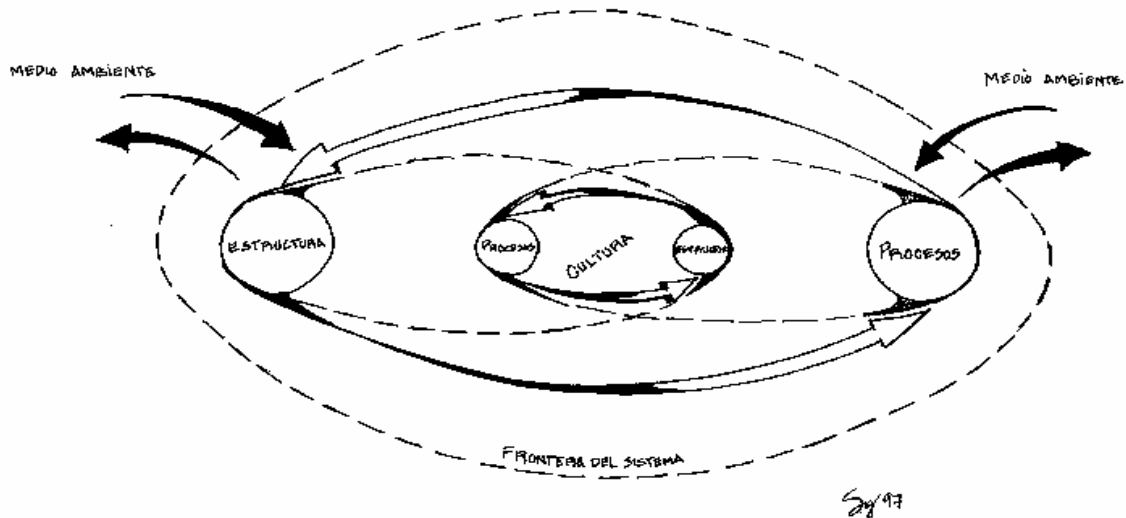
Improvement approaches have come and gone and still it seems that we are unaware of the possible effects of our acts, we don't have identified leveraging points nor the key variables to manage the organization conduct. All of this is due to the fact that many tools have been developed (with great improvement potential) to attack in an isolated and independent way parts of the system. Nevertheless, as any other strong drug, we forget the lateral effects when applying the antidote, and all this in non controlled situations may be delicate for the organization.

In fact it is still common practice to attack the symptoms of the problematic in the organizations without properly questioning if we have reached the bottom of the situation. We haven't realized that everything that happens within the organization is interconnected and when we attack one variable it generates effects in other parts of the system. If this is not taken care of, we can lose control of the system.



Also, it has been common practice to try to improve an organization from within its processes and not from its structure, when the latter is the one who generates the rules for possible actions to the processes. We had mistakenly searched attacking the chaos and organizational complexity through improvement processes without questioning which structures were generating the disorder.

After all, what is the organization?, but a chess board where the figures live through events under certain rules and a squared board. On one hand, the board and the game rules are at the same time the structure that defines the game to be played and its possibilities, and on the other hand, the processes are the place that are gradually generating the system's dynamic. And here is where the cycle ends because when the processes occur gradually they modify little by little the structure of the system, just like the water drop that graves the hardest rock as time goes by, and deforms it by the effect of a repetitive event.



Structure and Processes is a universal duality; it is the form and function. Is the dancing relation of two virtual poles with dynamic movement for any system at any level of the universe, from the atom up to galactic cumulus. One requires from the other to exist, and since there are no processes if there is no structure, nor structure without processes. We can imagine the structure-processes model as two separate entities but united through bonds

which connect both and are used to feedback their effects and modify their form through time.

How many and on repeated occasions we are faced trying to implant a change in an organization, whether is called quality program, leadership, productivity, team work, etc. (processes). The problem is that we never were aware that we were trying to change the organization. Now it is clear that in the majority of cases is not possible to modify processes attacking the processes. It is necessary to count on the required structure (may be policies, procedures, game rules) in order to provoke the improvement processes required by the organization. This is why it is important to discover the system natural leveraging points, that is, places where we can stimulate the variable with a minimum effort and great results can be achieved.

Chaos, complexity, lack of control, are concepts which we have been exposed to without knowing what produces them. Understanding the organizational dynamic seems to be unreachable because the quantity of dynamic variables involved and the quantity of possible states that are generated. Nevertheless, **The Structure-Process Model** allows us to see things from a different viewpoint, it allows us to step further into the Chaos and Complexity Management, in a world where the multiplicity of states darkens our vision and hinders our way to the predictability of future events.

Some of the most important principles and properties of **The Structure-Process Model** are the following:

- The system's structure generates its own processes
- The processes through time modify the system's structure, rising this way another structure... which generates another kind of processes...and so on.
- Changes in the Structure modify the processes and in the same way even the minimal change in processes has an effect on the structure.
- Solid structures allow controlled processes. If the structural elements lack solidity then it will be easier that the processes modify the structure.
- The greater influence actors can modify the structure and the processes in order to achieve the stability level that satisfies the interests of the groups with greater influence on the system.

Now let's talk about what The Structure-Process Model means within the organization:

### **Structure**

*(The board, the pieces and the game rules)*

- **Management Structure**
- **Technological Structure**
- **Human Structure**
- **Cultural Structure**

### **Processes**

*(The plays in chess and their possibilities)*

The Primary Processes are those which allow the sustainability and organization's growth. All the processes within the organization must have something to do with them and must support them, otherwise the organization may stop incrementing its internal entropy level.

- **Environment Adaptation**
- **Operation**
- **Maintenance**
- **Growth**
- **Learning**

The Secondary Processes are those that are given to support the organization's primary processes, but it is up to this level where we will see the structure living its processes.

### **Culture**

One of the most important phenomena yet not defined but which we can understand under the Structure-Process Model is that of the Organizational Culture.

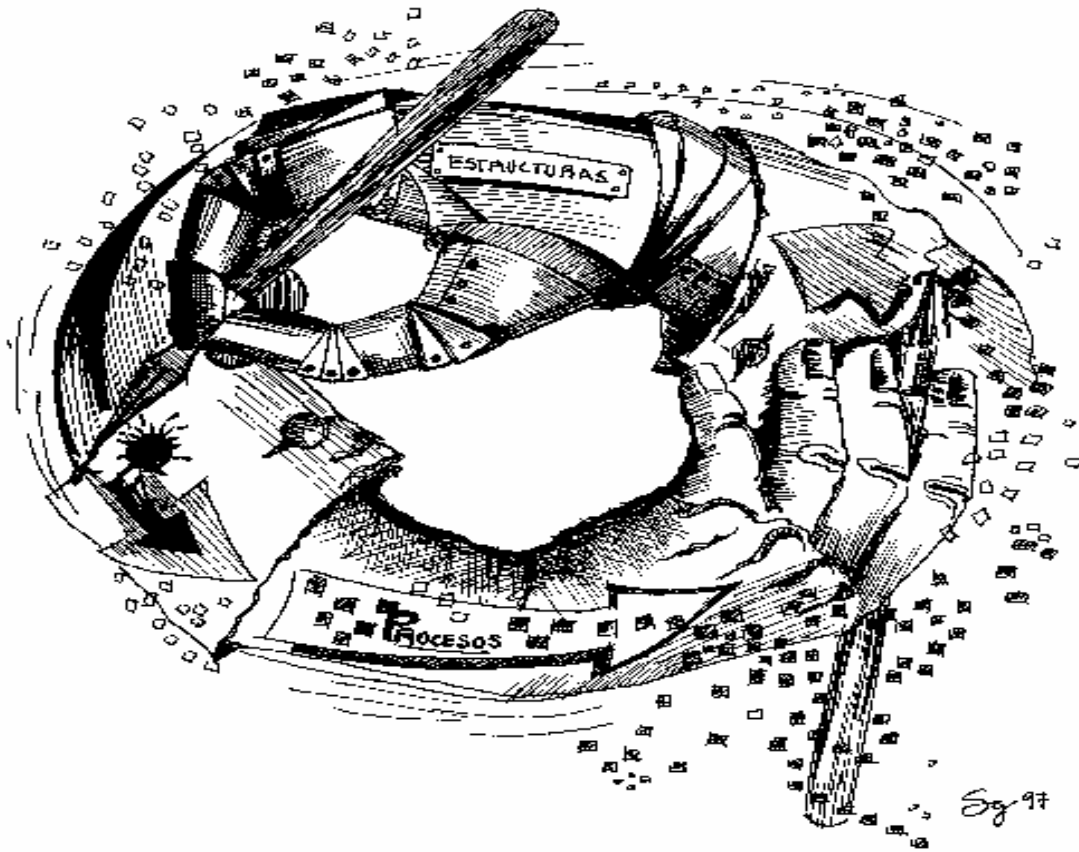
This variable has always been extremely complex to comprehend and because of that there is a great number of definitions trying to structure it under different criteria and viewpoints, all of them valid and rich in possibilities for its analysis.

However, I'm convinced that the organizational culture contains both elements of duality and from this perspective it may be perfectly understandable for managing it within the

organization, and in this way it may not be seen as a caprice of human groups who exchange ideas, values and conduct codes to rule the behavior which characterize it.

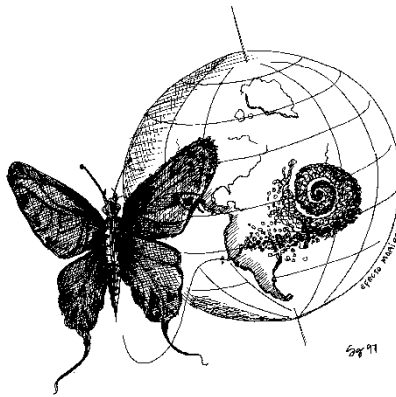
### Design

One crucial point for any system is that of its design, because it is precisely at this moment in which its structure is molded and defined and the spread of possibilities in its processes is created. From here on, depend the possibilities from whether the organization will be successful or not. In fact a badly designed system is a costly system to manage, because it is a system where the entropy starts to grow without measure and eventually it may make the organization lose its capacity to create positive cycles.



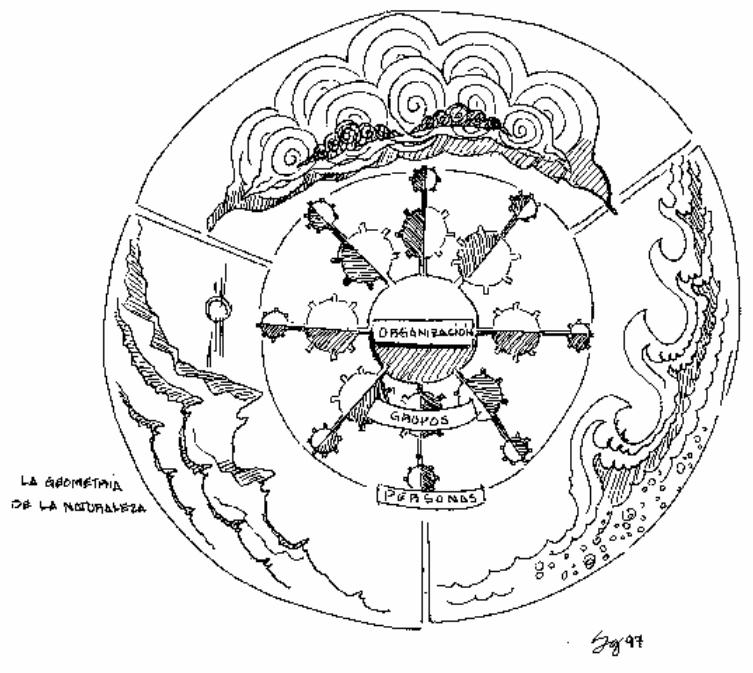
## Chaos Theory

The Chaos Theory is not only a new magnifier lens to understand the turmoil within nature, the capricious forms that it exhibits, and the conduct patterns to which it obeys. Furthermore, it also appears as a valuable tool to understand the human and social conduct behavior, the economic phenomena, as well as the evolution of technology and industrial activity. Currently there are many scientists studying this matter.



Faced with these perspectives, it doesn't seem to be far away that we use the new model to explain the conduct of the systems which surround us and which we form part of. Particularly, and as the main theme of this book, I'm interested in the application of the Chaos Theory, in this case to the organization and its dynamic. Nothing better than actually counting on a set of principles that help understand about the attractors that condition the apparently capricious behavior of some organizational variables being able to properly identify those variables which if not properly handled may degenerate into an "internal butterfly effect". Long after, understand this kind of attitudes that are repeatedly generated in different organizational scenarios and which reproduce in fractal scale, as well as creating the conditions so that under a certain basis a "bacterial culture" is originated from which well integrated work teams may emerge with the ability to self-organize themselves oriented to the business goals.

In the same way we must change the optics of the organizations. We have already mentioned that the mechanist principles from which they are ruled to be managed are turning very inoperative, for a simple reason, they were managed as machines in the machine era, but now that we are stepping into the information era they must be treated for what they are: living systems.



### **Organizational Attractors**

Starting from this new opening necessary to see with a different lens the organization, I would like to use the Attractors allegory which is mentioned in the Chaos Theory and I will try to carry them to the organizational environment where I am sure they will be greatly useful in order to understand what is happening, and which after all they will serve to establish order bases where apparently there aren't any. The attractors, are dynamic attraction zones that limit the variables' behavior in apparent disorder. These areas of attraction, where variables evolve in complex scenarios, make certain conducts which spin around them predictable.

The attractor concept is very interesting and I make reference to it because as it is cited in the Chaos Theory, is the order patterns that are located behind the disorder. Through them we don't have to worry to understand the dynamic of each variable, but understanding the limits that are established within which that dynamic will be lived. Besides I don't feel so alone in this audacity, because Margareth Wheatley (1992) also mentions the Business Vision as the great attractor that guides the organization towards a common goal. Translated to the organizational environment, those attractors that exist allow the dynamic evolution of the different variables that integrate, yet without control and supervision, as is mentioned by Wheatley.

The fields that limit the performance of the chaotic variables within their organizations are:

- **The Vision of the Organization**
- **The Mission**
- **The Power Group**
- **Its Product or Service**

The fields of attraction are not static, but they are also subject to their own dynamic, nevertheless they are more institutional and therefore more predictable in the organizational dynamic. Another additional aspect is that these fields cross themselves and even are of different magnitude and reach. In their group they define important aspects of the organization like its conduct, a response because of the environment, and its internal operation. The importance of the attractors relies in its knowledge and modification in

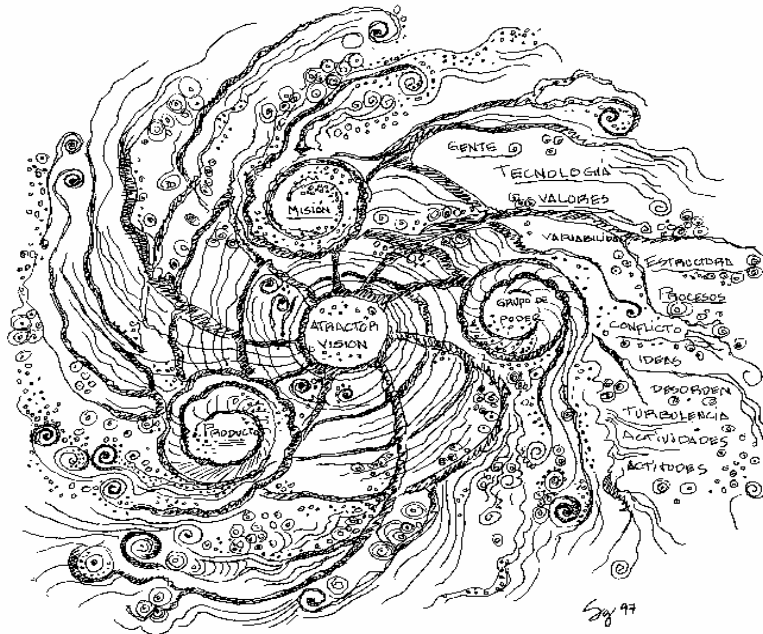
order to change the conduct of the organization towards higher performance levels. From my viewpoint they are the additional variables (besides the Structure-Processes Model) necessary to understand the organizational conduct.

### Vision

The Vision within any organization is important because it gives coherence and is able to drag the organization into the future. Although we must say that the Vision is not always necessarily expressed in writing and sometimes is not known to everybody. And however, it exists, impelled by a select group of leaders who maintain a shared vision and a future image of what the organization must be.

When the vision does not exist, the organization losses its meaning and its orientation to converge into something, because of the lack of vision a number of actions remain suspended which are lost because of not having a common reference. This may occur when the organization greater influence group leaders do not share what the future organization must be and each has his own vision.

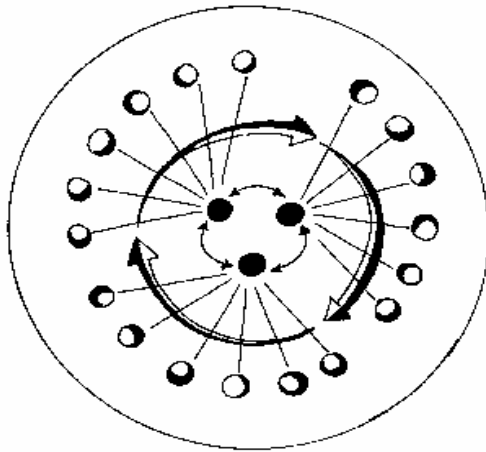
For this reason it is important that the company most influential people, responsible for setting the vision have the same objectives which must be the same the business has, for business sake. To divert the organization from its basic goals is to loose it.



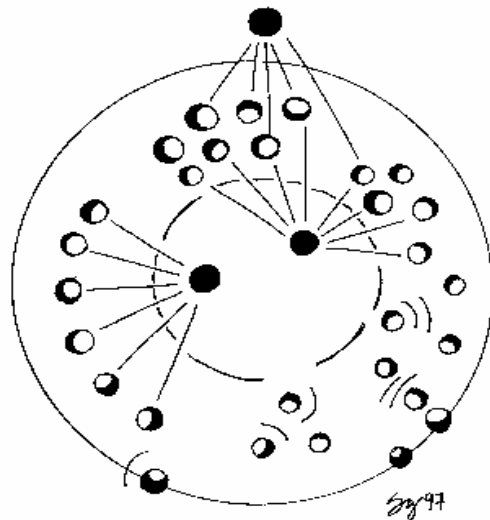
### **Self-Organization**

Systems are dynamic entities within an environment which is also extremely changing. Systems try to keep this dynamic balance with the environment through their internal processes and for this reason systems change, they don't stay the same, even for an instant. Systems are continually modifying and seek to organize their structures and processes according to the demands imposed by the environment to assure their survival.

Margareth Wheatley mentions in Leadership and the New Science: "Although flexible, an Self-Organized Structure is not a passive reactor to fluctuations. When it matures and stabilizes, it becomes more efficient in the use of resources and better qualified to exist within its environment. It establishes a basic structure which supports the system's growth. This structure then eases the formation of an isolation from the environment which protects the system from constant and reactive changes."



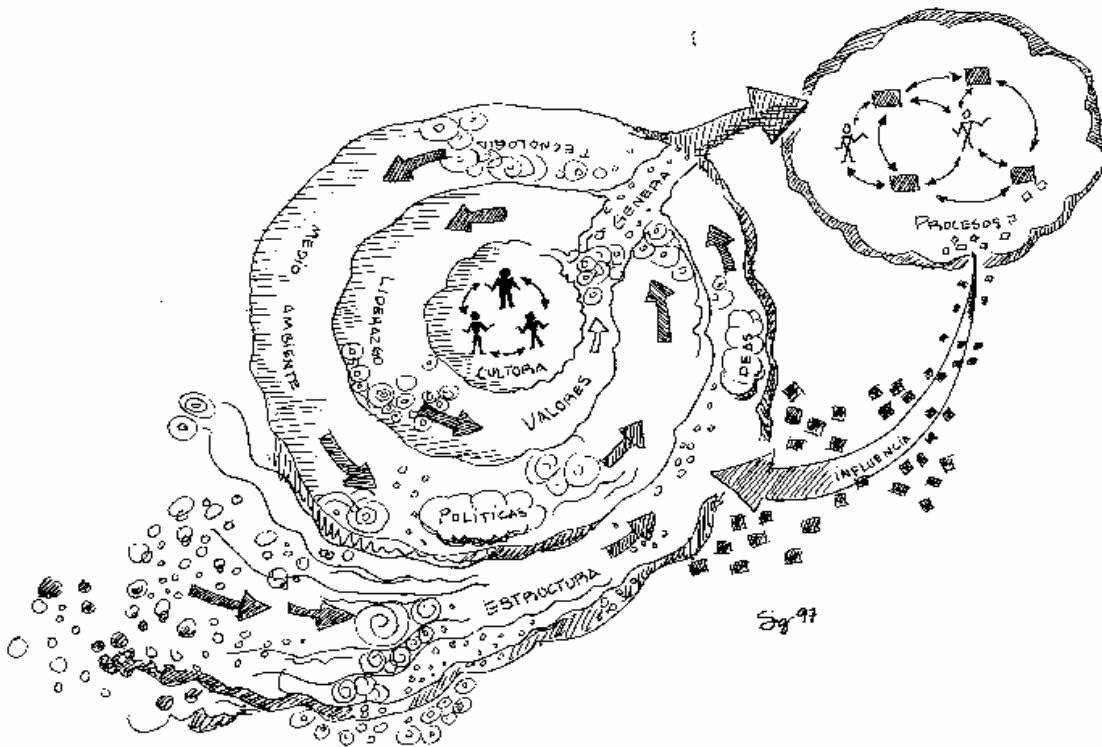
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Change then is a normal process that the entities and their environment play. The signals for change are out on the exterior environment and for this reason the organization must develop the proper mechanisms for capturing, interpreting, and install those emerging changes that will allow the organization to stay functional and up to date in front of its environment. The system must seek to keep its fundamental structure and in its process of change, adapt itself only to the required variables. This is what is known as Autopoiesis.

To elaborate on this principles made Ilya Prigogine win the Nobel Prize on Chemistry, when finding that, even when its true as the second law of thermodynamics postulates, when energy escapes from systems, their ability to maintain organized structures diminishes, this in turn increments the entropy and therefore disorder. Nevertheless, the disorder and opening processes are the ones that enable the systems to branch out and jump to new levels of order, making clear here that the entropy within the system is a trigger for order, unlike the thinking of it before.



This properties always have been with us. Along side the economic development history we have always counted on this self organizing ability, but we didn't know how to exploit it. Being a living systems property we have clung to thinking and demonstrating that is no use incapable people take his own initiative. When people is working care must be taken for them, because otherwise if they have the opportunity they'll betray their boss.

Companies that have done the above know this is a reality. The organizations that had been willing to create the participation and creativity structure have accomplished the organizational life enrichment and created the needed group synergism to be above the organizational complexity. This is the correct way to counteract the complexity and entropy which grow on every organization corner if their control is lost.

### **Complexity and Chaos Management**

Among other things, the Structure- Process Model may support the organization with:

1. **Environment** Analysis and its repercussion on the Organization
2. The diagnostic of the organization as a whole, as an **Open System** and exchanging energy and information with its **Environment**.
3. Its capacity to adapt to its **Environment**.
4. Evaluate its structures faced to "the must be"
5. Evaluate its fundamental processes.
6. Evaluate the Organization **Chronological Age** as a function of the rigidity of its **Structures**.
7. Detect the greater influence **Structures** within the **Organizational Culture**.
8. Detect how the **Culture** influences different **Processes** types within the Organization and how it affects the Organization **Structures**.
9. The Organization Attractors effect: Vision, Product/Service, Mission, and Group of influence.

### **Methodology for Managing Complexity**

The Methodology for Managing Complexity is divided in a simple stage Cycle:

- I. **Diagnostic**
- II. **Comparing the actual state against its corresponding "must be" (desirable and feasible Changes)**
- III. **Process of Change**
- IV. **Learning**

At different stages determined participation is required from personnel laboring within the organization, coordinated by the leaders, who should be monitoring and coordinating the process at different stages.

## **Structure - Process Model Principles**

### **(Selection)**

- 1.- The Structure - Process Model exist in all the systems taxonomy, from the simplest (cell) to the more complicated systems (organization, nation, etc.)
- 2.- Every event in the organization can be known through the Structure - Process Model
- 3.- Each organization is designed to obtain the results (processes) of it's design (structure)
- 4.- Main Management responsibility is to create the structure for the development of the fundamental organization processes (Operation, Maintenance, Environmental Adaptation, Learning and Growth)
- 5.- Organization degrades in all it's components (entropy increase), but through the fundamental process, it can survive and develop
- 6.- Organization should develop the capacity to use limited resources, because everything that happens inside the organization requires resources, and the more complexity, the more resources it requires.
- 7.- Processes can modify the organizational structure as times passes
- 8.- Organizational living should be reflected in structural evolution
- 9.- Structure - Process Model can be applied at organizational, cultural and personal level. All of them are interconnected.
- 10.- Organizational Change success could be measured not only by it's finances but by it's Structural Change
- 11.- Organizational changes requires time for inner cycles stabilization
- 12.- A bad decision increase the organizational complexity level
- 13.- Cultural Process are capable of modify the organizational Structure, so they should be monitored and controlled.
- 14.- Organization should be in permanent contact with it's environment and use the information to modify it's structures

