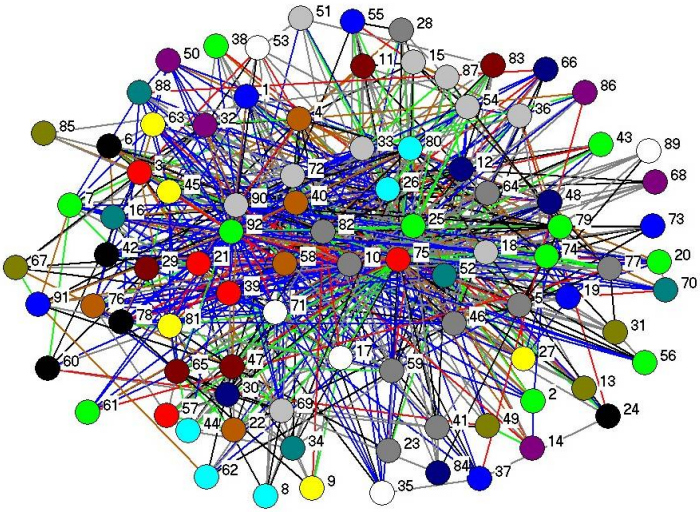

Social entanglement:

information is all there is,

communication is all we need.

Clara Pelaez Alvarez – June 2012

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1. Presentation

I´ve worked many years on the information technology field. I'm one of those who saved bytes because we were lacking storage space, what would eventually trigger the "millennium bug", which we all survived, fortunately.

Forty years ago the IT field was still incipient. It encompassed people from all specialties. I remember using punch cards. Computers were huge and needed special chilled rooms. The computer terminals were remote and any software was very expensive.

Throughout my career, I have come to realize that the problems we faced were almost never technical. Wasn´t uncommon to have users sabotaging the system. Developing a system, or anything else in this area, was always a relational adventure. Other departments could make harder to access information if they didn't want a given project to go on. There was a veiled egos battle and high competitiveness.

In the beginning of 90´s working as a consultant my team was hired to figure out why a bank business analysis area was not doing well. The department was created two years earlier to bridge the gap between the IT department and the users, as they were not working as they should, but now the director's job was at stake.

We started with the basics. We found that the area was created from a well done strategic planning and that the workers were competent enough. Why, then, was the department put aside? We found that prior to the business analysis department creation, users connected directly with IT staff and eventually,

when the business analysis department was created, IT department felt they were losing influence as they were no longer in contact with the users. Joining that fact users found it easier to keep in contact directly with IT because things tended to move faster, thus, slowly "sabotaging" the business analysis department and setting it aside to keep the old practices running. It becomes clear that there was an implementation error: people affected by the creation of a new department were not consulted. They were not considered part of the innovation process. One day they just received the communication that from that moment on the processes would change. There was no previous explanation or conversation. The innovation was imposed and therefore sabotaged. Any innovation always depends on a network of people. Innovation occurs when a new behavior is adopted by the networks involved. At this point, it ceases to be innovation to become standard practice.

The atmosphere was tense, with everyone trying to extricate themselves from responsibility, people were afraid of being fired. We tried to create conversation networks, put people together to exchange ideas and find some way out of the impasse, but despite that the department was shut down.

Similar problems were common across all departments. Things were locked not because of technical problems, but because of communication issues and interests/power disputes. In the end of the day, there wasn’t a single technical problem; it always came down to relational issues.

I´ve become interested in any information that would help me understand collective entanglement dynamics. At the time, I realized that my role was to articulate and influence not isolated

people, but networks of people. At the moment, the science of networks was still unknown, although, as I discovered later, research on the dynamics of social networks was already underway.

In the 1980s, I´ve discovered two things that would definitely change my perception of life: quantum physics concepts and the complexity theory. I was so tremendous impacted by that information that a few years later I went off for a sabbatical period to rethink everything. About fifteen years ago I “locked” myself at home between books and the internet and started to study. One thing led to another and I was putting more and more knowledge and flavors in the information cauldron.

I am a good example of this time. The internet gave me access to almost all the knowledge that I thought necessary. Others may be relegated to the impossibility of knowing everything, but I was able to follow my own learning path and choose who to learn with. As a matter of fact, I've always felt more comfortable learning in books than in classrooms. I am self-taught.

This book is a synthesis of my research over the past few years. In this text you will find knowledge of various areas, because they complement each other. I understand the network science as multidisciplinary and this is an important feature of my research.

Network society is not a new phenomenon. We have been a network since humanity emerged. Wealth generation systems have always had a huge impact on the structure and dynamics of social networks.

At this moment the fifth cycle of wealth generation is under way. Once again, the way to generate wealth and social relationships are changing deeply. Every transition is always confusing and very complicated. At one side are the heralds of the new order. At the other side are those who believe they have much to lose with it, so they resist fiercely. Most people are between these two poles, however, social changes and evolution to new levels of understanding are inevitable. Impermanence is intrinsic to life.

As in other cycles, those who perceive the change first have the advantage of getting ahead in any endeavor; however, they will also face difficulties in spreading the new idea. A society changes when a certain amount of people changes their behavior. It is very difficult to know, at this initial transition moment, how the new order will be shaped, but the foundation concepts can already be perceived: diversity, information fluidity, social relations circularization and symmetrical resources division.

I believe that network science will play a key role in this whole process. We are discovering that our collective behaviors are very different than the individual ones. This is social entanglement, a concept that I explore in this book. Social entanglement is the basic dynamics of our species evolution. All together we are brilliant, and this does not depend on individual intelligence.

2. Introduction

"What we observe is not nature itself, but nature exposed to our questioning method" (Heisenberg)

In this world, nothing is what it seems. Nothing is isolated, everything is entangled. Nothing is solid, everything is electron cloud. Turbulent and huge, this universe is not even unique. According to the recent Membrane theory (1) it is only one among many universes that co-exist in a multiverse. Everything is configured as a complex web of interdependent phenomena. Everything co-evolves. Everything affects everything. The universe is not finished. It is an eternal process of becoming.

Any and all explanation about nature is always human and will be related to the cultural parameters of its time. Any and all perception is linked to the neural processes of reality creation. The universe does not exist without the neural structure that thinks about the universe. The order of nature is understood by human parameters and its limit is what we can conceive. Nature has no fixed laws to be discovered, but patterns and structures that change over time. There is always a human in the evolution process thinking about evolution.

Life does not emerge when there are favorable conditions. Life creates the conditions for its existence. The Earth is a sentient being in an evolutionary process that self-creates and self-regulates, where all things are in dynamic equilibrium. The living parts - plants, microorganisms and animals - are intrinsically related to the non-living parts - rocks, oceans and atmosphere. The whole planet is a living system. (2)

In the 1970s, the physicist Geoffrey Chew proposed the "bootstrap" philosophy that postulates that there are no fundamental constants, laws or equations in nature. The material universe is understood to be a dynamic network of interrelated events. No part is more fundamental than another. The parts are just patterns in a web of relationships that is inseparable.

For millennia, our logic for understand reality is based on the hypothesis that there is a world "out there" independent of ourselves. "Out there" there are laws that must be understood and secrets that must be unveiled. The consciousness that perceives and understands the laws is generally not considered, however, there is no neutrality in the universe. All understanding comes from the neural structures of the one who understands. The understanding of a phenomenon always depends on the knowledge and experience of the one who is studying it, and as the act of observation itself alters the phenomenon description, the phenomenon and the observer are fully connected.

Life is entanglement and not isolation. There is no objective reality independent of the observer. Everything is entangled. There is meaning only when considering connections. The focus is not in objects, but in the relationship between them. Reality is something that happens "in between". Life is a network phenomenon. It is web, interlacing.

Brains are intricate webs of billions of neurons that communicate chemically by generating electrical energy. They are reality factories. Subatomic particles can only be understood in relation to other particles. The breath of living

organisms and decomposition of dead ones creates atmosphere for life. In order for us to live, others must die.

Everything forms a great planetary network that is inserted in the solar system network, which is inserted in the Milky Way network, and so on. We live in an entangled universe, in a universal network.

The human society network (social network), to which we are all connected, is linked to the great planetary network, formed by the thousands of species that live in the planet. Each species forming a subnet and all connect together.

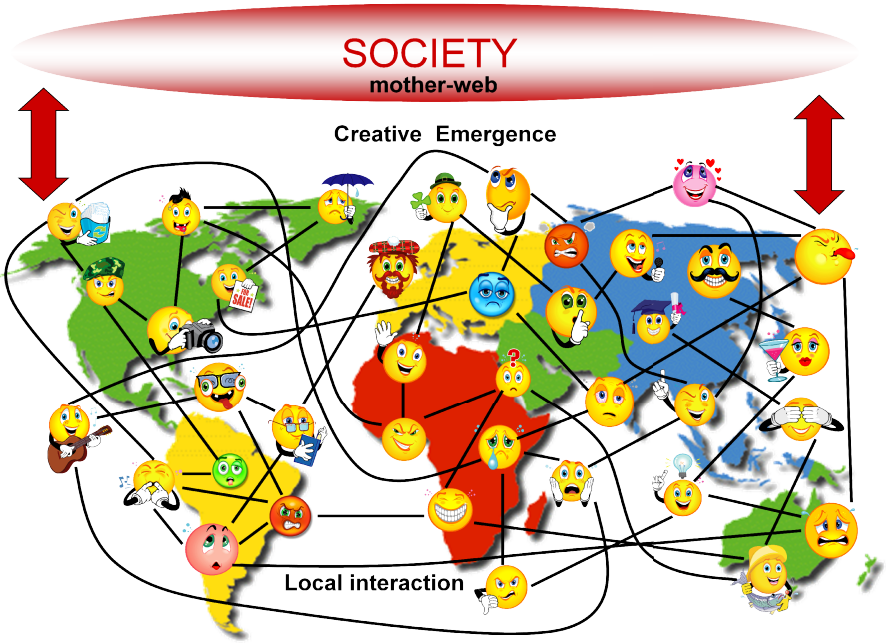
The dynamics of entanglement can be studied from many angles, but this study focus is the entanglement of human society. Through millennia wealth-generation systems and relational structures co-evolved and culminated in a densely connected, asymmetric, fast, and unpredictable society.

Much is said about network society and how communication technologies are changing the way we interact. Billions of people worldwide are connected to the internet and / or have a cell phone. The widespread adoption of new technologies is changing the face of the world. The most obvious effect is social empowerment. Information cannot be retained and manipulated by small groups. We are living an unprecedented sociological phenomenon.

But after all, what is society and how is it constituted? And what is the meaning of the word "social"? According to the Portuguese dictionary Aurélio, society is a group of beings that live in gregarious state. And “social” is a society phenomenon or related to it. Bruno Latour (3) says that the **social** seems to

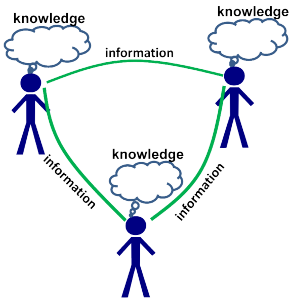
be diluted everywhere and yet nowhere in particular. The **social** is only visible by the traces it leaves whenever there is any kind of association. The **social** is what happens between individuals. Whenever two people interact they leave traces: documents, photos, physical memories of the interaction, or just memory. There are always traces. The **social** is a principle of connections (Gabriel Tarde, 1962).

Society emerges from the interaction between humans. We live in a "mother-network" of billions of individuals in which we are all connected. There is always a way of connecting two people, even though we do not know all the people in the world.



3. Cognition: how the brain processes information

What is information? According to the Portuguese dictionary Aurélio, information is: 1. act or effect of informing, inform 2. Data about someone or something. And knowledge is "1. Act or effect of knowing; 2. Idea, notion; 3. Information, news, science; 4. Practice of life, experience; 5. Discernment, criterion, appreciation ". Therefore, knowledge is an individual phenomenon, what transits between people is information and not knowledge. For example, imagine the following data: football, game, time. If combined they become information: The football game will be at 15:00 on Sunday. John will hear this information and it will have meaning because he is one of the players and the information will change his action: he will go to the game. Meaningful information becomes knowledge. Maria will listen to this information and it will not be turned into knowledge because she does not know the folks of the game and does not even like football. This information will not cause any kind of change in Maria. It will be quickly forgotten. In social entanglement, the information is received by each node, transformed into knowledge and returned again to the network as information. Since knowledge is an individual phenomenon, what circulates is only information.



Everything is information. We are information-processing units, traveling brains that transform information into realities.

Everything in the universe is made of atoms. And the atoms are filled with vast empty spaces. The electrons jump between the orbits expelling or absorbing photons (particles of light). In the nucleus, protons and neutrons are held together through the mesonpi, the messenger particles. An atom is in constant motion. And yet, this universe seems very solid and material to our senses. Why? After all, what is the structure of reality? How does information enter the brain?

The brain spreads throughout the body through nervous system. We constantly capture information from the environment through the five senses: vision, hearing, touch, taste and smell.

All senses retrieve information in a similar way. For example, at the instant of seeing a flower the photons travel from the flower to the eye. In the retina, information is divided by fovea into specialized systems. Colors, shapes, movements are transformed into electrical impulses and sent each by a different channel to the center of vision, located in the back of the brain. The fovea only has absolute clarity of a small portion of the flower. It sees only shapes fragments, curves sections, contour segments and colors parts. It is at the center of the vision that the brain predicts the final shape of the flower by joining the fragmented information sent by the fovea with the patterns of stored images. The flower image will form if the fragmented image of the fovea conforms to the patterns stored in memory.

We are continually filling the gaps in visual information. This is the reason for optical illusions. We see something that is not there because the clues induce our predictive models to tell us what it is.

The other senses work in a similar way. We are continually adjusting our sensations to what we have learned and often distorting them in the process. (4) The brain adjusts the information it receives to existing categories.

The brain never comes into contact with the reality it creates because it is sealed in the cranial cavity and yet we have the impression of a world full of colors and shapes. The brain is a reality generation facility sealed to reality. Reality is a pattern of frequencies, photons, electromagnetic waves, cosmic particles that is interpreted by the brain.

Perception is expectation.

At eight gestation months, the fetus brain is already fully formed and has twice the number of neurons an adult brain has. Throughout life the most used neural structures are covered with myelin and become permanent. The brain is a social organ, poorly used structures or isolated neurons are eliminated. The more we repeat an action, be it a movement, a thought or an emotion the more easily and automatic it becomes. Like walking, for example, no one thinks of how to walk. We simply walk, "automatically."

Throughout life we accumulate experiences and it is with this memory that we draw reality. Memory and emotions are tightly integrated. The greater the emotional load involved in an

experience, the greater its fixation on memory. That's why we never forget the day of our marriage, the birth of a child or the death of a loved one.

Experience is interaction with the environment and with other humans. We interact intentionally and non-linearly. The cognitive structures determine our actions. However, although we have different individual experiences, there are social rules of interpretation and behavior that we all follow. We learn these rules in the social entanglement.

We were already born entangled in the family network. Isolation means death. It is with the family that we begin to learn to live in society, to know what behaviors are appropriate in the context in which we live. Entanglement means living within the boundaries of the assumptions of the networks to which we connect. Over time we adapt and co-evolve. It is in the dynamic of social entanglement that we all together create the human society reality.

4. The network science

"Subatomic particles have no meaning as isolated entities; they can only be understood as interconnections" (Erwin Schorodinger)

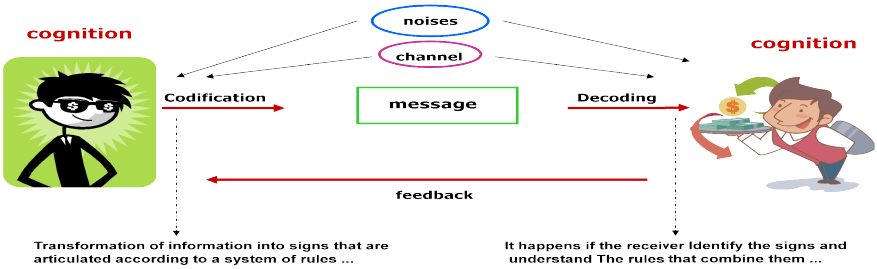
Although it is virtually impossible to study the whole mother-network, in the last thirty years the study of social sub networks has grown exponentially worldwide. The network science studies the networks structures, dynamics and their evolution over time. Human systems co-evolve in an intricate network of multiple relationships between agents (actors / nodes). Network science seeks to understand the patterns that emerge from interactions.

The networks study is a new scientific discipline and has applicability in all fields. Where there are networks the concepts and methods of network science are applicable: in the viruses' propagation, in the markets dynamics, soldiers on the battlefield, organizations, social media, traffic, citing only a few uses.

4.1 Actors, agents or nodos

The smallest unit of a network is a dyad, that is, two nodes in an information exchange dynamics. It should be noted that in human society all information originates from an individual or group of individuals and disseminates through the network by the communication pipelines. Human society emerges from this incessant information flow that overlaps, interpenetrates, and is altered by forming interference patterns (5) transformed by the

human brain into sets of signs that are articulated by dynamic rules systems learned throughout life.



Culture is a set of rules and meanings that articulates the exchange of information and changes over time. Inserted in culture, language and gesture are two important aspects in the information exchange. Although there are many different cultures in human society, there are gestures and habits that are common to all: everyone understands a pain expression without the need for words or a smile of welcome. In most cultures, walking dressed in public places is a rule that if broken is punished with the suppression of the freedom to come and go. This set of rules and meanings are the lenses through which we select information and interpret it.

The story of publicist Hiram Castello Branco (6) can be very illustrative about the culture and interpretation issue. He says:

"One day I receive a memorandum from Rio, from Jomar Pereira da Silva, CBBA president in Rio de Janeiro. He was celebrating the conquest of a customer, at that time little known. They produced the Postmix soft drinks machines, absolute novelty in our country. Solemnly, he announced that we had won the Cornelius account.

Cornelius? I was wondering. Jomar has always been a very serious fellow. But for a moment I suspected that some playful spirit had come down in him. Certainly the advertiser name - Cornelius - weighed on my suspicion. I called Rio to make sure. I started the conversation very carefully, avoiding asking directly if it was a joke. I feared I would demean a conquest, if it were indeed a new account. Realizing my detours, Jomar went to the brink of the matter.

- Hiram. Not only did we get the bill, but we're already authorizing some newspaper ads.

He paused and went on, now laughing.

- I already know that you thought the name was weird. But know that it is an important multinational, which manufactures these Postmix machines to sell soft drinks in glasses in the snack bars.

And always laughing, he said:

- You were not the only one who thought it was not serious. Orlando just came into my office asking me if I could authorize Cornelius. Like you, he was also suspicious of some mockery."

The customer's name was out of the advertisers' social standard leading them to think it could be a joke.

Entanglement means that actions taken by a node (person or groups of people) will affect other people or groups of people entangled. In entanglement, each individual transforms others and is transformed by others.

In a social network, the impact of an action is not uniform but depends on each individual state and the connections structure. Individually we are unpredictable, but collectively we obey rules and social coexistence presuppositions. People do not have a single identity, but an individual identity and a collective identity that is in continually transformation according to the contexts. Most people also act following simple and predetermined rules. (8)

4.2 The network dynamic

Every human being is a whole and has all human characteristics. We live in networks that help to lapidate our individual and social identity.

Since we were children, we have learned to get in sync with other people. We learn by imitation and by repetition. Everything in nature tends to synchronize. Have you noticed that when someone in a group of people yawns the whole group feels the need of also yawn?

Synchronization is the network dynamics basic mechanism. This phenomenon is abundant in nature, engineering and social life. Diverse systems like clocks, crickets, neurons, and applauding audiences exhibit a tendency to operate in sync.

There are three basic laws of synchrony (9):

1. **All individuals are aware only of their closest neighbors.** Notice that you have groups of people that you have directly relationship: family, friends, work, etc. No one knows all the people in the world. Each of us is connected directly only to a small group, although there are billions of individuals in the planet.

2. **All individuals have a tendency to align.** We align our behaviors with the networks dynamics in which we are inserted. If your friends are vegetarians and you are going to invite them to dinner, you certainly will not serve meat. If in your company everyone wears suit and tie, you certainly will not wear jeans to go to work.
3. **All individuals are attracted to each other.** We are social beings. We live in bands. Interaction with other humans is essential in our existence.

Most of our actions are guided by laws and standards that emerge from the networks in which we are inserted. It might be interesting to follow Barabasi's advice: "Think of yourself as a robot that is dreaming or is on autopilot and you will be much closer to reality" or "Our individual choices are highly unpredictable, but when in groups we follow strict standards ". (8) All sub networks have implicit and / or explicit assumptions and rules that are followed by all participants. In this aspect, connection is always limitation.

Since birth we learned to obey someone with authority. We obey parents, teachers, leaders, rulers and so on. With them we learn how we should act socially. Our lives are full of symbols, rituals and authority figures. The price of disobedience is the punishment that can range from a "simple" physical punishment to social banishment and / or total isolation, depending on the seriousness of the contravention committed.

In 1961 Stanley Milgram (10), a social psychologist, conducted a series of experiments to find out how people reacted to authority, even if what was being asked violated their ethical standards. He randomly chose "common" people for the experiment and informed them that it was a research on learning. The experiment was done in pairs: one person was the teacher and the other the apprentice. The apprentice should

answer the questions asked by the teacher. If he answered incorrectly, the teacher would apply an electric shock that ranged from 15 to lethal 450 volts. With each mistake, the applied shock increased a little. The teacher was taken to a room where he experienced a small 25-volt shock, to know what would happen to the apprentice every time he was being punished. The teacher saw that the apprentice was tied to a chair and connected to the electrodes. The teacher was then taken to another room where, through a microphone, he would ask the apprentice questions and apply the shocks if the answer was incorrect. What the "teachers" did not know was that the apprentice was not getting the shocks for real. The responses and reactions to the shock they heard were recordings. Some people, hearing the apprentice's reaction when they were in shock, even said that they did not want to do it anymore, but when the scientist urged them on, because they were part of the experimentation, they continued, although some felt very bad about doing that . The result was astounding: the overwhelming majority of people did not question the researcher's authority although they "knew" that it was causing great pain to the learner. Most of them felt that the researcher should know what he was doing and that, ultimately, it was his responsibility. This was how Nazism and slavery were sustained by society.

We have learned from childhood that rebellion against authority or breaking social rules can cost us social isolation. This is a price that few are willing to pay.

Soloman Asch (11), one of the pioneers of social psychology, studied the group conformity dynamics in an experiment with 123 men. Each (non-confederate) participant was placed in a group of five to seven "confederate" people (who knew the true experiment purpose). The goal was to find out if the "non-confederate" participant would change his response based on

the responses of the rest of the group. Participants were shown one card with one line, followed by another card with three lines marked with a, b and c. The group should answer which of the three lines was the same as the first. The non-confederate participant would be the last to answer. In the first three attempts the whole group gave the correct answers. However, from the fourth attempt the group began to respond incorrectly. In 75 percent of the time, the non-confederate participant thought it was odd, but changed his correct answer and responded incorrectly following the group, at least in one attempt. Only 25% of the participants did not agree on any attempt. And 5% of the participants followed the group in all attempts.

According to Peyton Young (12), an economist and researcher of the game theory, individuals gain a social reinforcement, a benefit, in consideration for following socially accepted behavior. Although we do not agree with certain social rules, we accept them because we have some benefit doing so. This is the compliance dynamics.

But despite the compliance dynamics society is always changing. The rules change, the habits also and to a culture there is always a counter-culture. Juan Urrutia (13) proposed the concept of the "rebellion threshold" which states that the more people around me change the safer I will feel to change.

When someone changes behavior, this change affects the people closest to them who can adopt (or not) this new behavior. We change behaviors and ideas by other nodes of the network influence.

Social influence (14) is one's ability to influence other people. Celebrities generally have a strong social influence. The way they dress or the opinions they cast reverberate across the

network changing the behaviors and ideas of thousands of fans. The so-called opinion makers have a central role in social culture.

The nodes that many want to connect are called hubs and determine the structural stability, behavior dynamics, robustness, tolerance to network attacks and errors. They are convergence points.

The connection dynamics shows that clustering is the tendency for two nodes connected through a third party to connect directly to each other. Technically this phenomenon is known as "triadic closure". If you are a close friend of A and a friend of B who do not know each other, the natural tendency is that A and B can meet at any moment. Two other standards in action are the homophilia that is the tendency of people to create bonds with other similar people and the law "rich get richer" the tendency of people to connect to the most connected nodes (15).

We connect preferentially to people who think and behave similarly to us. Or, we will seek connection with people who have great social influence, because this can eventually result in some kind of opportunity or benefit. Our social characteristics are continually being changed by our connections. People imitate others behavior when there is a direct benefit in aligning with others, regardless if it is an appropriate decision or not. It is important to remember that every observed pattern has its exceptions.

A massive adherence to a new behavior indicates a social contagion arising from resonance, or reverberation of information sets across the network. Examples of social contagion and their effects can be found in the wealth creation systems chapters. The way in which new practices spread to a

population depends, to a large extent, on people influencing one another's behavior. When we see more and more people doing one thing, more predisposed we become to do it too.

In clusters, generally, the bonds between people are strong. In clusters of family, friends, co-workers, etc., the information exchange is high and constant among all nodes. Clusters attach to each other and often interpenetrate. The links between clusters guarantees the news circulation and innovation. In a 1973 study, Mark Granovetter concluded that social co-ordination depends not so much on strong bonds (friendship or family) but rather on the weak links previously established with other actors with whom, until then, you had little or no contact. (16) Usually the source of new information and/or opportunities is a weak tie.

There are always paths connecting one person to another in a seven billion nodes network. As popular wisdom says, the world is very small. This was precisely the conclusion reached by researchers such as Stanley Milgram (1973), Strogatz and Watts (1998) and Barabasi (1999). They conducted experiments, where a package should be sent to a particular person, moving from a known person to another until it reaches the target. The experiments results showed that, on average, we are six degrees away from any other person on this planet. There is always someone, who knows someone, who knows someone.... who knows…

Society is a network of seven billion human beings, where each node tends to synchronize its behavior with the nearest nodes. Cultural changes are due to the social influence we have over

each other. The information flows through the network and changes ideologies, traditions or behaviors. According to a 2011 study, when 10% of people adopt a new behavior, then adoption becomes extremely fast. (17) It seems the "tipping point" or the phase transition happens when the adoption process reaches 10% of the totality of the people exposed to this new behavior. As a matter of fact, the difficult thing is to reach the 10%.

Networked society is as old as humanity, but only recently are we realizing that we live in a network. The next chapters will show that the networks dynamics can be observed at any point in history.

Throughout human history the structure of social entanglement was always influenced by the generating wealth system. The implicit rule is that each individual will always have as much resources as he can get for himself and for the people close to him, such as the family network. Although cooperation is our species hallmark, when there is no "external" threat, competition between individuals and / or networks of individuals is intense and often deadly. Historically we always compete for material resources, social status and attention.

Cycles of wealth-generating systems and their effects on social relations can be observed from the earliest days of humanity:

1. **Nomadic society** - before grounding;
2. **Sedentary society** - from landholding until the fall of the Roman Empire;
3. **Land and social prestige** - from the middle age until the court societies;

4. **Chimneys society** - from industrial revolution until the second half of the 20th century;
5. **Information society -** began in the second half of the 20th century.

The birth of a new cycle never meant the disappearance of the previous ones. The adoption of a new wealth generation system has always emerged as an option. To this day we have social groups that live from hunting and gathering in a very similar way to those lived by our ancestors in the first cycle, that is, the sedentary life did not ended the nomadic style, in the same way the information economy will not end the cycle of chimneys. Some people will adopt the new system. Others will prefer to continue with the old one. However, a pattern emerges very clearly: each new cycle has completely changed the human relations structure and dynamics and has become dominant.

5. Wealth generation systems and social structures

5.1 First cycle: Nomadic society

Many thousands of years ago, some events marked humanity: it was discovered how to produce fire and tools. The human technological journey began there. Adapting the use of fire and tools to the daily routine was an evolutionary advantage. Food was then cooked, which reduced the risk of contamination by bacteria, fungi or microbes. Predators were kept at a distance and bodies were heated in the cold of winter. The tools have made it easier to hunt and gather. Millennia later, because things happened very slowly at that time, in the long nights around campfires, day after day, language was being built: the ability to describe experiences by transmitting information through phonetic sounds. This was the second decisive event in

the humanity history and definitely marked the differentiation between us and the other species. The language creation has accelerated the information exchange dynamics among our species members, plus an evolutionary advantage.

It was a tough life during the first era of human civilization. There was an incessant search for food and the resources scarcity, the hunger ghost and nature hazards were the challenges and the demons to be overcome. But even then we learned and lived in a network. As a matter of fact, this has always happened.

Strictly speaking, the word “wealth” would not be applicable in this context because wealth is surplus and that notion did not exist at that time. Let us say, then, that this epoch marks the beginning of the long journey that will culminate in the third millennium society. In this cycle begins the creation and appropriation of knowledge by some individuals in the group. Knowledge begins to be used as a power instrument.

The bear clan (18)

The afternoon falls quickly. Bubo looked worriedly at the black clouds that formed in the north. He had traveled all day at a fast pace. He was tired, but he could not afford a break. It was important to get to the cave as soon as possible. He did not want to spend another night in the open. Winter was approaching and the temperature was falling rapidly, although the afternoon was still beginning. He had gone to Gere's cave, at Gib's request, to bring the news that Meira, his sister, had died. He stayed there for a week exchanging news with old acquaintances.

But this time, in spite of the warmth of meeting friends and relatives, there was no sounding of the cheerful laughter and screams of the children who usually echoed through the cave. People spoke in low and whispering tones. Many people had died in recent times. Death was a strange and frightening phenomenon. In the cave of Gib, besides Meira, the two children of the of Pent´s fire, Crun, and Tuna, Gib's companion, had also died. No one knew why and everyone was very frightened. People began to cough, then came fever, vomit and difficulty breathing, after a day or two they died. Despite the Isa' efforts, who was respected as the best Bear Clans healer, nothing could stop the disease.

Now, to make things worse, Bubo knew that seven people had died in Gere's cave, including Brun, the carver, with the same symptoms. Brun's loss affected Bubo deeply. He remembered the old man with his still very skilful hands sitting on the left side of the entrance´s cave with his tools scattered on the floor and a small piece of flint in his hand, delicately and patiently carving the Grun'ma, a small image of the mother goddess. The Grun'ma carved by Brun were known throughout the region, and often appeared people interested in acquiring one of them. People believed that they brought luck mainly to women when giving birth, but they were also used to protect the entrance of caves and places considered sacred. Gere´s cave was frequently visited by travelers because its position was central and because Brun´s carver fame. So whenever he wanted to know about the news Gib would send someone to Gere's cave or sometimes he would go himself. When Gib asked him to go to Gere´s cave, Bubo was worried about the chief's appearance. The look, once lively and clever, was blurry and

his head hung like he was sad with life - Go and come back as fast as you can Bubo, talk to Isa before you go, because she wants to send a message to Trila - He had said, balancing on the stone like an old man in the sun. The chief looked sick and Bubo, at fifteen, had never seen him sick before, which only increased his distress. He rushed the pace disturbed with all the things that had been going on lately. It was rumored that the spirits were angry and punishing the clan for some reason known only to them. He raised his hand, with a shudder, to the little leather bag attached to his neck that contained the talismans that protected him since his birth. He prayed to his protective spirit as the sun headed toward his nocturnal bed. There were many things he did not understand.

Creb was restless. His left leg that had been crushed on a hunt a few years ago, had never fully recovered, and strangely it always hurt when things got complicated. He looked at the black clouds that formed on the horizon and sniffed a snowstorm. Gib had gotten sick and sweated profusely under his skins. Now he was slowly drinking a hot tea that Isa prepared. Creb looked at him curiously. He had looked very badly, it seemed to everyone that he would die like the others, but strangely this morning he had woken up without a fever and seemed better. Creb thought he would like to understand the spirits. After all the long years of study, he still did not fully understand their will, and he thought he would never come to that understanding. Since Bruc's death, he had performed various purification rituals by appealing for protection to the known spirits and asking them to send a signal of the direction they should take. But so far, he had received no signal. He felt blind and wondered if he could have offended the spirits in any

way. While the spirits were silent, the people continued to die and Creb became more and more afflicted, because his magic was not working. But anyway, Gib's apparent recovery was good news; it could indicate that the anger of the spirits was passing. Creb sat on a stone beneath a huge tree and was silent watching the wind that rippled the yellow autumn grass. An owl chirped stridently. Creb raised his head just in time to see a wolf pass quickly with a cub in her mouth. The wolf saw him, hesitated for a few seconds and plunged swiftly through the forest trees. Then Creb knew. Commoved, he closed his eyes and thanked his totem and protector. He got up quickly and left the cave looking for Gib. He already knew what should be done. The spirits had finally sent the signal.

Oga was separating the things she would take with her. There had been a clan meeting after Bubo arrived with the news from Gere. And in the middle of much confusion and talk they decided to change the cave. Some argued that this would not be necessary because Gib had recovered and no one else had been sick since. But Creb was firm in his position: the spirits had spoken plainly, they had to change their cave and it was the only way to end the bad luck hanging over the clan. Oga was 20 years old and her hair was already beginning to whiten. She had been Bruc's mate for five summers, and now she missed him deeply. She lost two young children and had not become pregnant any more, although she always prayed to the Grun'ma carved by Brun two years ago. She knew Gib would have to find her another mate, and she was apprehensive because she did not like the men who were available. Tumo was nervous and aggressive. She remembered how often she helped Mira to heal her wounds after Tumo had beaten her.

Everybody hated it but nobody could do anything. Mira ended up dying in a difficult delivery in which Isa failed to save her and her baby. And Isa, everyone knew, was the most competent healer a clan could have. After that the troubles began. She thought, but had never told anyone, that if there was anyone who displeased the spirits that person was Tumo. She shivered with fear when realized that Tumo was watching her openly. There was also Gib, because Tuna his companion had also died with the fever. She hoped Gib would stay with her, but maybe he would decide for Trai or Bea because they come from more important bonfires.

Anyway, she hoped Gib would make that decision only at the next summer camp, when the clans will be reunited and the singles married. She slowly smoothed out a freshly tanned hare's skin and was pleased to see how soft it was. She would make a winter cap with it because the old one was too worn. She separated the small bones and fine bison tendons used to make the clothes and put them in the bundle. Creb had had a vision and said that a suitable cave would be found going east. It was the middle of autumn, the winter was already very close and if they had to change it would have to be fast. In addition to all the confusion, to make things worse, no herd was seen for a while. And more than finding a new cave they would have to hunt to be fed during the winter. Oga sighed and missed Crun. She had rarely felt hungry while he was her mate. He had an incredible ability to find food when no one else could. She touched the leather bag hanging from her neck and asked her totem for protection.

Creb thought about Gere's decision to change too, they would go south. How unstable life was! In such a short time everything had changed so much! The spirits were capricious and the mother was not easily understood. With all these losses, it was almost certain that they would also lose status in the great Bear clan. Creb had already decided he would call a meeting of shamans at the next summer camp. Something had to be done about it, but first they had to find a cave and hunting for the winter. He took a deep breath and prepared to drink Isa's potion. It was bitter but would allow him to fly through the spirits world. He wondered if he was getting old. In other times the vision would have shown not only the cave but also the position of the herds. But he had only seen the cave jammed at the foot of a hill with a river running fast about 300 meters from the entrance. It was a valley sheltered from the winds with many clumps of thorns and he thought he had also seen walnuts and chestnut trees. Gib was eager to begin the journey to the east and was closely watching Creb's movements. He took a few more sips from the potion, looking absent-mindedly at the fire flames, and then he saw: the bison herd was slowly moving south. And he saw that hunters came with spears that surrounded the herd screaming and frightening the bison. He saw burning fires from which the animals turned away in terror to follow the path hunters wanted. He saw a fence and blood, a lot of blood. He saw Tumo throwing his bowler and knocking over the leading bison and turning around with a smile on his lips saying, "Go fast that the gods do not wait." The sight fell apart, and Creb blinked at the fire again. He got up slowly with a slight headache and went to look for Gib.

The Bears clan story tells a bit about the life of our Paleolithic ancestors (18). It does not matter that habits and cultures have been different from those described, since the focus is on highlighting the social networks that already existed at that time.

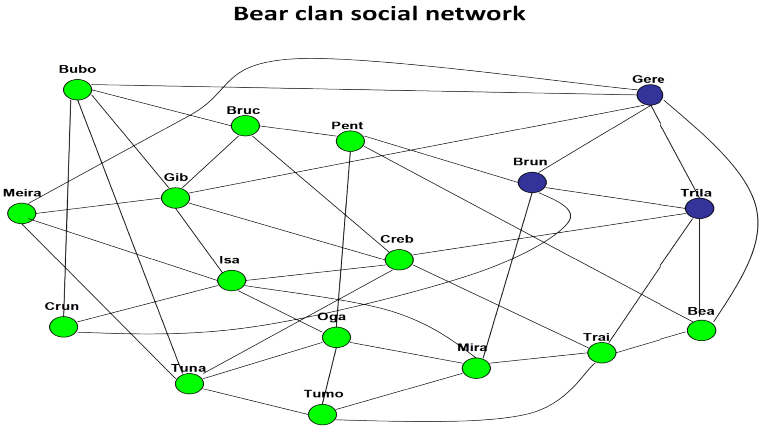
At this time the first divisions and notions of social status begin, the first signs of specialization appear and the generation and appropriation of knowledge by some begin to be shaped. Life was lived in scarcity and hunger. It was a constant struggle to seek food and protection against the nature and other animals. There was not a wealth notion, there were no surpluses, there were just enough to allow the survival. And often, not even that.

Social structures were more circularized. Although there were people with higher status important decisions were made by the whole group. Work was also an activity of all. They all hunted, collected, and performed the necessary activities for the group survival.

Those with higher social status had the ability to develop activities considered crucial to collective survival, such as leadership, an essential activity in conflict mediation and strategic decision-making for collective survival, the ability to understand the spirits world and to communicate with them, the ability to manipulate and apply healing herbs, carving tools and weapons, hunting, gathering, among others. People who excelled in these activities had higher status than others. They acquired this status by merit.

The story of the Bear clan is not the story of Buba, Gib, Creb, Ona, or any other character, but of the clan relationship

networks and how the information exchange dynamic drew the reality they lived. The Bear clan was a networked structure:



What kept people together was the information exchange dynamics.

Important points of this first cycle:

1. Circularization of social relations. Although there were chiefs, the important issues were discussed in a group.

2. **Beginning of specialization.** Although all people were involved in the search for food, some developed other skills such as knowledge of healing herbs, the making of tools, the making of clothes, communication with spirits, etc.

3. **Appropriation of knowledge.** In developing a certain skill the individual increased his social status and, therefore, his influence on the others.

4. **Social status acquired.** Social status was a function of individual ability. It was acquired when an individual developed a skill that benefited the whole group.

5. **Communication technologies.** It depended on people's physical presence for information to circulate.

6. **Slower adoption of new technologies and methodologies.** Characteristic of humanity in antiquity, changes in the way of living and doing things took a long time to happen. The information transition between groups only happened when there was a meeting between people. At that time, there was a lot of world, a lot of space and few people, so the meetings between groups of different cultures were sporadic and often violent. Because the environment was hostile and they had the necessity of continuous search for food it was easier, day by day, to use the knowledge already acquired than to take time to experiment new methods or inventions that might not work.

5.2 Second cycle: the sedentary society

A few millennia later, notable events have changed some human groups living way. People discovered how to grow food, how to domesticate animals and crafts techniques were improved. These "technologies" eliminated the need to wander incessantly looking for food. An alternative strategy emerged: food production instead of hunter-gathering which lead to new forms of social relationship.

The circularized relations, with relative equality between all the components of a clan, were replaced by hierarchical and unequal relations. It was decided that some men were worth much more than others so the surplus created by new technologies flowed to those that were worth more. The private property idea arises. And there were those men who were possessed like other animals: the slaves.

With the attachment to the land, women were entrusted with caring for their children and the "house" and men were in charge of providing sustenance and the world exploration. Without direct access to new information, women have also become objects of possession and manipulation by men. They were used for procreation and for the creation of political bonds between groups of different cultures. The men held the power of life and death over them and their children and the slaves they possessed.

This can be considered the first wealth generation system of humanity. Wealth was made of harvested and stored grains, animal husbandry, handmade products and slaves, which, in addition to being counted among the wealthy, were also tools for the generation of it. Trade, agriculture and mining technologies are beginning to be developed and become profitable activities as well as war and its technologies (weapons, shields, tanks, etc.). It should be noted that, in antiquity, the clash between nomadic and sedentary groups was constant.

Hierarchical structures emerge: a pattern of social organization that establishes importance differences among the people in a network. Important to note that as much as it has been spoken

of absolutist monarchs, tyrants, fascists, none of these individuals exercised power alone but were legitimized and supported by social networks.

Hierarchies and their castes of bureaucrats controlled the goods accumulation and distribution. In most ancient cultures, kings were legitimized by priests who claimed to know the gods will. Divine power (priests) and material power (kings) supported each other. Life begins to be ruled by religious and affirmation of authority rituals. Living in an unpredictable world with a violent nature that sent storms and floods can be very dangerous only the gods and their anointed sons guaranteed abundant harvests, victory over enemies, fertile women and healthy people. This little passage about Pharaoh Ramses of ancient Egypt illustrates this point (20):

"Ramses lit the oil lamps that illuminated the naos(*) of Karnac, the most secret part of the temple, where only he and his eventual substitute, the great priest, had the power to enter. The darkness dissipated; The Holy of Holies appeared, a chapel in pink granite containing the terrestrial image of Ammon, "the occult," of which no human being would ever know the true form. Incense sticks were consumed slowly, perfuming the sacred place among all places where the divine energy embodied in the invisible and the visible.

The king broke the clay seal placed on the naos(*), pulled the bolt and opened the doors of the reliquary.

- Awaken in peace, power of the creative origin of each moment. Acknowledge me, for I am your son. My heart loves you, and I come to receive your counsel so that I may do what

is useful to you. Wake up in peace and shine on this land that only lives for your love. By the energy that emanates, resurrect everything that exists.

- Live of it - said the king to the deity - You vivifies the land with your perfume, feeds it with your dew. Your eyes are the Rule, your whole being is the Rule.

When Ramses left the naos, the temple was awake. The priests removed from the altars the portion of the purified food that belonged to humans, breads and cakes from Karnac bakeries, meat was prepared for noon meals, craftsmen began their work, gardeners adorned the chapels with flowers. The day would be serene and happy. "

(*) Naos = in Egyptology, that which is hidden and unknown inside the inner sanctum of a temple

Hierarchies were the people of the ancient world social structure option. It is a mistake to believe that they have been imposed by few to many. The issue was never dominating individuals but networks of people who had dominion over other networks, ritualizing power. If a dominant network became inconvenient, the population, soon or later will replace it by another network.

Social status, previously acquired through individual abilities, is now attributed by being born into a dominant network. The notion of nobility arises, the perception that some individuals are better than others and therefore entitled to more. Social and material success becomes a function of the family network to which one belongs. The nobles dominated by their blood

lineage. Divine power and material power were entangled one did not exist without the other.

When mathematics and writing were invented the accumulation and distribution dynamics became much easier. From that particular moment, information could be transmitted over the generations to anyone who was able to read. The scribe's knowledge was passed down to a few chosen people, usually within the temples. The common people had no access to this kind of knowledge, nor could they learn how to speak to the gods. The knowledge appropriation began to generate profit. As Richard Sennet says; "In any organization the individuals or teams that compete and are rewarded for doing better than others will always treasure information" (21). Generally, even among the nobles, illiteracy was the rule. Any kind of artisanal work was developed in the place where the craftsman lived. There was no differentiation between public and private life.

It does not matter if they were Sumerians, Hittites, Hindus, Chinese, Egyptians, Israelites, Greeks or Romans this wealth generation scheme dominated the ancient world until the Roman Empire fell. It is the relationship between masters and slaves that delineates this cycle. Rites were designed for the legitimation and perpetuation of this social order. Because the human brain learns by repetition and movement, when information is repeated extensively and when a ritual that moves bodies is added to it, social truths are created. Here we use Foucault´s idea of truth that is a set of regulated procedures for the production of the law, distribution, circulation and operation of statements. Power systems produce and support truth (22).

In this cycle, the art of politics was also developed, which is nothing more than the art of articulating social networks. Everything we want always depends, to a greater or lesser

extent, on the other people in the network to whom we may or may not be directly connected. Success in any endeavor depends on the ability to seduce, or persuade, others to adopt it. It depends on our ability to stimulate one or more social networks. The social (political) articulation has been, throughout the centuries, the basic process of the power exercise. The use of violence is not the reason of domination, but the effect of a network articulation. Still, according to Foucault, (22) it is important to note that there are not those who have the power, and on the other side those who are out of it. Power is not an object or a thing, but a relation. There are practices or power relations and it spreads throughout the social structure.

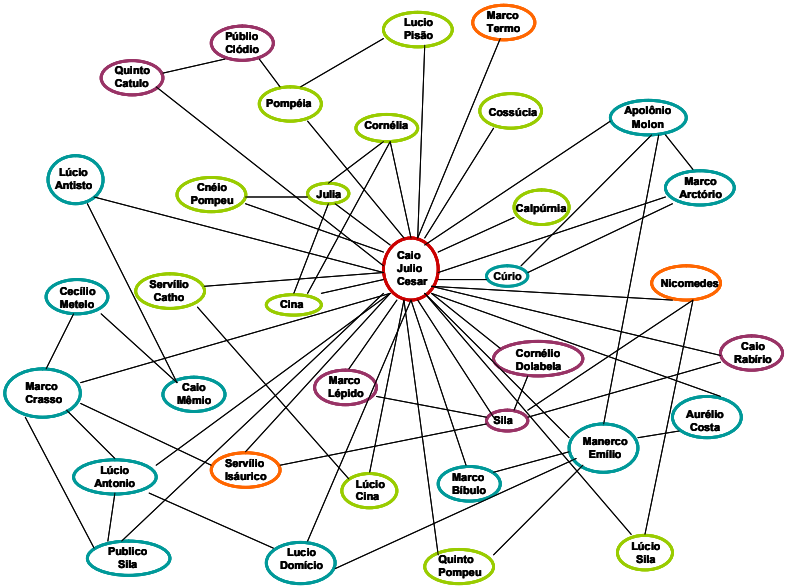
The changes in human history are generally extremely violent periods where there is the novelty heralds, on the other side those who resist it and in the middle those who must be "convinced" to adopt one or another posture. No network of people benefiting from a given social dynamic is interested in change. Maybe that's why new things have always been so scary. Fear does not emerge from the new itself, but from the process that changes the power configuration and social structure.

Humanity has lived in uncertainty, seeking certainty and perenniality, predictability in a totally unpredictable world, stability in an unstable planet.

The logic was clear in the ancient world: there were external powers that controlled human life. These powerful beings created all reality. Life was a book written by the gods that needed to be deciphered. "When a man walked along a trail in the woods, he would have had the strong feeling of following his destiny. Everyone was aware of their place in the cosmos. Everything that happened to him, even the sight of dust in a ray of sunlight, the sound of a bee's flight, or the sight of a falling

sparrow was set to happen. Everything spoke to him. It was all a punishment, a reward, a warning, or a premonition." (Jonathan Black, 2007) (23)

When Suetonius (24) wrote about the public and private life of twelve Roman emperors he tells his stories through his connections, his relations with his contemporaries. The events in a human being life are linked to the structure of relationship networks. Take for instance the life of Caius Julius Caesar; Suetonius uses other characters to tell his story. The network of Julius Caesar described by Suetonius has this structure:



We have a network structure whose central node is Julio Cesar, because the story was told with an emphasis on the events of his life. The way Julius Caesar thought, the events of his life, were effects of the relationships networks in which he was

inserted. When looking at this network, one can imagine that all those connected to him also are connected to many others. All the information circulating in this vast network, all the small actions taken in all points of the network built to a greater or lesser extent the History of that time. When the focus is on only one node, or a small group, the rest of the network dynamic is missed. Because life is unpredictable, the random little events that go unnoticed are those that often define history.

The second cycle of wealth generation grew and became dominant until the fall of the Roman Empire, when a new cycle of wealth generation began.

Important points of the second cycle:

- **Sedentary lifestyle.** Fixation in a given geographical area.
- **Technologies for communication.** Although writing was developed, communication was still predominantly oral, most of the population even those in the aristocratic class could not read or write. A class specialized in writing emerged: the scribes. The writing and reading technology was used in the temples.
- **Social status acquired.** The social position was determined by birth, or by war. The military strikes losers became slaves.
- **Hierarchical structures.** Bureaucratic networks, ruling families networks and priest networks were responsible for the accumulation and distribution control system of common goods. The notion of private property arises.
- **Violent social space.** Human emotions were exposed without brakes. Frequently any altercation could lead to

a death struggle. Violence could erupt at any time and place. Knives or swords were weapons carried by anyone who could acquire them.

- **Social structure.** Nobles and commoners. **Masters and slaves.**
- **Wealth generation system.** Agriculture, animal husbandry, mining, handicrafts, wars and plunder. Slavery.

5.3 Third wealth generation cycle: Land and social prestige

“The fall of the Western Roman Empire has plunged Europe into political chaos. Many factors have led to this decline, but in this context it is necessary to emphasize the barbarian invasions that have shattered Europe into small fiefdoms, each with its own rules and culture. It began what is known in history as the age of darkness, or feudalism. The Catholic Church succeeded in converting the pagan kings and thereby their influence expanded. New concepts in terms of social relations begin to emerge such as servitude and vassalage.

Servitude is the legal and economic status of peasants (servants) in feudalism, especially within the economic system of the "landlord" (feudal rights over land). Servants were rural laborers who were bound to the land forming the lowest social class of feudal society. Unlike the slaves, the servants were not owned by anyone and could not be sold. Servitude involves the labor of the peasants in the fields of landlords in exchange for protection and the right to rent land for subsistence. In addition to work on the land, the serfs performed various agriculture-

related jobs, such as forestry, transport (land and river), handicrafts, and even manufacturing.

Serfdom evolved from the land structure of the Lower Roman Empire, characterized by the existence of “latifundio” in which labor was made up of tenants who worked in the owner's fields and received a plot of land for rent in order to subsist. With the Empire instability in the third and fourth centuries AD, several small landowners began to sell their lands to the great landlords and to employ themselves as renters in exchange for protection.

Serfdom spread throughout Europe in the tenth century and became the predominant form of European agrarian work throughout the Middle Ages. It survived in England until the seventeenth century, in France until the French Revolution (1789) and, in most European countries, until the early nineteenth century. In Russia, servitude lasted until 1861, being the last country in the world to free its servants. (25)

Servitude or vassalage, like all authority assertions, was ritualized. The vassal (servant) paid homage to the suzerain (lord) upon receiving the lands. Kneeling put his hands in the hands of the master and swore to him to provide food and roasted meat. He committed himself to render his virile member, as well as to offer his naked body, to attend the court of equals, to contribute to the dowry of daughters, and to equip the sons of the lord with arms, in addition to military obligations. For his part, the lord undertook to protect the vassal and give him a portion of land (the fief) so that he could maintain himself. (26)

The land was the wealth that everybody wanted. Greed and prey produced a brutal dynamic: the land owners were often changed because of conflicts.

The fall of the Roman Empire marks the expansion of Christianity and the rise of the Catholic Church as one of the most powerful institutions of that epoch. The Church not only held the monopoly of religious ideas but also dictated the laws governing social behavior. At that time, for example, all the first-born men, born in noble houses, should be consecrated to the church. These first-born men were entitled to the family inheritance, so the Church managed to control much of the feudal territories and also influence the aristocratic decisions. But this process caused an unexpected effect.

By the eleventh century, Europe was overpopulated, with low food productivity, with a growing hungry population and many land conflicts. There were few lands for many men. These landless men, like the youngest sons of the feudal lords, steal, plunder, and kidnap, to survive. The solution to this problem was to begin the Holy Wars, the crusades, with the justification of recovering Jerusalem that was under the rule of the Seljuk Turks and reuniting the Christian world.

The Church was not the only one interested in the success of these expeditions. The feudal nobility had an interest in the conquest of new lands. Mercantilist cities like Venice and Genoa were dazzled by the possibility of expanding their business to the East. And all were interested in oriental spices, for their high value, such as black pepper, cloves, nutmeg, cinnamon and others. Moved by faith and ambition, between

the eleventh and thirteenth centuries, eight crusades left for the East.

The Crusades did not achieve their main objectives, but weakened the feudal aristocracy, strengthened the real power and the market expansion. The trade of products brought from the East has thrived.

Many nobles looking for possessions and land created social instability. The solution was to strengthen the figure of a king who could gather the nobles and pacify the geographical space. Court societies arise, like the Stuart dynasty in England, the Bourbons in France, as well as German and Slavic dynasties. As a matter of fact, what we call here "court is nothing more than a vast extension of the house and the domestic affairs of the king and his dependents, including all the people who are part of the house, in a more or less restricted way "(27a). In the ancient kingdoms whose governments were centralized like China, India, and pre-revolutionary France, the monarchs and nobles formed extremely powerful networks filled with prestige. History is not made by isolated actions accumulation performed by isolated men without connection to each other. On the contrary, even the most absolutist of the sovereigns ruled with the support of the courtiers networks that composed his court. Luxury at court was not something superfluous but a means of social self-assertion. Houses, clothing, servants, and carriages were important as symbols of social status. To know quickly what was the person social status it used to be observed how people dressed and the transportation means they used. To this day this has not essentially changed.

Court societies (between the twelfth and eighteenth centuries) played a leading role in the pacification of social space. In general, it was the kings' strategy to keep as many noblemen as possible with him, because it was easier to control them. Not only in the courts but in the aristocrats' houses there were many people. It was in this hubbub, among games, hunts, and anecdotes that society's direction was outlined.

The etiquette rules played a very important role in the social control mechanisms. In the Louis XIV court was gestated a new kind of court society that would serve as a reference for other kingdoms. A description of the king's awakening ceremony may clarify this question:

"In the morning, usually at 8 o'clock, and in any case at the time determined by him, the king is awakened by the first "chamberlain" who slept at the foot of his bed. The doors are opened to the pages. At that moment one of them just broke the news to the "grand chamberlain" and the first room gentleman, a second went to the court kitchen to make breakfast, and a third took his place in front of the door, letting in only the gentleman who have the access privilege.

This privilege followed a very precise hierarchy. There were six different groups of people allowed in, one after the other. The various "entrées" were then spoken. First the "entrée familiére": the king´s royal children and grandchildren, blood princes and princesses, the first physician, the first surgeon, the first chamberlain and the page.

Then come the "big entrance" reserved for the "grands officiers de la chambre et la garderobe" and for the nobles to whom the

king had given this honor, and then followed the “first entrance” for the king readers, the amusements and festivities intendants, among others. Next a fourth, the "room entrance," which included all the other "officiers de la chambre," as well as the chaplain, the ministers and secretaries, the state councilors, the personal guard officers, the France marshals and so on. The admission to the fifth "entrance" depended largely on the good will of the room nobleman, and of course on the favor of the king. Included here were gentlemen and ladies of the nobility, who received such favor, whom the room nobleman let in, so they had the privilege of approaching the king before all the others. Finally, there was still a sixth type of entry, which was the most disputed. In that case, one would not enter through the main door of the room, but through a back door. It was an open entrance for the king's children, including also the illegitimate, and their families and their sons-in-law. Belonging to this group meant a great privilege because those involved were allowed to enter the king's chambers at any time - unless he was in council or had begun special work with his ministers - and could remain in the room until the King went to Mass, even when he was sick.

Everything followed very precise rules. The first two groups were admitted when the king was still in bed. He wore a small wig; never appeared without a wig, even lying on his bed. When he was standing and the "grand chamberlain" with the first room attendant had just donned his robe, they called the next group. When the king had put on his shoes, he ordered the "officiers de la chambre" to open the doors for the next entrance. The king took off his robe. The wardrobe master tugged his night shirt on his right sleeve, the first wardrobe man by his left sleeve; the shirt of the day was brought by the "grand

chamberlain" or by one of the king's sons who was present. The first room attendant held the right sleeve, the first wardrobe attendant held his left sleeve. Then he would get up and the wardrobe master would help him buckle his shoes, hold his sword, wear his costume, and so on. Already dressed, the king prayed briefly, while the first chaplain, or another religious who was present, recited a prayer. The whole court was ready, waiting in the large gallery, next to the garden, which occupied the whole length of the castle behind the king's bedroom.

.... The king took advantage of his more particular activities to mark the differences of level, distributing his distinctions, evidence of favor or dislike. The etiquette had a symbolic function of great importance in the structure of that society and this form of government "(27b). Court rationality was a calculated planning of behavioral strategy in relation to possible losses or gains in status and prestige, under the pressure of continuous competition for power. The courtiers were interested first and foremost in people and their interrelationships.

The freedom of an individual is inscribed in the chain of interdependencies that binds him to other men and that limits what he can decide or do. An integrated system of values, beliefs and rules of conduct creates a cultural identity that reinforces the closure of the social network because it creates a limit made up of meanings and requirements that does not allow any person or information to enter the network. The network continuously coordinates the behavior of its members. (28)

Although everything can seem to be controlled, there is nothing more unstable than a social network. Small events happening on the network periphery, inscribed in other chains of events that are not apparent, were usually "tipping points" of social

transformations. The story of how Joseph, the Emperor of Austria, lost a war against the Turks is very elucidative:

"In March 1788 Joseph, an Austrian emperor, began a long journey from Vienna to the Wallachia principality, on the disputed frontier between Islam and Christianity. The initial aim of the Austrians was to liberate the strategic Sava River and subjugating the Turkish citadels of Schabaz, Belgadro and Vidin. And finally, after conquering the key fortress of Nis, incorporate all of Serbia into the Austrian empire. There were six army units totaling 245,062 men, with 36,725 horses, 898 pieces of artillery with 176,700 cannonballs and thousand tons of gunpowder. It was remarkable force for the time.

September 19, 1788. It was a moonless night, when a vanguard of the imperial hussars crossed the bridge of the Timis in Carensebes. Arriving on the opposite bank of the river, they did not find hostile Turks. On the contrary, they found a caravan of nomadic Valais, who cheerfully received the knights and offered them brandy and young women. After a quick negotiation, they set a price and the hussars jumped out of the horses and gave themselves to the revelry. A few hours had passed when the first infantry companies crossed the same bridge, the throat equally dry. By now, however, the hussars had already bought all the brandy. To defend themselves from unwanted newcomers, the Hussars soon established a fortified position around the brandy barrel and expelled the infantry men. This annoyed the thirsty men.

There was a shot, followed by another shout, and a body fell over. The Hussars drew their sabers and attacked the infantry, forcing the soldiers to retreat. The noise of the shot frightened

the men of the infantry, but once recovered began to shoot as well. Soon a small battle was under way. More shots were given and people began to die. The soldiers tried to advance but the hussars did not budge. In order to drive the knights out of their fortified position the infantrymen sought a ploy. They shouted, "Turci! Turci!". The thought of facing a Turkish host terrorized the drunken hussars and they galloped across the bridge. But the infantrymen also retreated, frightened by their own shouts. His (German) colonel tried to stop the rush, blocking the passage. It did not help, because those Hungarians, Lombard, and Slovaks barely knew a few words in German.

Meanwhile, on the other side of the river, the entire Austrian army was already asleep and was suddenly awakened by the gunfire on the other bank. The vanguard was fighting the Turks! They could not imagine another reason for the shooting and all that shouting, since everything happened in a total and frightening darkness.

Inside a fence in the middle of the camp was a horses troop. The animals were so frightened by the tumult that they overturned the fence and sped off, creating a commotion like the advance of a cavalry. The commander of one of the units mistakenly interpreted that noise as an attack and ordered his cannons to open fire. The night lit up with the blue flashes, the clashing echoed and more soldiers began to fall. A shout rang out: "The Turks! The Turks! Save yourself! We're lost!".

Panic gripped the whole army. The first regiment moved to the rear, followed by another and another. Soon a mass of soldiers returned as a huge human tide. Because of the ethnic origins

diversity, the troops could not communicate with each other and so they imagined that the shadows that advanced in their direction were the enemy. Terrified they fired at their own ranks.

The ammunition wagons drivers used their horses to made it easier to escape, and were soon accompanied by the gunners, who cut the harnesses that held the horses to the cannons and fled with the animals abandoning the artillery pieces. In their hallucinatory escape they were struck by those who dared to stand in the way. Many officers died and panic went out of control. They all ran, cursed, prayed, shot, or died. Houses were sacked, women raped and villages were on fire. The trail of panic was seized by abandoned muskets, saddles, tents, dead horses, and all the spoils of a defeated army. It was only after a long time that the generals were able to stop that hallucinating escape.

Two days later, the Grand Vizier and his army finally appeared before Caransebes. They found no Austrian troops. However, there were about 10,000 wounded whose heads were cut off by the Turks. "(29)

A small event around a brandy barrel reverberated through the network and completely altered the story final outcome. In social networks, small stimuli can cause big changes. Uncertainties and instabilities are constant. Note in this narrative that the actors of the network were from different races, cultures and languages which blocked the communication pipelines causing a huge chaos. There is an illusion of control, but there is actually no control. Absolute control would only be possible if there was absolute control of

the information transition in the network and this is certainly not possible.

You can control a human being when you control the information he or she accesses. At this time, as most people were illiterate, it was still possible to have a good network control, although, as we have seen above, unpredictability and random effects are constantly emerging in network dynamics.

The two effects of court societies were the cities increase and the inflationary process. In the cities where there was a great concentration of aristocrats prices began to rise, but the income of the nobility remained the same. Trade with the Orient and settlements invaded the market with an avalanche of new, highly coveted commodities. The bourgeois class began to emerge, enriched with commerce, and accumulated the capital which would later serve the industrial revolution. In the routs commercial junctions the cities grew, many of them buying their independence from the nobility. Cities like Venice and Florence, whose central position facilitated trade routes with the East, prospered.

According to Peter Burke, forms of sociability had - and still do - influence on the distribution and even on the production of knowledge. As cities grew, they became important centers for the information dissemination and production. The common spaces allowed the interaction between nobles, artisans, peasants, midwives, soldiers and the general population that met to trade and talk. "External" news came with merchandise, told by merchants operating by land or sea. Specialists in different types of oral communication appeared, like the "Corredors d'orella" of Lonja, in Barcelona, that listened to conversations and put the merchants in contact with each other; The runners who announced clandestine marriage services in eighteenth-century London, or brought news of the ships that

arrived; The ballads vendors who wandered around the city or parked in specific places where blind singers sold almanacs, newspapers, and official edicts. (30)

With the development of graphic printing technology, from the fifteenth century onwards, literacy expanded and many writing professions aroused, such as office workers, accountants, public writers (people who wrote letters to people who did not know how to write), notaries, postmen, journalists (newspapers, magazines), censors.

The emergence of cities and universities was virtually simultaneous throughout Europe from the twelfth century. The teachers were almost all clergy. The Church dominated the knowledge of writing and reading. The prevailing dogma was that universities should focus on the knowledge transmission and not on its discovery.

Between the eleventh and twelfth centuries, the first universities were created in Europe and their curricula consisted of the seven liberal arts: the trivium (grammar, logic and rhetoric) and the quadrivium (arithmetic, astronomy, geometry and music). The classes were in Latin and all had a Christian basis. To learn it was necessary to be a nobleman son so you could study the seven arts, in places where many students met. The overwhelming majority of the population was illiterate, even among the nobles a small minority studied.

The middle ages formed faith men. The principle of authority required humility to consult the great sages and interpreters authorized by the Church, which avoided the plurality of perceptions and maintained the cohesion of beliefs. God was the foundation of all pedagogical actions and the purpose of the formation of the Christian.

In the Renaissance, from the sixteenth to the eighteenth centuries, a new image of childhood and family arises. In addition to the knowledge transmission, the school goal becomes moral formation. Although there is a rejection of dogmatic ecclesiastical authority, education still remains strongly hierarchical, excluding the vast majority of the population.

Navigation technologies were becoming increasingly sophisticated, new routes were discovered and new continents were colonized. For centuries, the wealth flowed into the powerful European kingdoms that dominated the seas and commerce: Holland, Spain, Portugal, France and England were each in its time had its own hegemonic powers. Piracy, predation, robbery, decimation of native populations by smallpox viruses, influenza or chickenpox were the hallmark of colonization. Niall Ferguson says the following about England: "The British Empire began with an originally economic phenomenon, with its growth driven by trade and consumption. The demand for sugar has led merchants to the Caribbean. The demand for spices, tea and cloths took them to Asia. But that was, from the beginning, globalization by gunboats, because the British were not the earliest builders of empires, but the pirates who collected the remains of the former empires of Portugal, Spain, Holland, and France. "(31)

As information circulated, "revolutionary" ideas were taking shape in movements such as the Renaissance, the Enlightenment, and the scientific revolution. Thinkers like Galileo, Newton, and Bacon promoted a real revolution in the way of thinking the world: no longer because of divine causes, but because of natural causes. Experimentation and applied mathematics expanded: the angels and demons that populated the popular imagination slowly give way to the gears and

propulsion engines that would mark the economy of the chimneys in the twentieth century. The logic of the world as a mystery was replaced by the logic of the world as a machine. Science backed by mathematics becomes the great truths factory.

Important points of the third cycle:

- **Wealth generation system** = Social prestige = Lands. The greater the social status, the greater the access to land and the incomes that came from it.
- **Attributed social prestige**. It all depended on whether the person was born into a noble family or not.
- **Social structure.** Lords and servants.
- **The cities and the bourgeoisie ascent.**
- **Work.** The artisans possessed their tools and developed their work in the place where they lived. There was no distinction between professional and private life.
- **Capital accumulation.** From trade, theft, piracy, colonization.

5. 4 Fourth wealth generation cycle: chimneys society

From the eighteenth century great inventions arise. In England, in 1709, Abraham Darby was able to produce good quality iron for the first time by smelting iron ore and coke. And in 1750, watchmaker Benjamin Huntsman invented the process to produce steel by heating the high quality iron in a special reverberating furnace. The availability of metals, especially iron

and steel, was one of the key factors for the industrial revolution.

The invention of the four-stroke engines (1876), petrol (1885), diesel (1893), locomotives (1801-1808), steamships (1807), automobile (1885), motorcycle (1885), tires (1888) provoked a deep revolution in the transport of goods and people, as well as in the information dissemination. The size of the world decreased.

The industries and their production lines begin to be assembled. The earliest modern cotton spinning mills were built in the north of England in the eighteenth century. In general, all existing production of tangible goods was affected. Numerous inventions such as the first sound recording in 1877, harvesting machines (1834), milking machines (1860), barbed wire (1893), and so on, created new market niches. When people with good ideas and capital came together, big business came along.

In the first factories, the working conditions of the employees were hellish. The working day was 18 hours. The servitude mentality still prevailed among the early capitalists. In the previous cycle, the subsistence of any servant was also a responsibility of the lord, who guaranteed him housing and lands for cultivation in exchange for a part of the production. As in the last cycle the first factories still held the workers internally. This regulation of a fabric factory in which only women worked, can give an idea of what it was like to work at that time (1840-1850):

"It was an institution where there were 400 single people who had to get up every morning at five o'clock; At fifty past five they

should have finished morning toilet, making the bed and having had the breakfast; at six o'clock the compulsory work began, which ended at fifteen past eight at night, with an hour's break for lunch; At fifteen past eight began dinner and collective prayer; The pickup to the dormitories was at nine o'clock. Sunday was a special day, the regulations article five of that institution said: "We want to keep the spirit that Sunday must have, that is, dedicate it to the fulfillment of religious duty and rest. However, since boredom could make Sunday more tiring than the other days of the week, different exercises should be done in order to pass this Christian day joyfully". In the morning religious exercises, then reading and writing exercises and finally recreation in the last hours of the morning; Afternoon, catechism, vespers, and walk after four o'clock if it was not cold. If it was cold, read in group. The religious exercises and mass were not attended in the nearby church because this could allow the pensioners to have contact with the outside world so religious services took place in a chapel built inside the establishment. "The parish church," he added, "could be a point of contact with the world, and so a chapel was consecrated inside the establishment." The outside faithful were not even admitted. Pensioners could only leave the establishment during Sunday walks, but always under the religious personnel supervision. These people guarded the walks, the dormitories, and supervised the workshops. Religious personnel thus guaranteed not only control over work and morality, but also economic control. These pensioners did not receive wages, but a premium - a global sum stipulated between 40 and 80 francs a year - which was only given them the moment they left. "(32)

We note in this story what Foucault calls the body, time and movement control. It also tells about information circulation control as a form of social control. Today such a story seems absurd. It would be interesting to find out what they are going to

say a hundred years from now about the current working conditions.

Just as important as controlling employees in production processes was controlling the knowledge to create such processes or to protect inventions, while preventing others from benefiting, as well as slowing down the competition emergence. The patent system appears to protect intellectual property by ensuring that profits made with a given invention or idea flow to the patent holder and consequently that taxes flow to the country where the patent was made, governments and companies win. Formulas, methods and processes are locked in big secret. The previous cycle aristocrats are replaced by capital men. The notion of wealth is associated with the amount of money and the tangible goods one possesses.

The predatory and savage capitalism we know today began in the second half of the nineteenth century with the oil boom, shortly after the American Civil War. On August 27, 1859, Edwin Drake made the first drilling and found oil in Titusville, Pennsylvania. He died in poverty, although it was the "tipping point" of the oil industry. Since then a febrile activity of drilling new wells and speculation developed. From the oil was extracted the kerosene, a high quality illuminating whose use spread quickly in the following years. In 1865, Standard Oil emerged, a company that in the next decade would fight fiercely to increase profits and take complete market control. Rockefeller, the head of Standard Oil, started buying all the refineries. In case some irreducible competitor refused to sell, SO lowered prices, in that particular market, forcing him to operate losing money until the decision to sell. By the late

1870s the first monopoly was established. This dynamic has spread to other sectors such as transportation and food.

The situation was so bad that in the early twentieth century the first antitrust laws emerged and caused a fragmentation of Standard Oil. But in practice, the new companies operated in partnership and divided markets, that is, nothing has changed. As oil began to be found in other parts of the world such as Russia, Sumatra, Gulf Coast, Persia (now Iran), etc., new companies like Royal Dutch, Shell, Texaco, Anglo-Persian entered the war for profits and markets.

With the discovery of electricity, the kerosene market is shaken, but at the same time the gasoline engines came on and this market expanded with the speed of fire in the straw. In the United States, vehicle licensing rose from 8,000 in 1900 to 902,000 in 1912. In a decade, the gasoline-powered vehicle ceased to be a novelty to become a widespread utility. By the end of the 1920s, there were already 23.1 million vehicles registered in the United States. (33)

According to Frederic Lane, (34) governments are power-oriented organizations, which use warfare, police force and legal procedures, supplemented by appeals to moral feelings as means of achieving their goals; they generate law and fidelity systems. Commercial companies, by contrast, are profit-oriented organizations that use custom activities to buy and sell; they generate production and distribution systems.

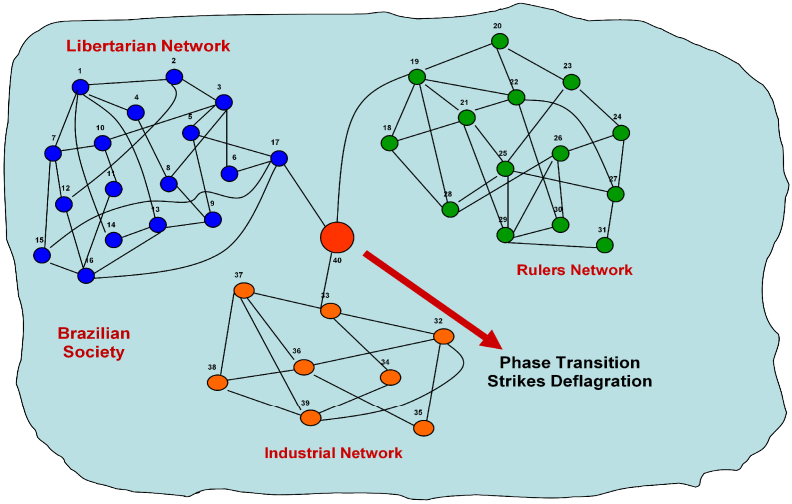
After the First World War, governments entered the oil game, not only to ensure supplies to their armed forces, but also to regulate the market and amalgamate a profits share. Thus, the

states practice to exert political market pressures spreads throughout the world. To succeed in the search for power, governments must be leaders not only in the state and war management processes, but also in capital accumulation processes. Throughout the twentieth century, the corporate international market predatory struggles, supported by their governments, created a scenario of social and environmental imbalance. The social and environmental degradation we face today are consequences of practices that begun in the nineteenth century. However, it is always good to remember that impermanence and change are the evolution engines. Nothing lasts forever.

The current workers' rights were achieved at the expense of much struggle. The employees formed trade unions with the aim of improving their rights. When information circulates freely among people, revolutions happen. The anarchist movement that preached the direct action strategy, the individual exaltation as itself sovereign and the capitalist society destruction through revolutionary action, was sad to be the only way to end social injustices and caused serious disruption to governments and corporations, among late nineteenth and early twentieth century. In 1886, with the end of slavery, began an immigration flow to Brazil subsidized by the São Paulo government. Many anarchists came here avoiding political persecution in Europe.

In 1917, the anarchist strikes in Brazil were a milestone in the conquest of workers' rights. Christina Lopreato (35), a historian, tells how these strikes happened. In early twentieth-century Brazil, although laws aimed at regulating the factories work, industrialists did what they wanted. The hoarders’ practice,

people who went from city to city buying the crops for export, caused the domestic market food prices inflation. The working conditions in the factories were hellish, they worked up to nineteen hours, and the bosses refused to raise payment despite the inflationary process. As women and children were cheaper labor (women had a 50% lower payment than men and children 90% lower), the men began to be fired. It is in this environment that the 1917 strikes are triggered by the death of the young Jose Ineguez Martines, who was killed by the police. From this report we can observe several phenomena and effects of social networks:



1. Luigi Damiani – Anarchist newspaper “A Plebe” editor
2. Rodolfo Felipe – sawyer
3. Francesco Cianci – Socialist newspaper “Guerra Sociale” editor
4. Antonio Nalepinski - anarchist
5. José Sarmento Marques

6. Antonio Candeias Duarte – merchand
7. Florentino de Carvalho – anarchist-communist militant
8. Silvio Antonelli
9. Giuseppe Sgai
10. Theodoro Monicelli – socialist newspaper “Avanti” editor
11. Rosa Musitano
12. Maria Angelina Soares
13. Roberto Feijó – One of those responsible for the manifestos and propaganda leaflets elaboration
14. Galileu Sanchez – One of those responsible for the manifestos and propaganda leaflets elaboration
15. José Prol – One of those responsible for the São Paulo Libertarian Center reactivation
16. Edmond Colli – – One of those responsible for the São Paulo Libertarian Center reactivation
17. Edgard Leuenroth –– One of those responsible for the São Paulo Libertarian Center reactivation and anarchist newspaper “A Plebe” editor
18. José Fernandez –anarchist and a representative of the Mooca Operative League.
19. Norberto Araújo –author of the shot that killed José Ineguez Martinez, a young man of 21 years.
20. Rudge Ramos – third police chief assistant
21. Thyrso Martins - general police chief
22. Eloy Chaves – justice and public security secretary
23. Pamphilo Marmo – deputy chief of police
24. Luiz Barbedo – military region general commander
25. Alexandro de Alencar – Admiral and Navy Minister
26. Wenceslau Brás – Brazil’ president
27. Nicanor Nascimento – Rio de Janeiro state deputy in favor of the strike
28. Maurício de Lacera – Rio de Janeiro state deputy in favor of the strike
29. Álvaro de Carvalho – leader of São Paulo’ congressmen
30. Washington Luís –São Paulo’ mayor

31. José Piedade – São Paulo' City Council, presented the bill for regulating the labor service
32. Crespi – Industrial
33. Matarazzo – Industrial
34. Gamba – Industrial
35. Hoffman – Antártica' director
36. André Belotti –Antartica' carriage driver
37. Salvador Ramos – Crespi' master
38. Fuzzi – Crespi' section director
39. Henrique – Irmãos Ferri' facility child worker
40. José Ineguez Martinez - Young man killed by the police. His procession funeral is the "transition point." It is on this occasion that the information reverberates, the indignation grows and there is an adhesion to the strikes in all Brazil.

Observable social network phenomena in this story:

• Fluid information between libertarians and workers: on one hand newspapers, manifestoes, pamphlets and on the other the information dissemination by those who could read. Another great action of the libertarians was the printing in several languages (Portuguese, Italian and Spanish) which eliminated the language barrier.

• Tipping point or phase transition: small stimuli provoking huge social transformations: the José Ineguez Martinez death.

• Dominant networks reaction: breaking the information flow prohibiting public groupings and information circulation.

• Demonization and arrest of the most prominent libertarian figures, creating counter-information and deconstructing the anarchist discourse.

• Homophile, people tend to connect to networks of people who have ideas similarity (birds of a feather flock together).

The Brazil' anarchist movement of 1917 was "controlled" and "extinct," but the libertarian ideas of that time would find fertile ground a hundred years later as we shall see in the next cycle.

The craftsman's work tools no longer served when the mass production begun. Now the machines did the work. Everything changed to the workers. They no longer sell the crafts they did; now they sell their bodies and intelligence to those who owned the machines.

Another industries effect was the workers displacement from their homes to the workplaces, a completely new way of life in human history. The sub products are now noticeable: traffic congestion, environmental pollution and noise are attributes of any major city.

In the nineteenth century, in Europe, states established elementary, lay, free and compulsory schools. Governments perceived a relationship between education and social welfare, stability and progress. The industries expansion demanded also technical education and scientific disciplines.

Knowledge became a commodity with perfectly defined guilds: schools, institutes, universities. The learning was circumscribed to the classrooms with quantitative systems of knowledge measurement and packed in curricular grids. Teaching

processes were developed in the same way as the industrial processes. Titles are now accepted as a guarantee of an individual knowledge quality and quantity. The knowledge priests of the chimney economy now have degrees such as bachelor, master or doctor. Anyone who wants to learn something has to travel geographically to specific places. Islands of knowledge perfectly compartmentalized, ensuring that each group had control over their knowledge, such as lawyers, doctors, engineers, accountants and so forth, have emerged.

Learning has become a bureaucratic, measured and controlled process. The learner is more concerned to assimilate the knowledge that will be evaluated than in the experience of learning. Knowledge is not a pleasure; it is a ritualized obligation to fulfill.

In the words of Ivan Illich "the school educates students to confuse process with substance. Once this has been achieved, a new logic comes into play: the longer the schooling, the better the results; or, then, graduation leads to success. The student is thus schooled to confuse teaching with learning, obtaining degrees with education, university degree with competence, fluency in speaking with the ability to say something new. " (36).

Eric Hobsbawn (37) says that the twentieth century was the bloodiest in history: we have lived two great wars and the tension between capitalism and socialism. We also saw the communication technologies development such as radio and television that allowed many to hear the ideas of few. The public opinion controlled by governments and corporate groups, through these technologies, marked the entire twentieth

century. The market speech has affirmed itself as a tool of social influence. To sell anything, from ideas to products or services, we buy speeches from "experts" or people with notable social influence. Advertising and marketing techniques flooded the market with an enormous amount of things that became indispensable to modern life. Each advertisement was carefully thought out to pass on a certain message, and although most of the time they were successful, the networks unpredictability was always present, as this case of Sadia (35) attests well:

"It was an almost technological turkey. We made a film that emphasized the great product practicality, in the following sequence: the housewife went out to buy her turkey, returned home, took the turkey from the packaging, put it in the oven, the stem went up, took out the oven and .. . ready! It would serve perfectly without having to clean, season and control the time in the oven. On top of these images the announcer bragged convincingly: "The seasoned turkey Sadia arrived. It's ready, clean. Just take it out of the package and put it in the oven. The thermometer warned, all right, that's all! "

The movie was done, okay - it was cool. But one of our sound directors thought it was missing something to get the attention of the housewife to that marvel. It was necessary to emphasize, he argued, the great product differential, the moment when that red business emerged gloriously right in the middle of the turkey's chest, summing up and celebrating the extraordinary technology embedded there. He decided to create a little sound - an emblematic beep - to sound just as the stem pointed out of that delicious meat.

The next day when I arrived in Sadia, I found the suppliant voice of the sales manager repeating perhaps for the umpteenth time the story that was tormenting the company that day: "Well, Mr. Ottoni, the worst happened. We received several phone calls complaining that the turkey burned because they waited for the thermometer to whistle. "

Of course the whistle never played again after that, but it did not matter. To this day the seasoned turkey Sadia has become known as the turkey that whistles. What was just a sonic feature to highlight the novelty of the kitchen thermometer ended up becoming an added product value. And the worst: without being true. "

In the consumer economy, wealth comes from the production and sale of tangible goods. As competition increases the variations on the same theme flood the market. For each marketed object there are a huge number of models. At the beginning of the 21st century, we face a paradox: if we stop consuming the capitalist system collapses, if we continue to consume the planet collapses!

Important points of the wealth generation fourth cycle:

• Wealth generation system: tangible goods production and sale.

• Great difference of knowledge between bosses and employees.

• Knowledge access: geographical displacement, educational institutions, libraries. Education ritualization with rigid grid and mathematical measurement processes of knowledge acquired amount.

• Production tools not accessible to the worker.

• People displacement to workplaces.
• Distinction between professional and private life.
• Competition, secrecy, information truncation.
• Speech market: through social influence.
• Communication technologies: telephone, radio, TV. Information dissemination system from one (or few) to many. The media controls public opinion and governments and corporations control the media.

5.5 Fifth wealth generation cycle: information society

The twentieth century second half and the beginning of the third millennium is characterized by the speed with which technologies have developed, especially those of communication and information. But what amazes most is the speed with which these technologies have been adopted by the world population. In 2011, 30% of humanity (two billion people) was already connected to the Internet and growth continues exponentially on all continents. What in previous cycles would take hundreds or tens of years to change, today can change in a matter of hours.

According to Crawford Stanley Holling (38) society is an accident waiting to happen. Buzz Holling, as he is best known, was one of the first ecologists to study the nonlinear dynamics of ecosystems arriving at a model called the "adaptive cycle." These cycles exhibit two large phase transitions: growth / exploration and collapse / reorganization. During the first phase, stability increases and the system accumulate nutrients and

biomass and generate new recombination. In the second phase, the system is so tightly connected that resilience decreases and any event can reverberate and cause system collapse and reorganization. Our society is exactly at the collapse point. We have reached such a degree of connection that any event anywhere on the planet can generate a domino effect.

Like other times, when a new cycle begins to emerge, we tend to deal with the new with the old way logic. This is what happened, for example, with the first Internet boom in the 1990s. It was a new media coming up, so expert professionals from previous media (TV, radio) were recruited to play the new companies. It was a silly thing! These professionals were accustomed to dealing with passive audiences and did not consider that on the internet there are no "audiences" but active users. Unlike the limited and limiting options of the previous media, on the internet each one opts for information in an almost unlimited "menu". As a matter of fact, as Macluhan says: "The medium is the message, the audience is the content." People not only seek information, they generate information.

Technologies have advanced from e-mail exchanges to real-time interaction with tools like Skype, MSN, Facebook, Twitter, Ning, and so forth. The adoption of these technologies has reduced the world social size. A person can directly access any other person, without space barriers. There are no more borders in the digital world.

The effects of this total connection can already be felt (39):

Thousands of people collaborate and create open source platforms. Nobody owns them, everyone uses them for free and anyone can improve them.

Customers are no longer passive; they interact, generate content and require customized products and services. Advertising is no longer a one-way street where the company sends a message that the consumer receives. Now they need to learn how to interact. Consumers use all possible tools (blogs, websites, social media) to share their personal experiences, opinions about products and services, brands, companies and news. A single dissatisfied customer can crucify a company.

The following happened with United Airlines: a group of musicians boarded an airplane and dispatched with their luggage their musical instruments. While they were still in the ground, from inside the plane, they saw their instruments being thrown without any care and when they arrived at the destination they realized that one of the guitars was broken. After two years of complaints and insistent requests for United to take responsibility for the damage, they received a definitive no. Discontented with the indifference and their rights violation, they made music and a home video and posted it on YouTube. In one week the video had 4 million accesses and United shares fell 14%!

Scientists gather in international communities such as InnoCentive, Nine-Sigma, Eureka Medical, YourEncore, and work on solving the most varied problems. Companies are finding that sharing data and using network intelligence is more advantageous than withholding information.

Decentralized and efficient companies appear such as e-Bay, Amazon, Intuit and Morningstar among others. They are no longer structured by the rigid hierarchies from the last cycle.

Copyright and patents are undergoing serious shocks as it is no longer possible to control intellectual property in a world of billions of connected people.

Governments and corporations are no longer able to contain the leakage of sensitive data. They also suffer virtual attacks by people or groups who do not agree with their actions. Their policies are constantly monitored by Human Rights Watch and Avaaz-like communities that can engage millions of people in their campaigns.

Across the globe, the voices of indignant people discontent with corrupt governments and predatory corporations make themselves heard using social media. Phenomena such as Wikileaks, Anonymous, Occupy (movements of occupation of public squares by people outraged by world order) are taking place all over the world. In the nineteenth century anarchist movements emerged in a reaction to predatory corporations and governments in the 21st century, this movement reappears for the same reason, with new clothes and names, but with the same principle of "direct action."

There is a war to control expression freedom on the internet. Unlike previous cycles when information control mechanisms were relatively effective and could be screened behind closed doors, today, information is always leaking, one way or the other. In conventional wars, governments have information and violence control and possess the weapons, but on the internet

reality is different, the same tools are available to everyone. As Eduardo Galeano says, "this world is pregnant with another world". But no one knows for sure what is going to be born.

In companies, the big differences in knowledge between bosses and employees, which characterized the previous cycle, no longer exist. Strategic positions are more opportunity than competence, which increases the organizations internal competitiveness level.

In the fifth cycle, it is evident that wealth is generated by those who have information and can transform it into revenue. The ability to transform information into knowledge is what moves any kind of economy, even in earlier cycles, trade and production lines had to be invented by someone. Human beings are not costs, they are not resources, and they are the creative matrixes of any kind of innovation. They always were, but only now they begin to be perceived as such.

Organizations are effective when their components transform information into knowledge, and knowledge into revenue. This happens naturally when the communication pipelines are opened and there are multiple paths: everyone access everyone.

The fifth cycle is still very recent and, in general, we still cannot see clearly where we are going. But the abundant signs of deep change are out there.

Main points of the wealth generation fifth cycle:

• Knowledge-based wealth generation;

• Work tools accessible to all. Creating new business is possible for anyone who has a good idea. The initial capital to build a new company, whose raw material is knowledge, is almost whimsy compared to the previous cycle;

• There are no significant differences in knowledge between bosses and subordinates. Leadership positions are more opportunity than competence;

• The work is developed at home again. Work tools (computers) eliminate the need for workplaces daily displacement;

• Networked learning, without the need for physical displacement to education places or teachers. People learn what they want and with whom they want. Self-learning is a widespread trend in this cycle;

• Dilution of the differences between professional and private life. Participation in virtual communities where friends, customers and / or co-workers are mixed creates an environment to the most varied information exchanges;

• Relations partner x partners. Since wealth is generated by the ability to turn knowledge into revenue, the professionals involved participate in the profits. Professionals are no longer understood as production resources, but as creation matrices;

• Horizontal hierarchical structures. Many new and successful companies are operating without any hierarchical rigidity as well as old companies are slowly changing their hierarchical rigidity. This is another inexorable tendency;

• Broad sharing of information and cooperation. Organizations that kept secrecy about their production processes or formulas, today share information seeking, beyond their borders, solutions to the most varied problems;

• The search for capital is no longer limited to financial institutions. It is now possible to get money for a project or business through crowd founding (donation of many people).

• The notion of wealth / profit is changing. New currencies and new philosophies about financial issues are beginning to be widely discussed all over the world.

• Customers are proactive, suggest changes or new products and require customization;

• Social Empowerment. Anyone can have their ideas disseminated. A single dissatisfied customer can create a serious problem for a business, no matter how large it is.

• People come together and cooperate in projects that benefit the collective, simply for the pleasure of doing so, without any kind of financial relation;

• The social status is acquired as in the first cycle. No matter the social class, if the person somehow contributes to the collective good the community will recognize its merit.

6.The network structure

The mother network, the human society, is made up of all the billions of humans living on this planet. No one is out. A single connection to another human already connects us to the mother network.

The social networks analysis began with Jacob Levy Moreno (40) who, in the 1930s, developed a graphical representation method, called Sociometry, to measure group relations. Moreno believed that life was a meeting of two, where the ability to see with the eyes of the other is what enables healthy relationships. He said: "And when you are near me, I will take off your eyes, and put them in mines place; and I will cut off my eyes to put them in the place of yours; then I will see you with your eyes, and you will see me with my eyes".

Moreno said that there were invisible structures of interpersonal relationships within a group that could only be measured with a

scientific analysis method. Sociometry was the method he idealized to objectively place what was seen subjectively.

In the Moreno method, all the components of the group to be analyzed answer questions that were elaborated according to certain analysis criteria. The questions usually follow the following structure: Who would you choose for ...., or who do you think I would choose for ... These are relational questions. The answers are always with respect to each other. These responses gave rise to a set of graphs that when interpreted is possible to find out if there were isolated or hated persons, who was the person with the largest number of positive answers, etc. This understanding could be used to help the group achieve a circularization, a relationship of all with all.

From the 1940s, other social network researchers have used mathematical propositions such as graph theory, statistics and probability, and algebraic models seeking a broader understanding of group structures. The central idea is to analyze the relations between social actors (people, institutions, etc.) since no social actor acts independently.

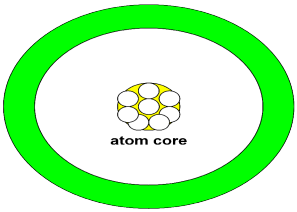
The social networks study was quite intense in the second half of the last century. Psychologists (Leavitt 1949-1951, Bavelas 1948-1950, Smith 1950) have discovered structural properties useful for studying group processes. Anthropologists like Barnes 1954, Bott 1957, Mitchell, 1969, Boissevan, 1968, Kapferer 1969, Thurman 1980 created new concepts to understand the social interactions observed. Burt 1976, Faust, 1988, Borgatti and Everett 1992 White and Reitz 1989, Winship and Mandel 1983 developed mathematical formulations to express social concepts. (41)

Several new concepts and network analysis methods emerged: social group, isolation, popularity, prestige, balance, transitivity, subgroups, social cohesion, social position, social role, influence, dominance, compliance, among many.

Since the 1990s, with the "world wide web", the world has become a large research laboratory. The study of the structures and dynamics of social networks has expanded and broken all frontiers of specialization. Social network analysis (SNA) can either be used to understand the dynamics of a virus's spread, the dynamics of a stock market, or the relationships between oil companies, or the soldiers' dynamics on the battlefield, or the link between countries through air routes or business transactions. Where there are people interacting the SNA is applicable.

6.1 The uncertainty principle

Quantum physics (42) has a concept that is worth analyzing in the context of networks. It is the uncertainty principle, postulated by Werner Heisenberg in the 1930s. Electrons are found in orbital, regions of space where the electron is most likely to be found. Electrons jump from one orbital to another. If they jump to a lower orbital, they "blow" a photon. If they jump to a higher orbital they absorb a photon. The distance between the nucleus and the lowest orbital is huge. Imagine a tennis ball in the middle of a football stadium, this would be the nucleus, the lowest orbital would be found outside the stadium. Atoms have lots of empty spaces.



Social Entanglement

The atom has in its core the protons and the neutrons. The green area, around the nucleus, shows the electrons orbital. Note that this figure is very simplified. An electron can be found anywhere in this region of space. But where is he, really? The only way to know is to shoot a photon, to the region of space where the probability, given by calculations, to find it is greater. When the photon reaches the electron, it ceases to be a wave of probability and becomes a particle. But it triggers another conceptual problem: where was the electron before it was struck by the photon? Was it standing or moving? This is the principle of uncertainty: if we know in what region of space the electron is, we do not know what its velocity was. If we focus on speed, we do not know in which region of space it is. In any case, the results obtained are incomplete and therefore uncertain.

The uncertainty principle applies to social network analysis as well. When we analyze a network, it is always a small region of the mother network (human society). By focusing our attention on a region of the mother network, we lose the dimension of the global structure.

When we analyze a network, it is always a subnet of the mother network. It's like putting a magnifying glass on a particular region of the mother network. This region or this piece of network that will be the object of analysis is a primary network (grade 1). Suppose a group of one hundred people will be analyzed, then the one hundred people are part of the primary network. However, these 100 people are connected to other people outside this group; this is the secondary network (grade 2). And each person in the secondary network connects to others forming a tertiary network (grade 3) and so on. Although the analysis focus is on the grade 1 nodes relations, it must be considered that any network expands to N grades.

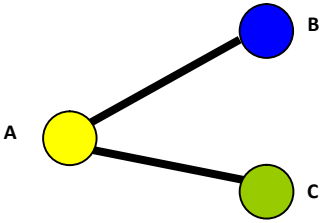
For instance, analyzing an organization means that all employees are grade 1. Customers, partners, suppliers and each employee personal network are grade 2 and so on.

6.2 Social Network Analysis (SNA)

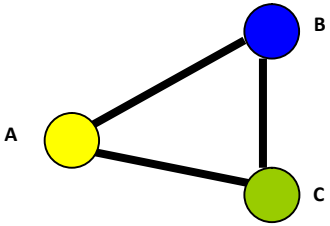
In the networks study, the focus is always on the relationship between nodes. The nodes characteristics have value only as relation attributes.

The smallest network unit is a dyad:

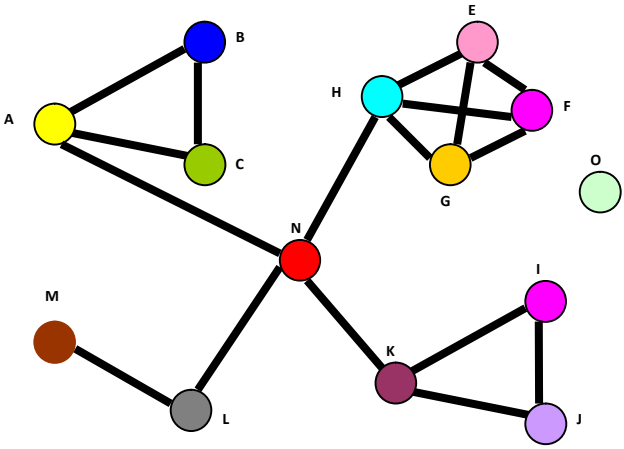
Points A and B represent an individual or groups of individuals, such as companies, for example. The connection line means that A and B exchange information. It is important to note that the relationship between a pair of nodes is a property of the pair and not a characteristic of the nodes individually. If we add another person (node / actor / agent) to this network we will have a triad:



This graph shows that B and C interact with A, but there is no relationship between them. As we saw in the networks dynamics there is a tendency for B and C to know each other at some point, this would be a triadic closure represented by another line connecting B and C.



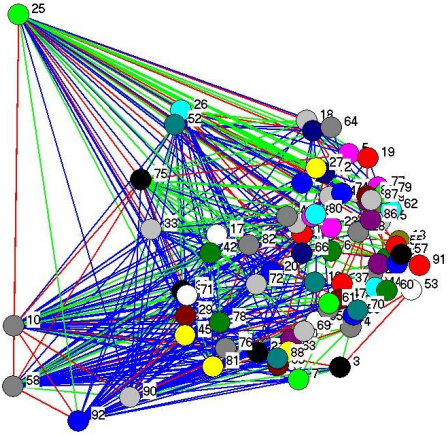
We could say that A, B and C are a cluster. A network with multiple clusters would look more or less like this:



It is possible to observe in the above graphic that there are four clusters (A, B, C), (E, F, G, H), (K, I, J) and (M, L). In this structure node O is completely isolated and node N acts as a bridge connecting the four clusters. O is not interacting with the network, which means that the information it has is not circulating.

It is also noted that if J wants to access B, the smallest path would be to pass through K, N, A and finally B. That is, J is three degrees (people) away from B. H is one degree From K, since to get to K it has to pass through N. The longer the paths average between nodes the sparse the network is. Densely connected networks have multiple paths between nodes and are more difficult to break. In the above example, the network structure breaks with the removal of a single node N. If we remove N there is not a single network anymore but four small networks.

Very connected nodes are hubs, points of convergence, nodes to which others converge. Some researchers refer to these nodes as points of centralization. I prefer to think of them as convergence points because connection is always an option; nobody is forced to do so. Observe the structure below:



In this structure, the lines color corresponds to the intensity of the information exchanged between the pairs. Red lines mean high interaction, green lines medium interaction and blue lines low interaction. Four points of convergence are noted: 25, 10, 58 and 92. However, between them the 25 is the one that has more connections with varied colors. Note that the other three nodes have many connections, but most are blue ones.

There are countless ways to build graphs to show the structure of a network and many softwares that helps in this task.

6.2.1 Data collection for a SNA (Social Network Analysis)

SNA is a relational archeology, because it seeks traces of past interactions between the nodes of the group being analyzed. There are several ways of collecting data:

• Through questions to the participants. A questionnaire is assembled and will be answered by all participants of the

network in focus. Questions are always relational and generally have this type of structure:
O With who do you exchange information about the day-to-day business?
O Who do you seek to give an opinion before making a key decision?
O With whom do you discuss new ideas?

Each question corresponds to one aspect of network analysis. Factors such as group size and context should be considered when collecting data through questions. Questionnaires can be answered online if all people can access the internet, or can be done on paper and then collected and typed. In this method there is no need for face-to-face data collection.

The answer to each question is how often each person perceives the exchange with other people. For example, a high level response from John to Mary means that John thinks they have daily contact. Medium level would mean that they exchange information weekly, for example. Low level means that they eventually meet when they coincide at events or when they go, once in a while, for lunch. An answer indicating a null means that John does not know Mary, he does not have any kind of interaction with her.

• Tracking the emails exchange. The data is collected through software that reads the e-mail databases and selects the required information placing it in the appropriate format to be processed by the SNA software.

• Tracking phone calls. Most internal telephone systems maintain a history of the connections made by the various extensions. As in the previous item, software has to be designed for data conversion.

• Tracking various databases (databases mining) for information such as contracts, invoices, or any other interaction trace.

• Tracking the web. Search for interactions in social network tools like Facebook, Twitter, Ning, Google, etc.

Several ways can be combined for more accurate results. For instance, tracking only emails or just phone calls does not give a full dimension of interactions because people interact in person and using other tools. The choice of data collection method always depends on the purpose and context of the analysis.

6.2.2 Neurometry: a graphic narrative

"Apparent complexity stemming from deep simplicity" (Murray Gell-Man)

Neurometry is a simple method for social networks analysis. The name came from an analogy with the functioning of the human brain: from billions of connected neurons the human mind emerges, out of billions of connected humans emerges human society.

Neurometry is a graphical narrative. It offers a set of graphs from which the structure of a network is discovered and its dynamics can be inferred. Dynamics and structure are inseparable in network theory.

Whatever the analyzed subnet is, it will always be changing. So when we design a network structure it is as if we were doing a

"tomography" of the collective mind (social interactions) at a given moment in time. To understand the changing patterns of a network, over time, various network analyses are required at different times. The comparison between them reveals the collective behavior patterns over time.

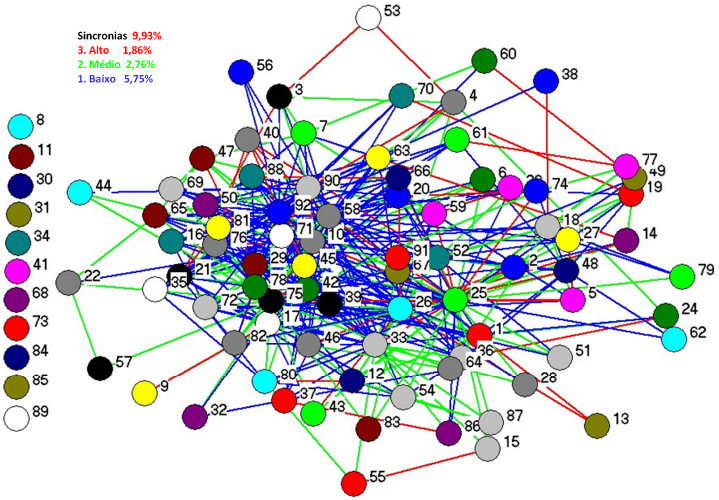
It is important to note that the focus of an analysis is always on the network as a whole, although we also work with individual results.

This SNA method is very effective for analyzing any kind of organizational networks, where the group to be analyzed is clearly delimited, which may be the whole organization or only one subgroup (a department, for example).

Neurometry uses the concepts of synchronous connections where the two nodes perceive the connection with the same degree of intensity and asynchronous, in which the nodes have different perception of the relational intensity. Two environments are created, the synchronous that shows the network of fluid relations and the asynchronous one that shows the network of relations "with noise".

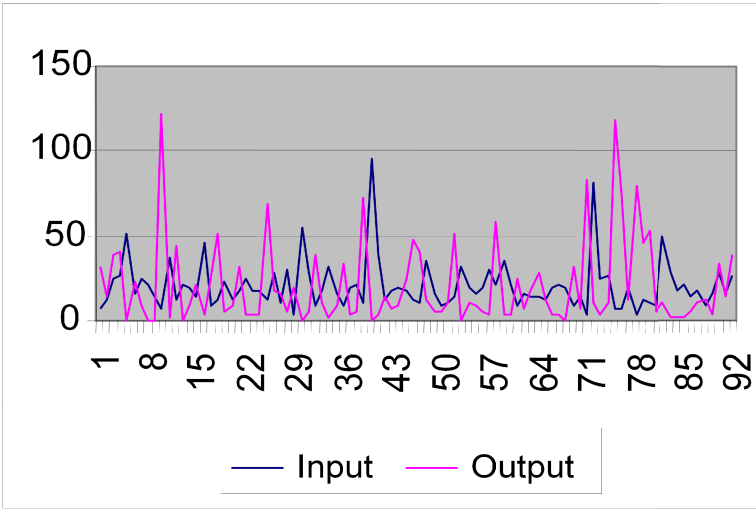
In this method, four degrees of relational intensity are used: H-high (daily interaction), M-medium (weekly / biweekly interaction), L-low (eventual interaction), and N-null (no interaction). Therefore, the possible synchronous connections between two nodes are H/H, M/M, L/L or N / N, the “hard” asynchronous connections (connections with two degrees of difference) can be: H/L, H/N, M/N and the "light" asynchronous connections can be H/M, M/L, L/N.

The variation between intensities with a degree of difference can be quite subtle. One of the nodes perceives the relationship with a high level of exchange and the other with a medium level. In this case, what we can safely say is that the two nodes have a mid-level link and that the node that responded to A has issued an extra degree of output and the one that responded M received another input degree. Below is an example of a synchronous network. Note that in this network there are isolated nodes and that the sync reaches only 9.93% and most connections are low:



Each node has an input and an output degree. These grades correspond to the differences in asynchronous connections. If the interaction between XY is HN (High-Null), X thinks that it interacts with Y at high level, but Y says that it does not know X. In this case, we cannot say with certainty whether the relation exists or not, but we can state that X issued three degrees of

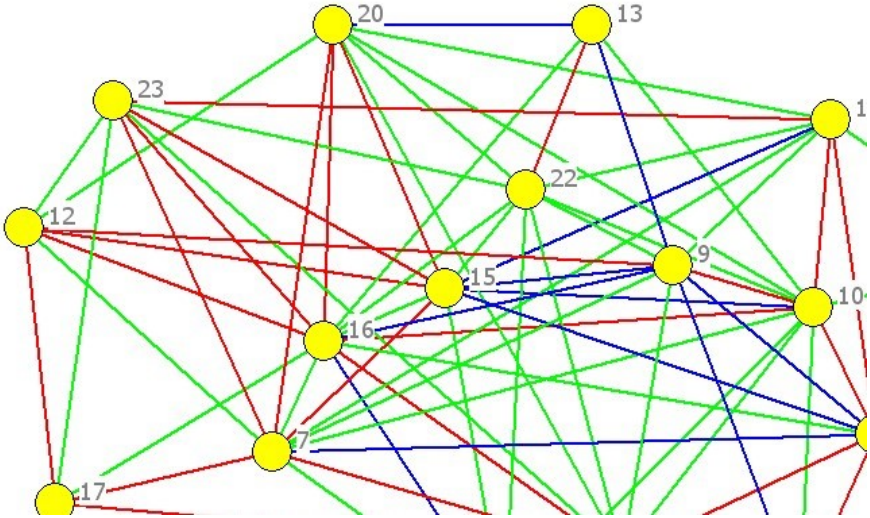
output and that Y received three degrees of input. Some nodes have output grades much larger than the input and vice versa. These differences indicate that these nodes did not have reciprocity in the responses. A node with the input degree greater than the output node usually indicates a person to which the others converge. A node with the degree of output greater than the input can mean that it is an information disseminator. It should never be forgotten that any analysis always depends on the context. The graph below shows the degrees of input and output of the 92 components of a group:



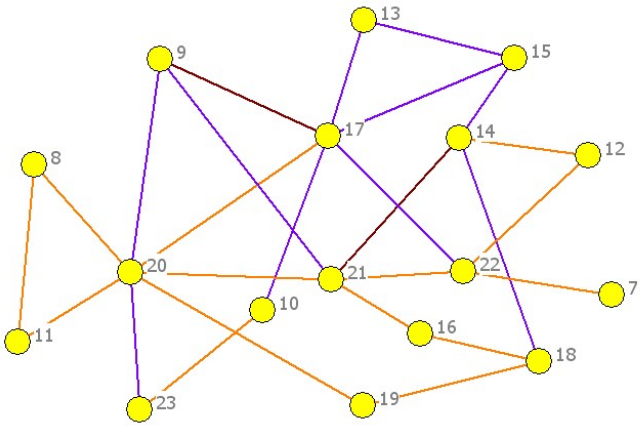
Asynchronous "light" connections with a degree of difference are transformed into synchronous, as follows: nodes X and Y have an HM interaction that is transformed into MM with an output degree for X (which responded H) and an input degree for Y (who replied M). The same occurs with M/L connections, they are transformed into L/L. L/N connections are turned null (N/N).

In the Neurometry graphs, each type of bond has a different color. Usually: red lines correspond to high-level synchronous connections, green lines are middle-level synchronous connections, and blue lines are low-level synchronous connections.. The colors of the lines of the asynchronous connections: Black (H/N), Brown (H/L), Gray (M/N). These notations may vary from analysis to analysis, but in the same analysis it is important to maintain the same pattern.

Another synchronous relationships example:



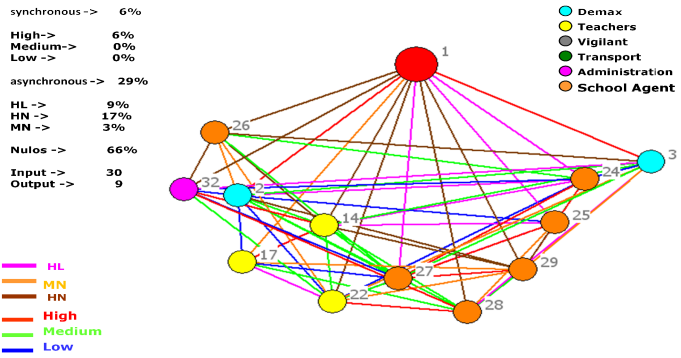
As we can see it is a group that interacts a lot, most of the connections are high or medium and there are no isolated people. The graph below shows, for the same group, the asynchronous connections found:



In this example, the lines color has the following meaning: blue H/N, pumpkin H/L and brown M/N. In general, asynchronous connections can point to communication noises, hierarchical differences (in a strongly hierarchical organization, for example, lower nodes tend to emit more than receive), or relational difficulties between nodes.

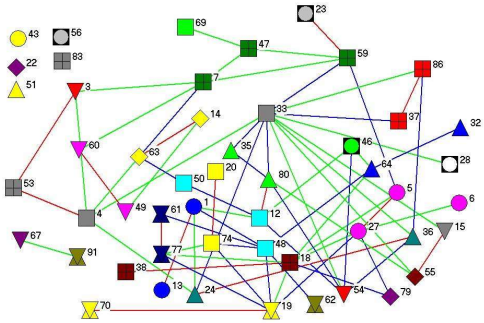
Asynchronous connections always exist in any group and are part of the network dynamics. But we found that when the amount of asynchronous connections is greater than the amount of synchronous, the group may be facing some kind of difficulty.

When we analyze a network by this method, in addition to the graphs that give an overview of the network global structure we also use the view of ego nets. Ego nets are graphs that show how each node connects to the network, as in the example below:



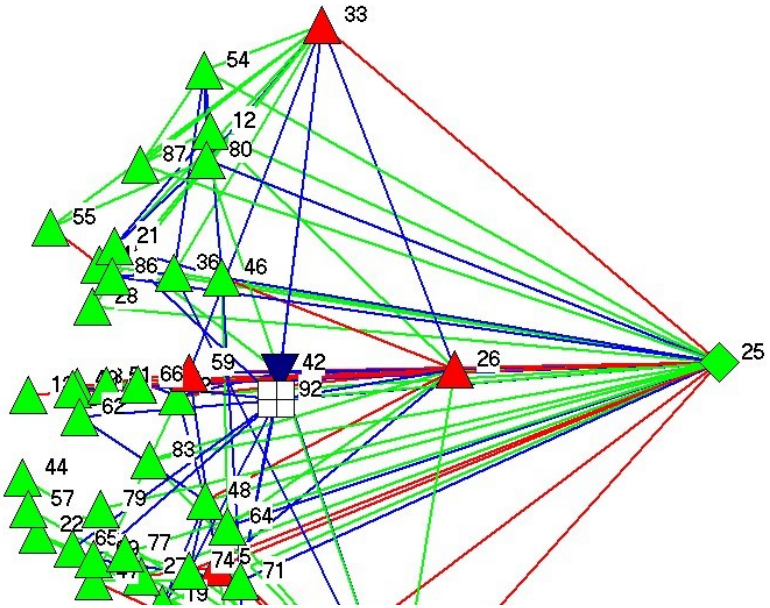
This is the ego net of node number 1 (in red). It is connected to the network through these connections. In the upper left corner, these node individual results are noted: synchrony, asynchrony and input and output degrees.

Viewing the network through the nodes attributes can also bring very relevant information. You can use various attributes to help understand the network, such as department, job role, city, etc. The graph below shows the interaction between employees of different cities. Nodes with the same symbols work in the same city:



We can observe that in some branches, people working together do not interact, for example, node 22 (isolated) and node 79 (connected with only two blue links). Another disconnected team is that formed by nodes 48, 12 and 50. One of the well-connected teams is that formed by nodes 7, 47 and 59 or the team of nodes 60 and 49. The convergence point is node 33 which means that he is able to reach various cities.

Another example of using attributes: green triangles are managers, red triangles are regional managers, green diamond (25) is the department superintendent and green triangle (75) is the department director. Note that several managers connect directly to the superintendent (25) rather than connect with regional managers. Another group of managers connects directly to the director (75). It seems that the group acts like they were two different teams.



The SNA results using the Neurometry method are composed of dozens or hundreds of graphs, depending on the size of the network and the analyzed facets. They are graphic narratives that tell the relational moment of a given network.

Neurometry (Social Network Analysis) is important for an organization because:

• Allows the analysis of any aspect considered important resulting in an organization systemic view.

• The communication networks show interrupted pipelines, isolated people or bottlenecks.

• It is a metric to know if the stimuli applied to the people in the organization was effective. Over time, the different network analyzes become a relational memory.

• It is an excellent starting point for group reflections on organizational dynamics. The results, when shared with the mapped group, provoke reflections, insights, ideas and questions that lead the group to a new level of understanding of the collective and to an information flow optimization.

7. Hierarchies x Collective Intelligence

"Nothing will change society if the mechanisms of power that function outside, below and alongside state apparatus at a much more elementary, everyday level, are not modified" (Michel Foucault)

Organizations, especially those still in the chimney economy, are generally hierarchical. Hierarchy comes from the Greek "hierarchia". "Hier" is a composition element that comes from

"Hieros" meaning holy. So hierarchy can be defined as a sacred scale, untouchable, anointed by the divine.

According the Brazilian Aurélio dictionary hierarchy means:
1.Order and subordination of ecclesiastical powers;
2.Graduation of the authority corresponding to the various categories of civil servants;
3. Continuous series of degrees or ranks in ascending or descending order.

At the origin of most businesses is an entrepreneur with a unique resource that can be an idea, a good relationship with customers, a tool or an innovative form of management. The crucial problem of any entrepreneur in the early stages of a business is: how to encourage employees to protect rather than appropriate the source of organizational income? According to a study conducted by the National Bureau of Economic Research of Massachusetts (43) USA, the answer to this problem will determine the internal structure of the organization, its growth and eventual size.

In a company, the hierarchical structure emerges fundamentally from the need to protect business knowledge. This causes a paradox: on the one hand, if you pass all the knowledge of your business to an employee, the possibility of competition grows. On the other hand, you need to pass on enough knowledge so that he can produce. This is solved with specialization and functional hierarchy. Each one knows only part of the production process.

Generally, industries tend to have hierarchies with many vertical levels and companies that produce intangible goods tend to have more horizontal hierarchies.

Social Entanglement

As economic complexity grows, traditional hierarchical structures have proven to be inadequate in at least three crucial business needs: leadership, innovation, and response speed to the market.

Leading is getting harder and harder. Proof of this is the intense pursuit of executives for information on new leadership styles, as well as coaching and counseling consultancies. Making strategic decisions is also much more difficult as the number of variables involved in a decision has grown exponentially in recent years.

Technological innovation processes have to deal with cultural barriers. The company's relationship with their customers becomes more and more personalized demanding new knowledge levels for the customers contact responsible professionals.

Now we know that communication between the various areas and people of the company is crucial to the smooth running of the business.

When people in an organization acquire a greater variety of professional profiles there is a natural tendency towards multifunctional learning, complementarities between processes and activities, and decision making decentralization.

Although not yet explicitly perceptible, hierarchical structures are already undergoing a transformation. A May 2007 study by Paraná University UFPR (44) conducted in 500 Brazilian industries indicates that there is a trend towards hierarchical circularization, even among companies in the chimney economy!

Companies adapt and learn about what happens in the environment (such as changes in raw material prices, consumer tastes, technologies, etc.), and a company's ability to learn directly affects its performance.

As the environment becomes more complex, the learning ability of an organization decreases. Frequently, there is a need for multidisciplinary visions to understand a given market configuration, to solve a difficulty or to create a strategy. Currently, isolated decisions are dangerous and risky.

The perception of companies as collective minds arising from a nonlinear neural network, where each network point receives information, processes it and returns it to the network in an uninterrupted process, can be determinant for new organizational structures to emerge.

According to a study by the Observatoire Français des Conjonctures Économiques (45), there are six similar characteristics between companies and human brains:

1. **Decentralized and parallel processing**.
   The company is a coordinated network of people who process information in parallel and serial way to make decisions;
2. **Built-in decision-making**
   Decisions within decisions;
3. **Learning by experience**
   People become competent by gaining experience through trial and error;
4. **Adapting to the environment**
   Since firms deal with different environments,

organizational adaptation suggests that there is no ideal way of organization;

5. **Pattern Recognition**
   As people process information, they recognize patterns and, as a result, are able to process information that resembles previously learned patterns;
6. **Companies contain more knowledge than anyone**
   The Company is not a simple collection of people, but a coordinated set of specialized people. Therefore, the knowledge of a company is greater than the sum of the knowledge of each person that composes it.

Organizations with rigid hierarchical structures have a high level of internal competitiveness because peers compete to achieve higher ranks in the hierarchy. This also leads to the evasion of talent, as there are bottlenecks: for example, thirty managers for only one vacancy in the director board. Sometimes the organization decides to choose a professional from the market. In any case, if the choice is internal, deferred professionals may "lose their momentum", and if it is external, the new professional gets the risk of dealing, at least initially, with a stubborn resistance and information sabotage. Moreover, as already mentioned, the differences in knowledge between bosses and subordinates practically do not exist anymore in the knowledge society, which subjects the leaders to constant team pressure.

Although the market is full of techniques for choosing leaders, this is perhaps the focus of the problem. Leaders do not emerge naturally from the group, leadership is decided

externally. It is, ultimately, a collective intelligence denial of its ability to find solutions to business difficulties.

Imagine a group of friends who usually meet for various activities together. There may be one or two more popular figures, but there is no leader, simply because it is not necessary. This group decides to take a walk in a forest and is lost. One of them had already taken a survival course in the jungle. In a natural way, the group will accept the leadership of this person, because in this context the knowledge he has will allow the group survival. This is collective intelligence.

In a turbulent, volatile and accelerated society it is safer to rely on collective intelligence than on the skill of a few leaders. Collective intelligence emerges when there is no obstruction in the information pipelines. If everyone has access to the same information, the collective capacity to generate creative and innovative solutions increases exponentially as decreases the resistance to change and the talents loss because everyone feels part of the process. The greater the control exercised over the information dissemination in organizational networks, the less creative and innovative capacity the organization has. Creativity, when transformed into innovation or product improvement, is today the main source of wealth creation for companies. (46)

The table below shows the differences between this new wealth generation cycle, based on intangible goods (knowledge) and the previous cycle, based on the tangible goods production:

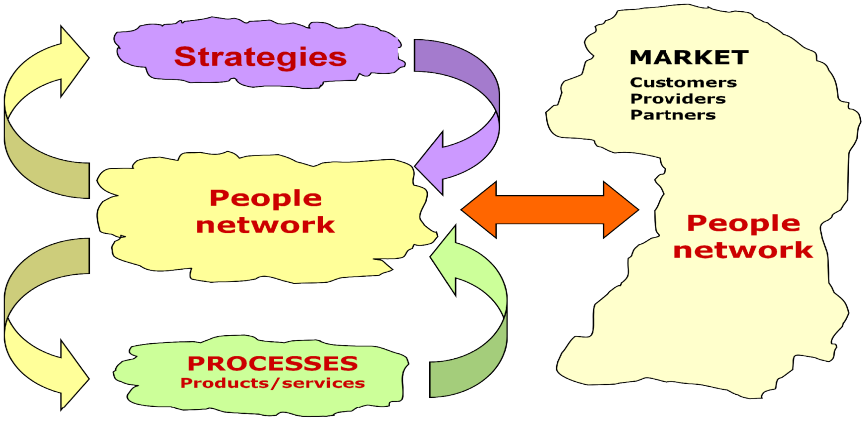
	Tangible	Intangible
People	Resources / Cost generators	Revenue generator
Managers power source	Hierarchical rank	Knowledge level
Management model	Standardization, control and punishment	Knowledge flow and creative emergence
Information	Control tool	Communication tool / Innovation
Information flow	Through hierarchies	Through the networks
Production flow	Through machines; sequential	Through ideas / non linear

Alvin Toffler (47) tells us that businesses that produce tangible products are limited by property and capital scarcity. Knowledge-based business has perennial and unlimited resources, because knowledge can be compressed into symbols and abstractions and stored in ever smaller spaces. Knowledge is non-linear, small insights can lead to great discoveries.

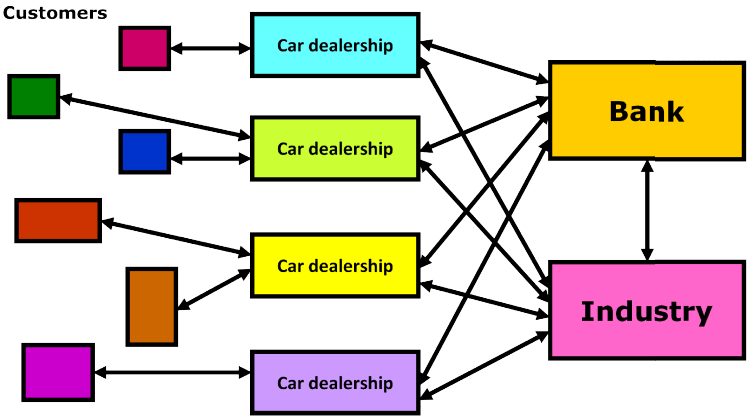
Do you remember the regulations of that factory at the beginning of the industrial revolution? What will be said fifty years from now about working conditions at the beginning of the knowledge society? Maybe something like: they worked at tables for eight hours a day or more, having to go to work every day, congesting traffic, with bosses constantly monitoring their performance, earning salaries that forced them to work until retirement in companies whose owners and/or shareholders pocketed all the profits. How could they be creative?

8. **Networked organizations**

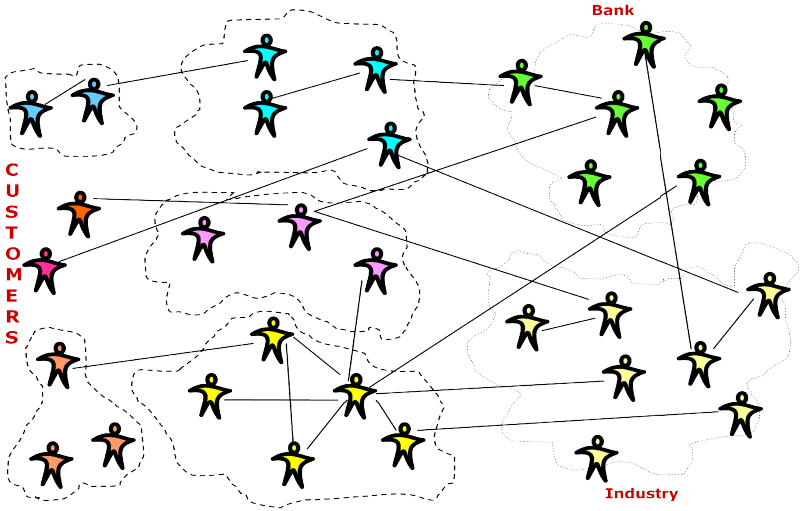
Organizations transform knowledge into revenue in ever-changing environments. Any organization is a creative emergence phenomenon, emerges from the interaction between the people who compose it. Organizations are networks of people who develop processes to create products and / or services and strategies to put them on the market. These processes and strategies also influence the network from which they emerge. The market, customers, partners and suppliers are also networks of people. It's a great hyper cycle:



Imagine, for example, an automobile industry organization. This organization is made up of a bank, the industry and the car dealerships that sell the vehicles. The relationship between these components could be represented as follows:



But each box is, in fact, a network of people:



In any organization, the difficulties and problems come from obstructed communication channels. Those who do not have

access to information, imagine it. And of course they will imagine it within the limits that they can conceive. That is why the gossip works so effectively in organizations. This is one of the information control problems.

If you do not have a city map, finding a street will require tremendous effort and time. But if you have access to a map, not only will you be able to find the best route to your displacement, but you will still know how others are moving as well, making joint coordination more effective to achieve group goals. When strategic information does not circulate throughout all the organization, the intelligence at disposal to achieve the goals is reduced to a few people. The other people of the organization will try to do what they can, not the best possible.

The manual work is from the past cycle. The control of bodies, times and movements is no longer adequate to generate wealth in the learning economy. Human beings are not linear and do not react to situations the way we would like them to react. Each has its context and its experiences. Conflicts will always exist. Attempts and errors are the dynamics of evolutionary processes.

When an organization hires a professional, gets a new customer, buys from a new supplier or makes a new partnership, it connects to new networks, expanding its relational universe and its possibilities horizon. Smart organizations take advantage of the creative and productive possibilities of these expanded social networks.

The organization's employees personal networks are real gold mines, often unexplored. Imagine a company of 100 employees. Each of them connects to family networks, friends,

schoolmates and so on. Let's imagine that each one connects to 10 more people. This expanded network has a thousand people. If each of the ten people, in turn, connects to ten more, expanded third-grade networks reach 10,000 people! Mechanisms can be created to expand sales to these networks using employees as intermediaries. Each of us always knows someone who is looking for a job, or who stays at home with plenty of free time. These are people who could be used to expand the sales network.

In the expanded networks of each employee, there is also an enormous amount of knowledge, services and / or products that can be useful to the organization community. For example, imagine an operations manager, married to a dentist, or the mother of the receptionist who makes cakes to sell, or the uncle of the driver who is a shoemaker. Imagining mechanisms to create a service network with people of these secondary and tertiary networks can be a way of spreading the brand and at the same time increasing employee engagement. Being part of an organization should be not only good for the employee, but also to his personal networks.

Kleinberg (14g) suggests that innovations often emerge from unexpected syntheses of multiple ideas. Put people together with different knowledge and free information flow and the results are likely to exceed expectations. Restrict your organization's intelligence to the small group at the strategic level and you will have resistance to change, gossip at all levels and employees who work because they have no choice.

In the learning economy, companies profit comes from their ability to turn knowledge into wealthy. People are not costs, nor resources: they are the raw material, the creative matrices and business partners. They create profit, therefore, must have a part of it.

There are basically two different ways an organization can be stimulated to change: through collective stimuli or through specific nodes or in small network regions stimuli. In the first case, the search for the collective intelligence emergence and in the second case social contagion is expected. So far, the market has favored the second alternative, but most of the time, the cascade effect is not achieved.

9. The entanglement rationality

Reason, according to the Portuguese dictionary Aurélio, is the ability that the human being has to evaluate, to judge, to ponder universal ideas; the ability that man has to establish logical relations, to know, to understand. Reason is, then, the means by which we interpret the world.

So far, human rationality has followed two basic postulates: there is a world out there independent of the observer, everything is disconnected and isolated.

Entanglement is antonym of isolation. The observer and the universe are inseparable. In the entanglement dynamics I, you and they become us. Any action that affects the closest nodes can grow and infect vast regions of the network impacting the environment.

The planet's resources are finite. All living places are occupied. There is nowhere to put people and the garbage produced by unbridled consumption. In big cities, there is no more space for cars. In the world we live in, violence and the asymmetric distribution of resources are synonymous. We are billions of humans living huddled. Conflicts are inevitable. Laws, most of the time, are useless and paradoxical. Killing is a crime but in war it is heroism. The crimes punishment is a function of the criminal wealthy. The jails are full of poor people.

Social Entanglement

The entanglement perception demands an inclusive and responsible rationality. Problems are not of others they are ours. What affects the other also affects me. The planet is ours and we are all responsible.

Every human being has all the human potential. A soldier trained for violence can show tenderness or someone very affectionate can become very aggressive, everything always depends on the relational context. The relationships define the individual characteristics that will emerge. The “us” draws the reality.

A new cycle begins in human society. Signs of profound changes are extensive. For the first time, the knowledge generated by humanity over the centuries is available to all. This is a time for new insights and bold choices. Ancient paradigms no longer work. There is a new world to create and new truths to uncover. Collectively, we are extremely intelligent. Perhaps this time we will learn from the past experience and with the new emerging perceptions.

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