Beyond the Decision-Making II: *Methodological Aspects*

Dante Roberto Salatino★

About the author

★Dante Roberto Salatino is a researcher of the Institute of Philosophy and of the Institute of Linguistics - Lecturer in the General Psychology Department - Faculty of Philosophy and Letters - Teacher and Researcher in Artificial Intelligence in the Mechatronics Career - Faculty of Engineering - National University of Cuyo - Email for correspondence: dantesalatino@gmail.com

ABSTRACT

The objective of this work is to show that the determinants of conduct and subjective behavior that govern research in Social Sciences, especially in Economics. Both the investigative process and the economy have at their base the same relational pattern that determines subjective reality. We used the method based on the Transcurssive Logic that is apt to investigate the subjective reality, of which the economy forms part. Individualistic methodological proposals and the one based on unification are adjusted. It constitutes a methodological contribution in Economics.

Keyword: Economics, Psychology, Methods, Social Sciences.

JEL Code: A12, B41

CITATION:

Salatino, D. R. (2017). "Beyond the Decisions-Making II: Methodological Aspects." *Inter. J. Res. Methodol. Soc. Sci.*, Vol., 3, No. 2: pp. 6–24. (Apr. – Jun. 2017); ISSN: 2415-0371.

1.0 INTRODUCTION

All attempts that scientists have made over time to control social phenomena have been limited by the constitutive complexity of human society. This complexity comes from conflicts that operate in it and the laws that govern its behavior. This situation was evident in the late s. XIX. (Sumner, 1883)

The appetite for power always has been part of mankind. It has conditioned even part of the research in the social science. Perhaps the Economy, as a social science, is one of the most affected since it has to do with the management of scarce resources and their distribution. No one can deny that this function, generally in charge by the government and the powerful companies is a determinant of power.

As we saw in an earlier paper (Salatino, 2017), the individual or social subject, that makes a community meaningful, is never taken into account. From time immemorial and after an unpleasant learning subject has been able to find a way to 'survive' biologically, psychically and socially, and

thus was molding their conduct in front of others. Increasingly, that imposed conduct has been nullifying their behavior and annihilating their beliefs.

If we take the economy as a cooperative game it has become a 'zero sum' game; that is, what others gain comes at the expense of common individual who, instead of being enabled to generate conduct based on genuine economic behavior, sunk into abandonment thus, becoming the 'forgotten man'. (Sumner, 1919, pp. 466)

The aim of this work is to show that both the process of scientific research applied to the economic phenomena and the economy itself as a science, including its rational and subjective approaches, as it happens with other branches of scientific knowledge (biology, physics, psychology, etc.), responds to a common relational pattern. This 'universal' pattern is the same as that proposed by the Transcurssive Logic (TL) (Salatino, 2017) to explain the importance of the subject in the determination, analysis and understanding of real facts.

2.0 LITERATURE REVIEW

It is done through the approach of the economic conduct from the subject (1) and the existence of patterns common among the different ways of seeing the economy (2).

2.1 Economic conduct from the subject

John Stuart Mill (1806-1873) English philosopher, politician and economist representing the classical economic school who theorized about utilitarianism and in his book *A system of logic* (1843-1889-1950) says, referring to the social phenomena derived from a psychological law: "Taking into account that they have no origin in other social facts and that no other circumstance can interfere , gave rise to have created a department of science called: Political Economy", making clear allusion to its subjective roots. In contrast, in the chapter devoted to the definition of economic policy, it says: “Economic Policy can be defined as the science of laws which regulate the production, distribution and consumption of wealth. Wealth is defined, as all material objects useful or agreeable to mankind, except such as can be obtained in indefinite without labor.” (*ibid*., p. 412)

Austrian school of economics: this line of economic thinking emphasizes that individuals do not act automatically and in response to a rational elaboration which requires a total knowledge of the ends and means. An individual acts as a consequence of cognitive processes that allow him to perceive, recognize patterns, learn and understand the social reality that will determine the means and ends appropriate to his subjectivity to face an economic decision. That is, an individual’s decisions will always be individual and subjective. Some of the outstanding figures of this school: Carl Menger (1840-1921) (Subjective value theory, Menger, 2007, p 114); Ludwig von Mises (1881-1973) (Praxeology: logical structure of human action, Mises, 1998, p. 30) Methodological individualism: all social phenomena, including economics, can be explained from individuals, their goals, their beliefs and their actions, Mises, *op. cit.,* p. 41); Friedrich August von Hayek (1899-1992): the methodological norms adopted by Hayek are a direct reflection of his perception of the subject. According to Hayek: "It is probably not an exaggeration if we say that any important advance in economic theory during the last hundred years was a further step in the constant application of subjectivism" (Hayek, 1955, p. 31)

William Graham Sumner (1840 – 1910), an American academic at Yale University. A polymath with numerous books and essays published on United States history, economic history, political theory, sociology and anthropology, whose essay, *The Forgotten Man* (1883) shows that politics had already been subverted by a series of 'measures of relief', that which are generally economic, and which, although they attract public attention, always go to the detriment of the common man. Sumner was a promoter of the free markets and defender of the anthropological approach of the economy.

2.2 Common patterns

Carl Gustav Hempel (1905-1997), a logical empiricist philosopher and epistemologist, who in his *Philosophy of Natural Science* states: "What scientific explanation, especially the theoretical ... is achieved by a systematic unification, by exhibiting the phenomena as manifestations of structures and common underlying structures and processes that conform to specific, testable, basic principles. If such an account can be given in terms that show certain analogies with familiar phenomena, then very well." (Hempel 1966: 83) (Metaphorical by analogy method (Salatino, 2009).

Milton Friedman (1912-2006) in one of the most influential works in economic methodology writes: "A fundamental hypothesis of science is that appearances are deceptive and that there is a way to looking at or interpreting or organizing evidence that will reveals superficially disconnected and diverse phenomena to be manifestations of a more fundamental and relatively simple structure." (Friedman, 1966, p. 33).

3.0 METHODOLOGY

Supported by the TL the method based on: (A) economic facts, because they belong to the social sciences, depend on the subjective reality and not on the objective reality that frames traditional natural science; (B) the basic elements that intervene in the definition of the fact or phenomenon analyzed must form a relational pattern; (C) the minimum pattern thus formed must form a group (See Appendix) to demonstrate the presence of symmetry (Salatino, 2016); That is, it must give evidence of the conservation and invariance of the fundamental laws governing the fact or phenomenon being studied; and (D) the ontological projection of the developed scheme emphasizes the presence of a common relational pattern (Salatino, 2012) which link together different real facts seemingly unrelated, such as economy with the determinants of conduct and human behavior, or mathematical models and reality.

4. FINDINGS & DISCUSSION

4.1 Scientific investigation

In the first half of the last century the science of economics, according to prevailing theories, had to be evaluated either by the accuracy of its predictions or by operationally significant theorems leading to an empirical verification. One of the central concepts, proposed by Samuelson, was that of 'revealed preference'. (Serrano, 2007). We must add that this last proposal ignores both the moral principles derived from ethics and, therefore, the character of the subject that select, as well as the subjectivity of the preference.

The second half of the last century was invaded by dynamic econometric models and methods that were based on non-experimental data. They were understood as a learning process where theoretical information was incorporated through mathematical models and the empirical information through statistical models. (García, 2007). Here, we invoke an 'information generating process' as the only representative of 'reality' and Bayesian inference that structures the learning of that reality.

One of the paradigms of economic thought of the twentieth century was the methodological individualism, in which a defined equilibrium is promoted in terms of a theory of perfect competition (Mas-Colell, 2007). It is a very particular 'individualist' view, since it deals with social reality as a 'collection of individuals', that is, where it is the group that defines what is an individual called 'consumer' or more generically 'agent', when in fact, as we will see, it is exactly upside down.

Game theory, the great contribution to economic methodology, began with the book *Theory of Games and Economic Behavior* of John von Neumann's and Oskar Morgenstern of 1944, reached its highest recognition with the Nobel Prize awarded to John Forbes Nash in 1994 by the discovery of necessary equilibria in theory, is based on decision making when there is an uncertainty associated with any of the alternatives. It is considered as one of the most important contributions to human thought since it can explain how cooperation arises in conflict situations. (Ferreira García,

2007) It is not a faithful representation of reality, but simply a simplification of the way of saying the relevant things.

Other methodological ventures, such as dynamic macroeconomics, experimental or behavioral economics, or the theory of evolutionary games (Diaz-Giménez, 2007; Brandts, 2007; Thomé, 2007), just to name a few of the most recent, leave aside the ethical and the ontological, while the epistemological is taken from Cognitive Psychology as is also the case with Neuroeconomics, or of the Darwinian and Neo-Darwinian theory of evolution used as metaphors devoid of content.

As we saw in a previous paper (Salatino, 2017), research in a social science as the economy must be approached: (i) from the ontological or through a set of elements whose existence can be known by a subject; that is, it belongs to its subjective reality; (ii) from the epistemological or from the nature of that knowledge or the beliefs that arise in the exchange with such reality; (iii) from the methodological point of view or through the procedure and the norms used to acquire, control and systematize this knowledge, including the strategies used; that is, a way of defining the behavior and conduct of an individual; and finally, (iv) from the ethical or starting from the set of psychic and affective qualities that form the character as an expression of a knowledge or experience and condition the behavior of each individual in his real world.

It is clear that research is not always about strictly objective questions, but especially in human and social sciences, we must take into account that observed and observer are the same subject. Therefore, it is imperative to take into account the conditioning factors that determine observation and observed.

In short, social research must be based on a simultaneous assessment of human behavior and conduct. To understand how these two elements are integrated, let us observe the following scheme of the subjective reality (Salatino, 2017).

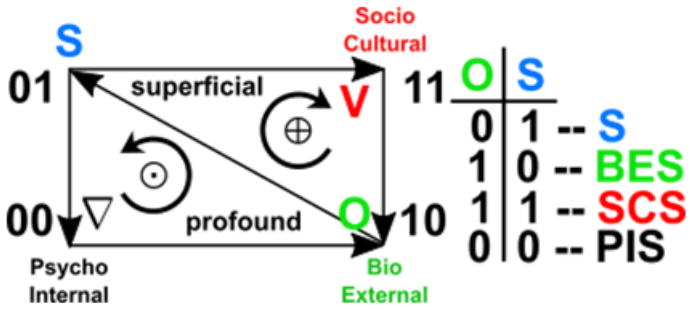
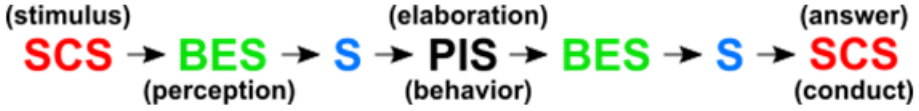


Figure 1. Subjective reality
S: subject – O: object – V: external transformation - ∇: internal transformation

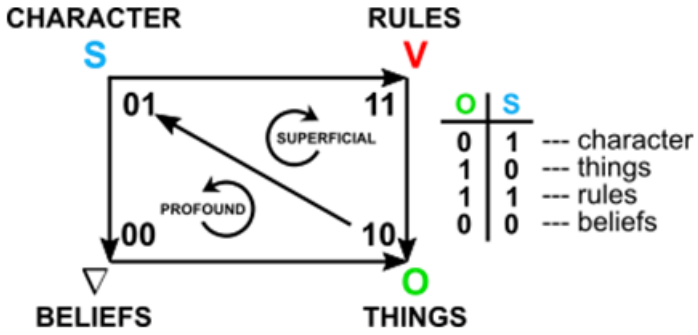
If we look at the previous figure, we can see the relations between the three real systems that make up the subjective reality, namely: socio-cultural system (SCS), bio-external system (BES) and psycho-internal system (PIS). Each of these systems is structured as PAU, which makes them absolutely homeomorphic. On the other hand, they also form a PAU. The real element unifying them is the subject (S).

The dynamic sequence in the previous scheme is as follows:



As can be appreciated, behavior is strictly individual and unconscious and strongly biologically rooted, whereas conduct becomes manifest exclusively when we relate to others. Both respond to the following fundamental elements.

Figure 2. Fundamental elements of behavior and conduct



Character refers to the peculiar and exclusive way of being of each subject that conditions the behavior, attitude, reactions, emotions. In short, the affections before any challenge that life proposes to an individual.

"Things" are everything that exist outside the psyche of the subject; that is, the immediate surroundings with what interacts which includes their own body. In other words, it includes everything that occupies the so-called 'subjective space' (Uexküll, 1934) from where the subject 'cuts' its surroundings to configure its 'surrounding world' (*Umwelt*) composed by the 'perceived world' (*Merkwelt*) and the 'world of action' (*Wirkwelt*).

The rules represent the norms to which the subject has to adjust their behavior, that is, the ways of acting in front of society or what is the same, the ways of elaborating their conduct, which are not the formal, prescriptive rules designed and imposed and applied by an exogenous authority through the administration of certain incentives. Social norms do not represent solutions achieved through coordination, but emerge when there is a conflict between individual interests and collective interests. (Bicchieri, 2006)

Beliefs embody 'truth' or what for the subject has 'sense' (or what is useful to survive biologically, psychically or socially) in the 'perceived world' and that, prior to adequacy with behavior in their psycho-internal system, can be projected as conduct in its 'world of action', that is, socially.

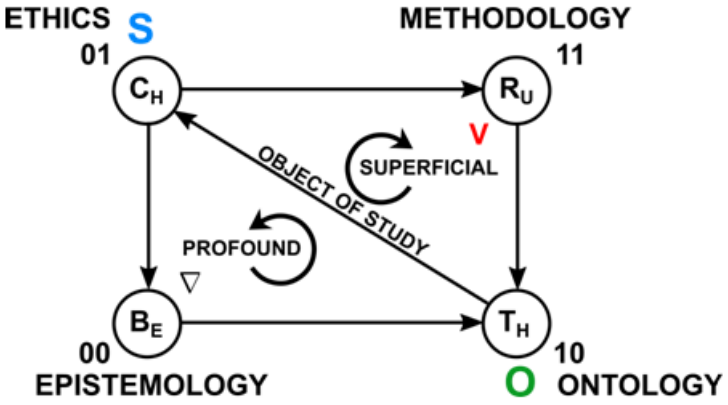
In the PAU to the conduct correspond the code **11**, that is, that of the rules because, like them, it is the final result of the assemblage between the character of a subject and the 'things' or 'objects' that they come from the outside, instead, the behavior corresponds to the code **00**, that of the beliefs, because the behavior is neither subjective nor objective but biological.

As in any science, the objective of the Economy is to study the real economic facts. Being consistent with what has been developed so far, we must define what is a real fact for the TL.

From our point of view, it is considered as a real fact the relations between a subject (S) and a object (O) generics by means of a double transformation: an evident one that connects subjective and objective aspects through a function and a hidden one that puts in relief the subjective structural aspect. These relations determine that the subject is the source of these transformations or changes and the object the destiny of them.

Going back to the initial approach, it may now be easier to understand the link between the different ways of approaching social research.

Figure 3. Forms of social research



C_H: character – T_H: things – R_U: rules – B_E: beliefs

Starting from a specific object of the study, any research should conform to the norms of the scientific method and apply them according to ethical principles and criteria; that is, to observe a conduct adapted to different social and cultural spheres. As antithesis, from a comprehensive perspective of truth based on science or justified belief, knowledge with a biological support determines a behavior that allows the cognitive projection (Salatino, 2014) on what the empirical shows, for its purification, explanation and justification or rejection if it turns out to be a derivative of dogma or reflection of everyday concerns and prejudices.

4.2 Economic models

The factual sciences, whose object of study are the real facts, require both observation and experimentation. In natural sciences, such as biology, physics or chemistry, this is basically ensured because it is easy to separate the observer from the observed; however in the social sciences, such as economics, for example, this is very difficult if not impossible, because such separation is infeasible.

One way of achieving a certain approximation to the scientific method as applied to the natural sciences, when trying to investigate economics, is to vary the point of view, or better, to adapt the real frame of reference.

Mathematical procedures were chosen, long ago, to analyze the phenomena of economic reality through its formal methodology, assigning the weight of the decisions to supposed rational agents.

This type of approach has at least two problems. On the one hand, they are considered unreal by the important distance that separates them from the facts that occur in the economic reality; on the other hand, when assigning the decision making to rational agents all their results are crossed by the rules that govern the logical thinking, whose main sustenance is a theory.

Every theory, necessarily represents an abstraction of the real world. Given the immense complexity that economic reality show in this case, in order to be able to analyze even though it is a small part of that reality, characterized perhaps by the appearance of a particular economic phenomenon, there is no known mechanism other than theorizing on the apparent relationships that show us the primary factors revealed as those that define the problem which will be the object of our study. Everyone is aware that this crude 'skeleton' or 'economic model', as it is called, is nothing more than a deliberate simplification for analytical purposes.

There is a variety of economic models, but here we will only address, by way of example, those dedicated to the static comparative analysis. (Chiang & Wainwright, 2005).

What is it that is compared in these models? The comparison is made between different states of equilibrium that are associated to different sets of parameters and external variables. This simple proposition is useful for modeling, for example, an isolated market, or the national income, or the ratio between total utility and marginal utility.

If in the evolution of the model there is an imbalance manifested as a change in the value of some of the parameters or external variables, the initial equilibrium must be updated, and therefore, the internal variables of the model will suffer a certain adjustment.

How is the process of comparison between a new state of equilibrium and the previous one? Ignoring what happens to the variables, the above is restricted to comparing the initial state of equilibrium (before the change) and the final state of equilibrium (after the change). But if we do not exclude the possibility of equilibrium instability, then it is clear that the problem under consideration is essentially different and should focus on the 'rate of change' which evaluates how quickly an internal variable changes relative to the change of a parameter or external variable to the system. It is at this point that the concept of derivative becomes important in the static comparison.

In general, one could consider the rate of change of one variable ***y*** in response to a change of another variable ***x***, and where both variables are related through a function.

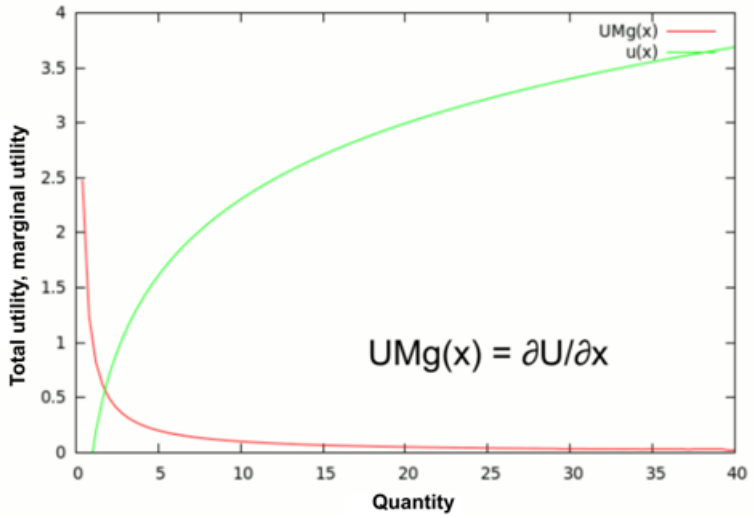
$$y = f(x) \qquad (1)$$

Applied to the context of the static comparison ***y*** represents the equilibrium value of an internal variable (dependent variable), while ***x*** represents some parameter or external variable (independent variable).

As an example, we will consider an element that is part of the microeconomic theory, specifically the theory of consumption and, within it, the demand or the relationship that links prices and quantities required by the consumer. (García, 2000, p.29).

To understand the above relationship, concepts of total utility and marginal utility are necessary, which are by no means synonymous. The price is explained through the utility that gives us the last unit consumed of a product. The total utility derives from the sum of the utilities provided by the successive units consumed, in contrast, the marginal utility is the utility that derives from additional unit consumed and that represents a decreasing value, unlike the total utility that is a value which grows logarithmically to a maximum point and then falls. Formally, marginal utility (**UMg (x)**) is the first derivative (or the partial derivative if we consider more than one product) of the total utility (**u (x)**).

Figure 4. Marginal and total utility



The mathematical procedure that relates a function to its derivatives is called differential equation. The method for solving these equations also responds, structurally, to PAU (Universal Autonomous Pattern), as shown below.

Of the numerical methods for solving differential equations, Euler's is one of the most imprecise. By including in the calculation an average of two next slopes remarkably adjusts the results, much closer to the real calculation obtained by the analytical method.

Recall that the method of Euler has the form:

New value (dependent variable) = Previous value + h x Slope (2)

where **h** = step (increase of the independent variable).

The enhanced Euler method, suitable for solving first-order differential equations with initial values, will have the form:

New value = Previous value + h x Average of slopes (3)

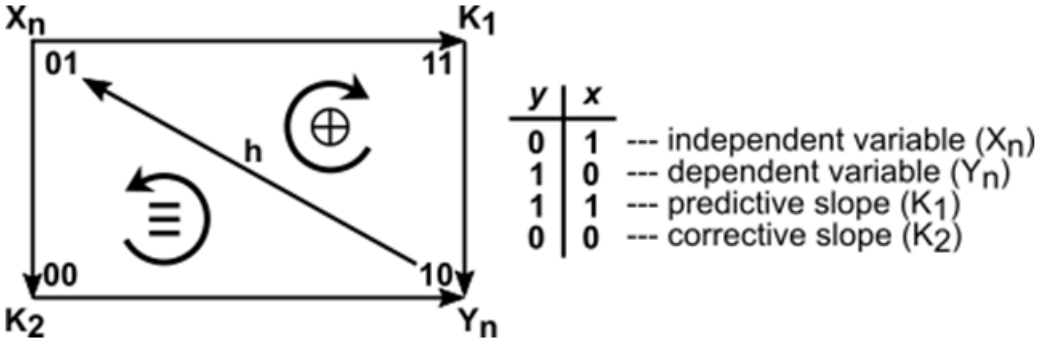


Figure 5.

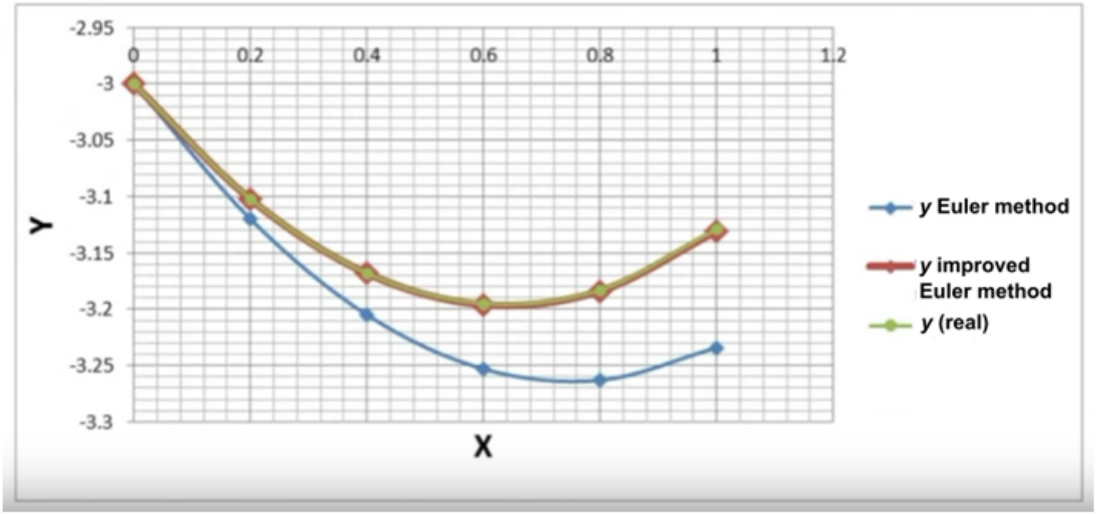
In **Figure 5**, we can see the elements that intervene in the application of the improved Euler method. The codes come from the attached attribute mapping table. ***Xn*** and ***Yn*** have no difficulty in assignment. As for the code of predictor slope (superficial) arises from the apparent relationship that binds directly the independent and dependent variables, transformation that we can call 'organization', since it comes from a structural relationship. On the other hand, the code of the corrective slope (profound) does not depend on a structure, but on a function in which the variables intervene, indirectly; we can call it 'disorganization and reorganization' due to greater complexity to the system achieves a greater approximation to the real value.

The result in K_1 is obtained by the evolution of the superficial level through applying **XOR** (⊕), while the result in K_2 is achieved by the evolution of the profound level through applying the opposite operation to that of composition, that is, the Equivalence (≡).

Both levels cycle in the opposite sense and do it simultaneously each time the independent variable is increased in **h**. Formal definitions follow:

$\mathbf{d_y/d_x = f(x,y)}$
$\mathbf{y(x_0) = y_0}$ **(Initial values)**
h = paso
$\mathbf{U_{n+1} = Y_{n+1}}$
$\mathbf{U_{n+1} = Y_n + h.f(X_n, Y_n) = Y_n + h.K_1}$
$\mathbf{X_{n+1} = X_n + h}$
$\mathbf{K_2 = f(X_{n+1}, U_{n+1})}$
$\mathbf{Y_{n+1} = Y_n + h.K}$
$\mathbf{K = (K_1 + K_2)/2}$
Prediction: $\mathbf{U_{n+1} = Y_n + h.f(X_n, Y_n)}$ (4)
Correction: $\mathbf{Y_{n+1} = Y_n + h.½(f(X_n, Y_n) + f(X_{n+1}, U_{n+1}))}$ (5)

Figure 6. Euler enhanced method



The previous figure shows the good approximation achieved with the Euler enhanced method to the real values.

In summary, the analysis the evolution of the PAU proposed by the Transcurssive Logic can explain and understand perfectly how this method of solving a mathematical problem works. This operation is as follows: from the initial values the first value of the curve is calculated after adding ***h***. This prediction (apparent or superficial estimate) has a gross error with respect to the correct real value. This 'difference' (error) is not dissipated, but accumulates. When the sum of the differences exceeds a predetermined threshold, the system goes to the deep level where a new calculation is made with the same ***h*** and the average between the two results is estimated (corrective calculation), projecting the final result, again, towards the superficial level to estimate the degree of coincidence with the real value, with which there may be a small disparity but that should always be much smaller than the error estimated in the first step, somewhat corroborated in the chart above.

According to what we have seen, we can say that this relational system (PAU) is able to demonstrate that the system obtained after evolving from an initial situation is more complex than the one from which we started, because it 'learned' to solve more adequately and properly a problem, as if it had 'adapted' *(sit venia verbo*) to the new demands of its surroundings.

All the previous development is not enough to justify that the economy, as a social science, is being approached 'scientifically', because here the participation of the subject is relegated to a mere equivalent, to comply with the forms, is established as real reference. Or presented in another way, utility is a subjective concept that can not be measured; maybe it can be simulated using utility functions that relate the value of utility (arbitrarily assigned) to the quantity consumed of certain goods or services.

4.3 Decision Making: Prisoner's Dilemma

A variant in the rationality hypothesis is 'Game Theory', an area of applied mathematics that uses models to study the interaction between formalized incentive structures (games). This development contradicts the fundamental idea suggested by Adam Smith: "Individual interest drives human beings towards the common good" (Smith, 2015), ensuring that individual interest, selfishness and rationality in making decisions, lead humans to a non-optimal situation.

Among the different types of possible 'games' we will only mention two: cooperative game, where two or more players do not compete, but collaborate to achieve the same objective by forming coalitions and therefore win or lose altogether, and the game does not cooperative in which players make decisions independently for their personal benefit, which does not prevent those decisions from favoring or harming all, as happens in cooperatives.

John Forbes Nash in 1950 presented in his doctoral thesis an analysis of a situation of equilibrium that occurred in non-cooperative games. There, he defined the concept of balance as follows:

> "An equilibrium point is [a set of strategies] such that each player ... maximizes their gain if the strategies of others are kept fixed. Thus, the strategy of each player is optimal compared to that of others." (Nash, 1950, p. 3).

A pair of strategies is in equilibrium only in the event that it is true that if these strategies are chosen by the players then none of them could achieve a better individual outcome by switching to another strategy. (Peterson, 2015, p.6)

What Nash proposes approximates the rationality to the subjectivity a little (Tohmé, 2011) taking into account not only the decision of the others but also the individual's decision. The equilibrium can be interpreted as a pair of expectations about the choice of each person such that when one of them reveals his choice, neither wants to change his conduct. In other words, it showed that decision-making is an interactive question where selfishness ('the intention to survive', in this case, socially), and that the best results for the group, At least in the short and medium term, although decisions are taken individually, are achieved when a very particular type of equilibrium is reached between pairs of opposing and simultaneous strategies.

Let us analyze the above through the example of the 'Prisoner's Dilemma', an expression coined by Albert W. Tucker in 1950 during a conference in which he discussed the work of his then postgraduate student John F. Nash. (Peterson, 2015).

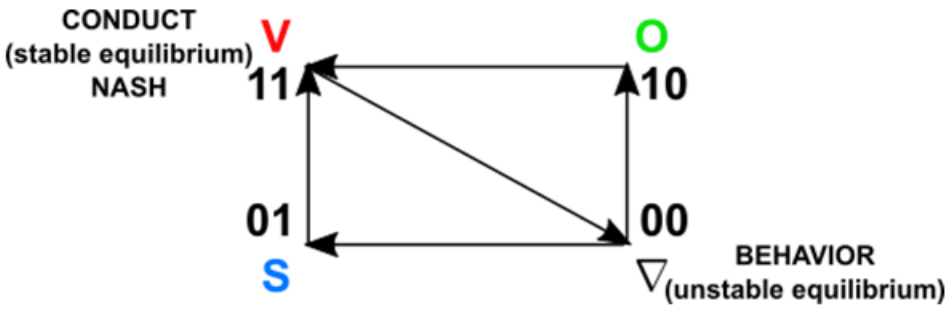
The TL focuses on the analysis of this intellectual puzzle, not as a simple mathematical model, but, as Peterson asserts, a type of situation frequently encountered in real life.

Considering this dilemma in the context of the subjective reality is expressed in estimating that the subgroups that constitute, the levels in reality represent each and in an alternative form, the subject with their behavior (**∇ = 00**) and their conduct (**V = 11**), in front of another subject that the TL considers as object. Throughout the evolution of the system and alternately, the 'object' will become 'subject' and vice versa.

Returning to the 'Prisoner's Dilemma' we can add that the 'game' alternatives are given until either of them breaks the 'Nash equilibrium' and loses the game.

Speaking of Nash equilibrium, it is important to realize that this form of analysis reveals the transfer of an unstable equilibrium or uncertainty (**00** given by the behavior of each player) to a stable equilibrium or certainty (**11** given by the conduct of each player) which is the Nash equilibrium (*See* Figure 7).

Figure 7. Conduct and behavior under Nash equilibrium

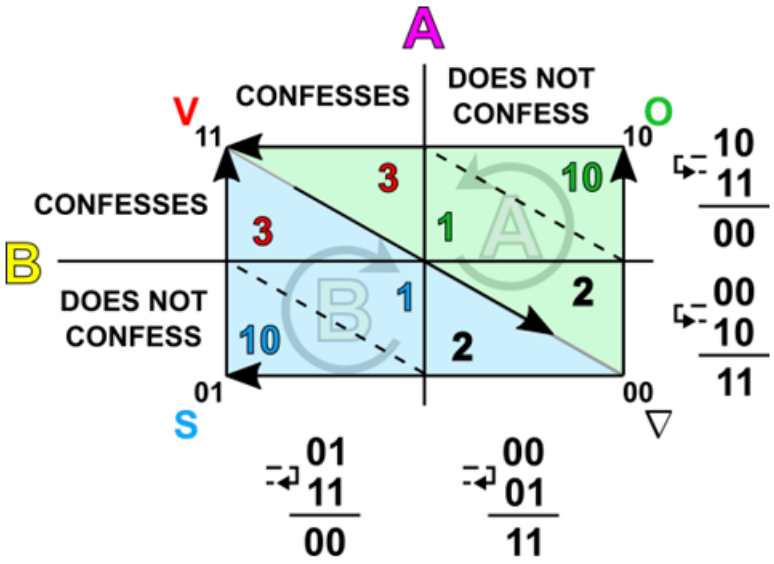


The transfer of a balance to the other is done through an intermediate step, that is the one that allows the decision to choose the best strategy. In short, we have demonstrated that decision-making is not, as gambling theorists assert, a rational question of an agent that becomes a maximizer of a given utility because its preferences obey a set of structural conditions, such as

completeness, transitivity , independence and continuity (Peterson, 2015, p.10), but an assemblage between the behavior and conduct of an individual.

In this example of the Prisoner's Dilemma, we will make the following fictitious proposal (Figure 8):

Figure 8. Two players game theory



A police, investigating a bank robbery, has detained two well-known criminals (A and B) for illegally carrying firearms. But as there is a suspicion that these people are responsible for the assault on the bank the previous week, his interrogation begins, and this is what is said to each one separately: for carrying an illegal weapon is a 2 year prison sentence, but as we are sure that you and your partner have robbed the bank last week, we need your confession. If you confess and your partner does not, you add only 1 year of jail, that is, you would get 3 years in total, and to your partner we will get another 10 years. Of course if you do not confess, but your partner will you are the one who will receive the 10 years, while your partner will receive only 3 years in prison.

In both cases and individually, they see the convenience of confessing and they do so, both of which will be sentenced to 3 years in prison.

What is the dynamics of the system reflected in Figure 8? We start from a situation of uncertainty given by a basic behavior, which is to stay as short as possible in jail. The problem is that not confessing on the part of both is an unstable equilibrium since the final result does not depend on the behavior of each other, but on the conduct of the other. This uncertainty and the possibility of reaching a new equilibrium are reflected in the binary operations between the codes that identify the four possible situations. (See Appendix)

These operations tell us that in the case of A if starting from a non-confession decides to persist in it and B confesses, his sentence would increase in 10 years; therefore he decides to confess, something similar happens with B. All of which leads to confluence in a new situation of equilibrium, now stable (where both confess) known as Nash equilibrium, where each player has opted for his best strategy and knows the strategy of the other, and where in addition, he will lose the game if he decides to change strategy again while the other player remains unchanged. The latter situation can occur in both A and B and this is shown by the remaining binary operations, which in both cases allow it to return to the initial unstable equilibrium state, loses the game one who returns to that equilibrium.

From what is shown through the example, it follows as a corollary that a decision making, is an assemblage between the individual behavior and the conduct that a subject shows according to the relationship he has with others, all of which can be weighted. That is, in spite of its mathematical approach, we see that it is possible to approach the fundamental subjective aspects

that give referential frame to the solution of a problem, something that is not usually considered in the habitual scientific method where math is used.

Without sharing the optimistic prediction of Siegfried (2006) when he believes that game theory could someday become the nexus that brings together all the pieces of the scientific puzzle, we must leave it as a precedent that the contribution of Nash can act as a catalyst in a useful way to understand individual behavior and social conduct, such as TL.

4.4 Economy

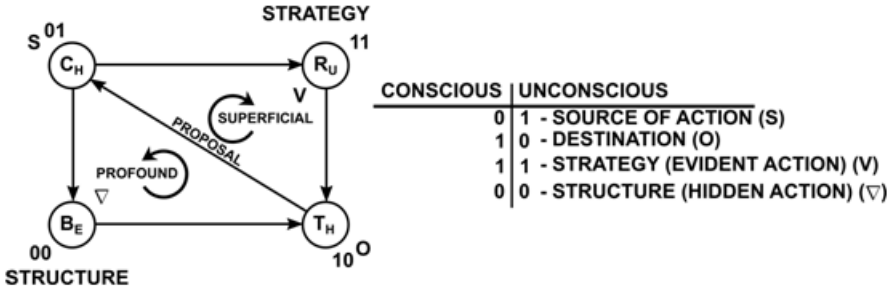
In life survival is the imperative need to be satisfied; in society the satisfaction of material needs (food, clothing, housing, etc.) and not material (education, health, leisure, etc.) is the determinant of that survival in society, which could be called 'acceptance' or 'recognition' by others.

The traditional definition tells us that economics studies both the basic behaviors of individual agents and global behaviors when they manage scarce resources to produce goods and services and distribute them among the individuals. (Mochón Morcillo & Becker, 2008, p.2)

According to Bicchieri (2006), the games that social norms solve are called games with multiple motives. Such mixed-motivation games are not co-ordination games (such as cooperative) at first, but social norms can transform games with mixed motives into co-ordination. This transformation, however, depends on each individual hoping that other people also follow the norm. If this expectation is violated, an individual will return to playing the original game and behaving "selfishly" (non-cooperative game) (Bicchieri, 2006, p.3).

In this work, we see economics as such rather as a game, but not as does the game theory of von Neumann and Morgenstern or Nash where the analysis is done from a language exclusively mathematical, but from the relational approach that proposes the TL between a structure and a function or between individual behavior and social conduct to explain the subjective need to choose, which is the backbone of the economy.

Figure 9. Framework of decision making



C_H: character – T_H: things – R_U: rules – B_E: beliefs

The above figure is intended to reflect a real framework for decision making something different from what was previously discussed. The variant is the fact of focusing the problem from the subject and not only what results from their interaction with others. In other words, making a decision here is much more selfish than in the case of non-cooperative games, since what is really at stake here is 'life' itself.

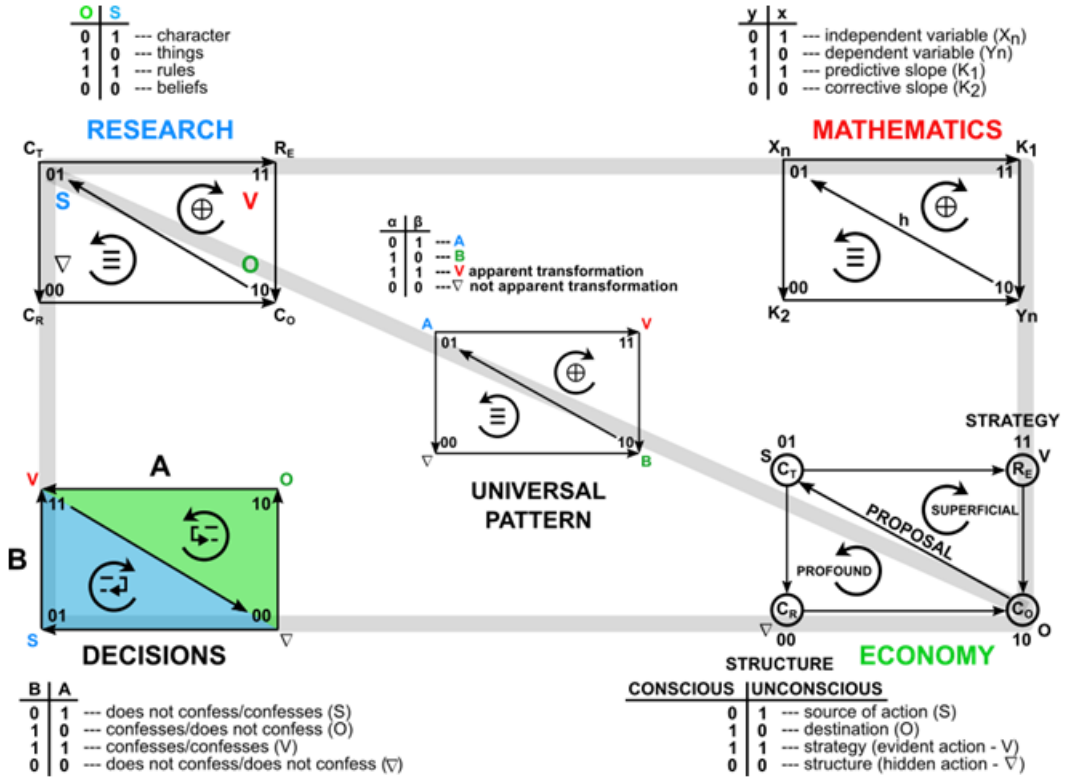
The illustration in Figure 9 may well represent a situation similar to that evidenced in a non-cooperative game between two players: a subject with his character and, therefore, with his ethics, and the environment with his things and his other individuals. There are two well-defined levels: the superficial or apparent level or that where the future of the players is settled according to a strategy chosen consciously and unconsciously by the subject according to certain rules that are the product of a conflict; and the profound level, where the rules of the game (structure) are proposed that depend on the individual beliefs and to which cannot access or modify neither of the players (the structural is neither conscious nor unconscious is biological).

A system (couple of players: the subject and its environment) represents a dynamic state of repose that accuses a certain organization (determines a specific behavior), a certain stable imbalance that promotes an exchange that is projected as evident action (a conduct adjusted to norms or rules). The irruption of a proposal or challenge by the environment the equivalent of the 'stimulus' specified in a previous point that causes a deviation in that subject (S) that perceives. This forces the subject to submit that previous 'organization' to the rules of the game. Those general rules that define the generative structure of their behavior before the situation, as something disorganized that the profound structure reorganizes. Elaborating either a defense that is arrived at as an adaptive response to the environment (O), or as a change of level of complexity. It is now possible, by means of strategy, to respond with an attack, which causes that the environment to become the 'subject' that receives a challenge and to repeat the alternatives of the game until one of the two does not adapt and 'die', that is, lose the game or come to an agreement and is terminated.

5. CONCLUSION

We have tried to approx repeat, the sequence that would follow an investigator that proposes to study social phenomena like those that occur in the economy, but raised from the subject's perspective. We can see in the diagram (Figure 10) that from the methodological approach and the use of tools such as mathematical models, to the application of theories that consider the behavior of others and the relationships with individual behavior, have in their basis a common relational structure. To this disposal, we could equate it with a kind of 'universal pattern', since it encompasses the different strata that define this universe of study (Salatino, 2009), which also contains a similar provision among its components. This type of structure behaves in much the same way as a fractal does in that the same structure is repeated at different scales, and its deepening or superficialization allows to study or analyze the dynamic relational structure of different real facts that apparently are not related, as in this case
the economy with the determinants of conduct and human behavior.

Figure 10. Universal pattern



REFERENCES

Bicchieri, C. (2006). *The Grammar of Society – The Nature and Dynamics of Social Norms* – New York, Cambridge University Press.

Brandts, J. (2007). *La economía experimental y la economía del comportamiento* - En "Sobre la Economía y sus métodos" – Editor: Juan Carlos García-Bermejo – Madrid, Editorial Trotta.

Chiang, A. C.; Wainwright, K. (2005). *Fundamental Methods of Mathematical Economics*. New York, McGraw-Hill/Irwin.

Díaz-Giménez, J. (2007), *Modelos y métodos en la macroeconomía dinámica* - En "Sobre la Economía y sus métodos" – Editor: Juan Carlos García-Bermejo – Madrid, Editorial Trotta.

Ferreira García, J. L. (2007). *La teoría de los juegos, sus aplicaciones* - En "Sobre la Economía y sus métodos" – Editor: Juan Carlos García-Bermejo – Madrid, Editorial Trotta.

Friedman, M. (1966).*Essay in Positive Economics*. Chicago, The University of Chicago Press.

García, H. S. (2007). *Modelos y métodos econométricos dinámicos* - En "Sobre la Economía y sus métodos" – Editor: Juan Carlos García-Bermejo – Madrid, Editorial Trotta.

García, V. F. (2000). *Para entender la economía política (y la política económica)*. México, Centro de Estudios Monetarios Latinoamericanos.

González, W. J. (2012). *Scientific Realism and Democratic Society. The Philosophy of Philip Kitcher*. Leiden, Rodopi.

Hayek, F. A. (1955). *The Counter-Revolution of Science. Studies on the Abuse of Reason* – London, The Free Press of Glencoe, Collier-Macmillan Limited.

Hayek, F. A. (1958). *Individualism and Economic Order* – Chicago, Illinois, The University of Chicago Press.

Hempel, C. G. (1966). *Philosophy of Natural Science* – New Jersey, Prentice Hall, Inc.

Mas-Colell, A. (2007). *La teoría del equilibrio general.* En "Sobre la Economía y sus métodos" – Editor: Juan Carlos García-Bermejo – Madrid, Editorial Trotta.

Menger, C. (1871-2007). *Principles of Economics* – Alabama, Ludwig von Mises Institute.

Mill, J. S. (1889). *System of Logic. Ratiocinative and Inductive. Being a connected view of the principles of evidence and the methods of scientific investigation* – London, Longmans, Green, and Co.

Mises, L. von (1949-1998). *Human Action. A Treatise on Economics* – Alabama, The Ludwig von Mises Institute.

Mochón Morcillo, F; Beker, V. A. (2008). *Economía Principios y Aplicaciones* – México, McGraw-Hill Interamericana.

Nagel, E. (1950). *John Stuart Mill's Philosophy of Scientific Method* – New York, Hafner Publishing Company.

Nash, J. F. (1950). *Non cooperative games* – Tesis Doctoral – Universidad de Princeton.

Peterson, M. (2015). *The Prisoner's Dilemma* – Cambridge, Cambridge University Press.

Salatino, D. R. (2009). *Semiótica de los sistemas reales* – Tesis Doctoral en Letras especialidad Psicolingüística por la Facultad de Filosofía y Letras de la Universidad Nacional de Cuyo, Mendoza, Argentina – Director: Dra. Liliana Cubo de Severino.

Salatino, D. R. (2012). *Aspectos psico-bio-socioculturales del lenguaje natural humano. Introducción a la teoría psíquica del lenguaje* – Mendoza – Argentina, Autoedición – ISBN: 978-987-33-2379-9.

Salatino, D. R. (2014). *PSYCHE – Structure and* Function – Mendoza – Argentina, Desktop Publishing – ISBN: 978-987-33-5702-2.

Salatino, D. R. (2015). *La verdadera historia de la Lógica Transcursiva*. (Vol. 3) – Mendoza – Argentina, Autoedición – ISBN: 978-987-33-6655-0.

Salatino, D. R. (2016). *La importancia de la simetría*. En Educación en Ciencias Empíricas en Facultades de Ingeniería. (ECEFI 2016), pp. 1-29. Ed. Cuadrado, G.; Gómez, L. – Mendoza, Argentina, Facultad Regional Mendoza –Universidad Tecnológica Nacional. (In press).

Salatino, D. R. (2017). *Beyond the decisions-making: The psychic determinants of conduct and economic behavior*. Inter. J. Res. Methodol. Soc. Sci., Vol. 3, Nº 1: pp. 6-26 (Jan. – Mar. 2017); ISSN: 2415-0371.

Samuelson, P. A. (1965). *Foundations of Economic Analysis* – New York, Atheneum.

Schmoller, G. von (1901) *Grundriß der Allgemeinen Volkswirtschaftslehre* – Leipzig, Duncker & Humblot

Serrano, D. T. (2007). *Los economistas como metodólogos* – En "Sobre la Economía y sus métodos" – Editor: Juan Carlos García-Bermejo – Madrid, Editorial Trotta.

Siegfried, T. (2006). *A Beautiful Math. John Nash, Game Theory and the Modern Quest for a Code of Nature*. Washington, Joseph Henry Press.

Smith, A. (2015 -1776) *La riqueza de las naciones* – Edición ePub libre de Carlos Rodríguez Braum.

Sum, N-L; Jessop, B. (2013). *Towards a Cultural Political Economy. Putting Culture in its Place in Political Economy*. Cheltenham – UK, Edward Elgar.

Sumner, W. G. (1919 – 1883). *The Forgotten Man* – In "The Forgotten Man and Other Essays", pp. 465 - 495 – Ed. Keller, A. G. – New Haven, Yale University Press.

Tohmé, F. (2007). *Evolución y teoría económica* - En "Sobre la Economía y sus métodos" – Editor: Juan Carlos García-Bermejo – Madrid, Editorial Trotta.

Tohmé, F. (2011). *Consideraciones epistémicas en juegos: nociones de solución y conocimiento*. En: "Consideraciones Epistémicas en Juegos: Nociones de Solución y Conocimiento" – Serie Progresos en Economía – Asociación Argentina de Economía Política pp. 87-99 – Compiladores: Arozamena, L.; Weinschelbaum, F. – Buenos Aires, Temas Grupo Editorial SRL.

Uexküll, J. von (1934). *Streifzüge durch die Umwelten von Tieren und Menschen: Ein Bilderbuch unsichtbarer Welten*. Berlin, J. Springer.

Von Neumann, J; Morgenstern, O. (1944). *Theory of Games and Economic Behavior* – Princeton, Princeton University Press.

APPENDIX

Groups and symmetry in Transcursive Logic

The notion of group is unfailingly associated with the concept of structure. In fact, the oldest structure known and studied is the group that was discovered by Galois in 1832.

A group, according to the modern definition (Salatino, 2015, p. 122), must show a series of properties to be considered. To certify such properties, we will take as a guide a generic group. We see in Figure A_1 different ways of representing this type of group according to what we want to emphasize in its structure.

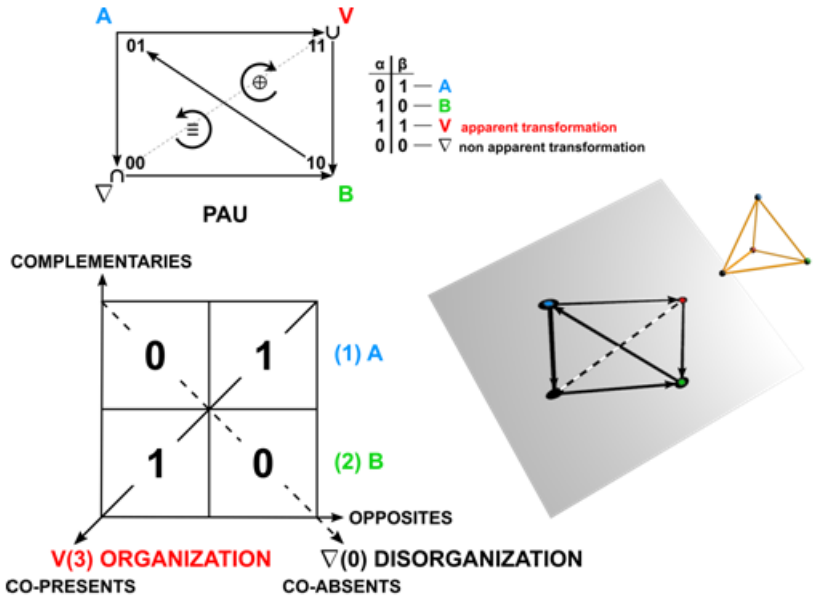


Figure A1. Group representation

The structure of this type of group consists of two opposing static elements (A, B) and two dynamic elements arranged in opposition (V, ∇). Each alternately occupies each of the four vertices of a rectangular parallelogram. All elements have a binary code that identifies them and that arises from a table of assignments with at least two basic attributes (α, β).

The static elements besides opposing are complementary and concurrent (simultaneous). Of the dynamic elements, one of them (V) has the function of "transformer link", in apparent form, between both static elements. From the logical point of view behaves as a disjunction and its code corresponds to the co-presence of both attributes, which is equivalent to the union of the elements by their differences, so we will also know as 'organization' and is represented by the composition operation that governs the superficial level of this structure: XOR (⊕).

The other dynamic element (∇) represents a 'hidden transformation' whose function is to break the previous ligature, which will enable the future evolution of the system. It behaves as a logical conjunction and its code arises from the co-absence of attributes, which amounts to a separation of elements by similarities; also known as 'disorganization' and is represented by an operation opposite to the composition operation of group: Equivalence (≡) that disorganizes and subsequently reorganizes the profound or hidden level of this structure.

The geometric projection of the tetrahedron in the figure is only to emphasize that the two levels that form this structure and its temporal evolution in the opposite sense represent, in reality, the 'shadow' of a topological arrangement of the elements of the group in a superior dimension.

GROUP PROPERTIES

Having done the elementary definitions, we will analyze if this arrangement we have proposed (PAU) complies with the basic properties of a true group.

Closure: For a set of elements to be closed under a certain transformation, the response to its application to any possible combination of its elements must be the production of an element belonging to the set. In order to demonstrate the above, it is essential that we identify more precisely the applied transformation. Every group must have a 'composition operation', which represents the transformation that must be applied in order for the group to evolve in an evident way; that is, to cycle through the different constituent elements (static and dynamic), in any sense until the element from which it departed and thus demonstrate the presence of symmetry (see below). The presence of cycles is only admissible if in response to the application of the transformation we obtain the subsequent element.

In our case, the apparent transformation will be XOR or exclusive disjunction, a logical Boolean operation that allows us to work with the binary codes of the elements. Figure A_1 is represented by a logical sum and tells us that is taken into account of the simultaneous presence (co-presence) of the attributes that distinguish each element, (Figure A_2).

Exclusive disjunction (A⊕B: is read A unless B): It is true (1) only when one of its disjunctives is true (1) and the other is false (0). When their values are equal, the exclusive disjunction is false (0).

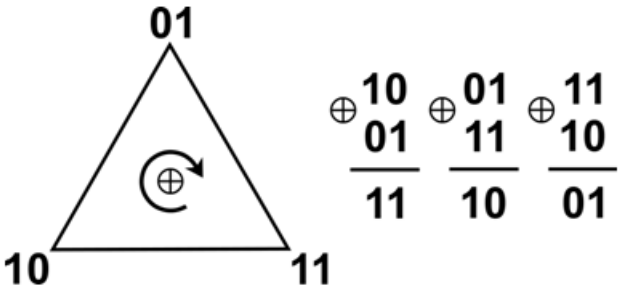


Figure A2.

It can be observed in the previous figure the dextro-rotatory cycle (Dx) or in the sense of the needles of the clock, that causes the continuous application of a transformation, checking itself thus two things: first, the property of closure of the set, since always, in response to the application of the transformation we obtain an element of the set, and secondly, the symmetry of the set as a system, since after applying the successive transformations we arrive at the same element from where it was depart. Something equivalent to the above would be to say that the equilateral triangle has undergone three successive rotations of 120º, whereupon the system returns to its initial state.

Identity property: There must be an element of the set such that by affecting by a transformation to another element of the same set, do not modify it. (Figure A_3).

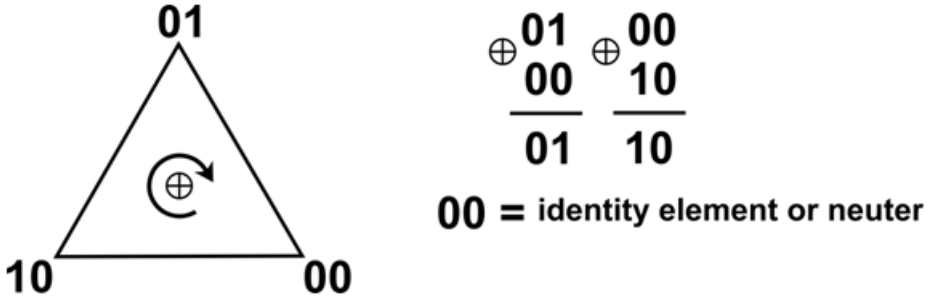


Figure A3.

Inverse property: all the elements of the set must have their inverse, such that the composition between them give as answer the neutral element. For this to be effective, an operation

opposite to that of composition is needed. This operation is the Equivalence (≡) or double implication where a proposition is true (1) only in the case where both components have the same truth value. If their values are different from each other, then it is false (0) (Figure A_4).

$$\underline{(01 \oplus 10)} \equiv \underline{(01 \equiv 10)}$$
$$11 \quad \equiv \quad 00 \quad = 00$$

Figure A4.

Associative property: all the compositions achieved by a given transformation are independent of their grouping. (Figure A_5).

$$\underline{(01 \oplus 10)} \oplus 11 = 01 \oplus \underline{(10 \oplus 11)}$$
$$\underline{11 \quad \oplus 11} = \underline{01 \oplus \quad 01}$$
$$00 \quad = \quad 00$$

Figure A5.

If a set satisfies the properties of closure, identity, inverse and associative, it is said that this set constitutes a group.

The set presented here (PAU) complies with the previous properties and this allows it to evidence a symmetry by rotation. But in addition, it must comply with another property that we could call the closure of the conjugate.

Closing the conjugate: if we look closely at Figure A_2 we will see that the closure is partially fulfilled because the neutral element or identity (00) never appears in response to the successive transformations. This has an explanation. (Figure A_6)

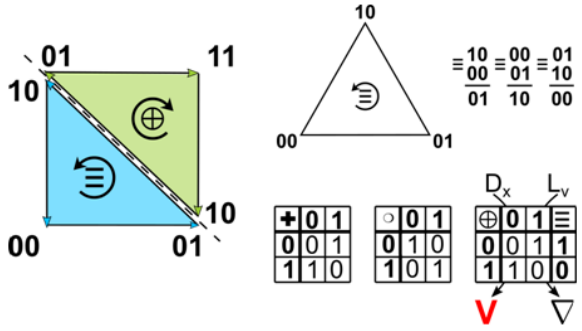


Figure A6.

If we analyze the previous figure, we can see that our supposed group is really it and its reflection through a flat mirror (- - - -). The elements arranged at the vertices of the reflected triangle (blue) constitute a group that can respond in a closed manner to the continuous application of a transformation. Unlike the original group, here the non-apparent (or hidden, if it fits) transformation is the Equivalence (≡), which as we have already said is the opposite operation to XOR.

The evolution shown in Figure A_6, where the neutral element (00) appears as an answer, makes it clear that this 'mirrored' group also observes a rotational symmetry since, after three turns of 120 °, it returns to its initial position, although rotating in reverse direction to the original group; that is, in the left-hand (Lv) or anti-clockwise sense.

If we speak of complex or hypercomplex numbers, we could say that the set we are analyzing represents a group and its conjugate or reflex. We recall that the conjugate of a complex number is another complex number that is obtained by symmetry with respect to the real axis, that is, changing sign or denying its argument or imaginary part. In our example, the sense of rotation is also included.

In the same figure, finally, we can review the basic tables of the minimal finite bodies that represent the two levels of our group: a superficial level whose internal operation is the logical sum (+) and the apparent transformation is XOR; and a hidden or profound level whose internal operation is the logical product (○) and its transformation the Equivalence (≡ which in reality is an exclusive AND, better known as XNOR). The third table represents the generalized correspondence between these finite bodies and the group that is called the *Galois Connection* (an opposition mediated by another opposition) and where both levels are integrated and where the product of rotation Dx certifies the closure of the superficial level generated by the apparent transformation, whereas the product of rotation Lv does the same in the profound level by means of the hidden transformation.

In summary, we have verified the existence of symmetry both rotational and reflection of the group formed by the essential aspects of a problem, which meets the requirements set out in the methodology.

Other composition operations

Both XOR (⊕) and Equivalence (≡) are applicable when we must specify the dynamics of a structural PAU, which is where its two levels represent a single system that must interact with its environment.

A different case is the functional PAU or those where each subgroup (level) of the system represents a different subject that must interact with the one near to it, but to which it is not subordinate (that is, neither is an *ad later* of the other, both are independent)

The type of composition operation to be used in functional PAUs is what we have called 'hybrids'. Let's see what this is. (Figure A_7)

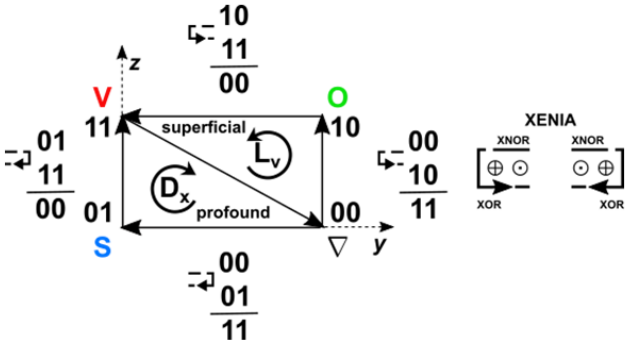


Figure A7.

What do the symbols mean: ⇂ ⇁?

They represent the hybridization between XOR and XNOR (or equivalence). This means that both operations are applied partially to each column. The ⊕ is applied on the spin side, that is, in the right column in the Dx spin and in the left column in the Lv spin. Anyway, the arrow of the symbol indicates the same thing; that is, it is enough to apply one or the other to the elements involved in each turn: 00, 01 and 11 in the Dx spin and 00, 10 and 11 in the Lv.

To this symbol we will know as XENIA: X because both operations are exclusive (XOR = exclusive OR, XNOR = exclusive AND) and ENIA (of Irish): what unites two people (levels) to face the demands of their environment and the elements what's up in it.