

II. Description of the model

A. *Social context*

Given the present global context, where the institutional frameworks for dealing with contemporary global challenges do not match the scope, scale and nature of the challenges themselves; the central challenge of the 21st century is to create a model that is able to effectively address the most pressing risks that threaten the existence of humanity.

The medium and long-term forecasts for the evolution of mankind are pessimistic - it is said that we have entered a period of involution on all levels that will lead to a total resource depletion, demographic imbalance, environmental disasters etc. In their last report (2017), the World Economic Forum highlights a series of imminent interconnected crises: extreme weather events, food crises, natural disasters, biodiversity loss and ecosystem collapse, man-made environmental disasters, failure of regional or global governance, large scale involuntary migration, profound social instability, unemployment or underemployment, fiscal crises, interstate conflicts, cyber-attacks, illicit trade, state collapse or crisis, etc [3]. Due to this exponential increase in the likelihood of a global catastrophe, the physicist Stephen Hawking stated that the human species has only 100 years to populate another planet to ensure its survival [4]. Also, from other authors' point of view [5], a pandemic was evaluated as the event with the highest probability (7.5 out of 10) that would eventually lead to our extinction. This threat is highlighted by the rise of antibiotic-resistant microbes and the Ebola outbreak that started in 2014 in West Africa [6].

Without negating these conclusions, at a closer causal analysis, we can find two main approaches that led to this very dangerous situation. Firstly, the use of the short-term thinking and reductionist thinking models (the process of omitting important dimensions that shape a model) that generated the current global context. Thus, certain dimensions such as: the spiritual and evolutive nature of human beings, the connection between socio-economic context and cultural development, the impact of technology over the natural environment and resource depletion, were not taken into account. Secondly, the methods of evaluating economic reality were based mainly on quantitative indicators (i.e. GDP), therefore the transition from the quantitative to the qualitative approach is one of the most important prerequisites for solving the current crises, and for preventing any future ones.

Due to the **inter-connected** nature of the threats [3,7], **dysfunctional** global institutions [8] and the necessity of a **shared responsibility** [9], this model proposes the framework that will allow the development of **forms of global cooperation with increased effectiveness** based on **professional networks**. This approach based on qualitative mathematical models will be detailed in section D.

B. *Scientific context*

Beginning with the 20th century, the paradigm of a Universe governed by mechanical laws, along with the reductionist philosophy of thinking became obsolete due to the new scientific approaches [10]. Thus, concepts inspired from different scientific areas (biology, physics, chemistry, cosmology or mathematics) have disseminated into the socio-economic field, becoming trans-disciplinary theories. Below, we present some of these theories that paved the ground for the model's vision:

- **Fractals' theory and chaos theory** – Fractals are complex patterns with the property of self-similarity across different scales. They have the ability to build special shapes that reproduce different natural patterns [11]. These concepts also apply to markets, being a non-linear dynamic system, able to predict reversals among larger, more chaotic price movements. [12,13].
- **Network theory** - Network theory, as a part of graph theory, has applications in many disciplines including statistical physics, particle physics, computer science, electrical engineering, biology, climatology and also economics, finance, and sociology. Social network analysis examines the structure of relationships between social entities. These entities are often persons, but may also be groups, organizations, nation states. [14,15]
- **Generative grammars** - In the theory proposed by Noam Chomsky, grammars are called "generative" because they possess the mathematical capability of generating an infinite set of sentences from a finite lexicon and a finite set of rules. The property of “generativity” also became applicable in organizational theories, because it suggests the possibility of predicting new organizational processes and forms based on a given set of constraints, or changes in a set of constraints [16].
- **Universal patterns and symmetries:** In some theories the universe is seen as a system of symmetries and patterns interactions. Symmetries can be found in structures at different levels of complexity: an elementary particle, an atom, a molecule, a crystal, a plant, an animal, the Earth, the Solar System, our galaxy or the whole Universe. Therefore, symmetries that create universal patterns can be used to model any phenomena, including DNA [17] or socio-economic dynamics [18].
- **Gaia theory** –This hypothesis, formulated by Lynn Margulis and James Lovelock, proposes a vision where Earth is seen as a synergistic self-regulating complex system. Also, at the social level, different functions can be identified - functions that need to be transferred from the biological organism to the social organism - and also the dimensions required in order to obtain a well balanced “cultural organism” [19].
- **Organic codes and information processing** – There are many codes in nature, such as the genetic code, splicing codes in eukaryotes, adhesion codes in multi-cellular organisms, pattern codes in animals, but there are also cultural/linguistic codes. The existence of different codes on different layers of complexity allows specific information to be processed by the structures that have the ability to recognize them [20].

- **Autopoietic social systems**-The concept was originally developed by the two biologists Maturana H and Varela F, then Luhmann transferred it to social systems [21]. Autopoietic systems are systems that reproduce themselves from within themselves, as, for example, a plant that reproduces its own cells with its own cells. Luhmann argued that the basic idea of autopoiesis can be applied not only to biological but also to a large number of non-biological systems: social systems such as societies, organizations and the interactions between them [22].
- **Open systems and dissipative structures** - The open systems theory, (a system that exchanges feedbacks with its external environment) initially developed by Ludwig von Bertalanffy [23], was also transferred to the social sciences, as a process that exchanges matter/materials, energy, people, capital and information with its environment. Later, the Nobel Prize winner, Ilya Prigogine, stated that, due to the fact that all processes in nature are open systems, different patterns will self-organize in far-from-equilibrium dissipative structures. The concept of dissipative structures is also important for economics, because it makes it possible to have new idea on how economic systems work [24].

C. Goals and objectives

C1. Our goal in this project is to create the framework needed in order to obtain a sustainable Humanity, following the rules of organic development.

C2. The main objective is to create a computational model able to:

- characterise in a multidimensional and non-linear way the inter-related crises of humanity based on a hexavalent logic and multiple inter-related networks.
- to give the potential solutions that are applicable in different contexts, through the different types of functional networks (re-active, pro-active, executive, collaborative, supervising and innovative).
- to shape the frameworks of functional global cooperation, through the professional network.

D. The basic concepts of the model

Fractal manifolds [25] is the mathematical domain which has constituted the technical basis of this model. The basic concepts of the model consist in:

DI. Nodes and vectors, which assemble into hexagonal structures

- The nodes contain concepts and can be seen as nouns [26,27]
- The vectors contain processes/transformations by which the information passes from one node to the other. The vectors can be seen as verbs [26,27]

- The content of the nodes and vectors will be placed/defined by experts in the respective fields, with respect to the "generative law", which will be detailed below.

D2. Hexagonal structures, which assemble into networks.

D2.1. The hexagonal structures are based on a hexa-valent logic. Most of the thinking models that have been used until now were based on binary logic: true-false, ugly-beautiful, correct-incorrect, etc., but this approach has a limited ability of evaluation and decision-making.

D2.2. The hexagonal structures have two types of internal organisation given by the directions of the vectors:

1. Cycles: the vectors from the starting node will end in the same node; Ex: $A \rightarrow B \rightarrow C \rightarrow A$
2. Commutative diagrams: the vectors starting from node A and ending in node B give the same results in compositions; Ex: $A \rightarrow B$, $A \rightarrow C$, $C \rightarrow B$

D2.3. These two types of organisation lead to important abilities at this level:

1. Cycles represent debating circuits. Every node from the circuit receives, synthesizes and processes the information, and then sends it to the next node.

The use of cycles allows an approach from different perspectives, creating the context in which different actors (organisations, institutions, leaders) contribute to, and optimize the decision-making process.

2. Commutative diagrams ensure the accumulation and the validation of information. They also help in finding alternatives to get from one node to another through specific paths.

The use of commutative diagrams allows the accumulation of information and the development of informational clusters related to specific concepts (aggregate databases).

D3. Networks, used as informational maps.

D3.1. Depending on the hexagonal organization, there are two main types of networks:

1. Adjacent hexagons, that are connected through nodes.

This type of organisation ensures the communication and the circulation of information (passing from one node to the other), for example inter-institutional or human collaboration.

2. adjacent hexagons, that are connected through sides

This type of organisation ensures the coherence and the optimisation of the efforts needed in order to accomplish different tasks.

D3.2. Networks description

Depending on the type of hexagonal organisation there are eight types of networks with their own specific functions. The function of each network represents a universal pattern of organic development that takes place in nature.

1. Network 1 is administrative-governmental type, which represents the functional characterisation of administrative institutions and the relationships between them.
2. Network 2 is communication type, through which information circulates between institutions (nervous-system like).
3. Network 3 is re-active type, where the reactions to different types of crises are highlighted.
4. Network 4 is pro-active type, where the measures to be taken in order to prevent crises are highlighted.
5. Network 5 is collaborative type, where the abilities needed in order to collaborate for solving various crises are highlighted.
6. Network 6 is executive type, where the specialized “actors” that can take action in order to solve crises are highlighted.
7. Network 7 is supervision type, where the balancing mechanisms that need to be maintained between society and nature, and also the impact analysis of different decisions or actions are highlighted.
8. Network 8 is innovative type and it focuses on finding solutions to any kind of problems.

D3.3. Network general features

1. The networks structure is fractal, meaning that the structures from one level of complexity are found in superior levels within similar but not identical structures. This property allows the observation/characterisation of phenomena at different levels of complexity. By analogy, it's a kind of microscope that lets you highlight the structure by zooming in or zooming out.
2. The fractal character of the networks is of particular importance because it allows a very accurate assessment of the current situation both globally and at the level of small communities. Moreover, due to their functional roles, the networks will also highlight the possible inter-connected solutions and the type of necessary institutions that need to collaborate in order to accomplish them.

3. They are able to centralise the information, to validate it through the triangulation mechanism, to offer the possibility of finding correlations inside different functional clusters.
4. Within the networks, functional roads and cycles can be described. This gives the model the possibility to support the decision making process through the mechanism of passing information through consecutive nodes and revealing possible solutions.
5. The existence of the 8 types of functional networks provides a coherent model of management and collaboration with the possibility of achieving both sustainable governmental structures, and of identifying, adapting and developing solutions for solving existing crises and preventing those that can be generated from them.
6. The first five networks and the connection points between them can be visualised in the additional material provided.

D4. The principles on which the model was designed will be presented below

1. The principles of generative laws:

- In any network, any two points forming a triangle have to generate the third; also any two lines forming a triangle have to generate the third.
- Depending on the context, two nodes generate more than one node, with different contents, but belonging to the same semantic cone

2. Fractalisation of information:

- Through fractalisation we understand the mechanism of generating new structures. The newly generated structures will preserve properties from the previous level but will also generate new properties that are specific to the new level of complexity.

3. Directioning of informational flow to specific clusters/nodes

- It is given by the non-contradictory directions of vectors. They follow certain specific paths, allowing the passage of the informational flow through different nodes. This step by step processing ensures the mechanism of problem solving due to the fact that there is a communication between any two points of the network.

4. Node specific processing

- Every node in the network bears a principle, and the information processing mechanism of that node takes place from this point of view. The principle can be understood as a given functionality, in relation to other nodes of the network.

E. Decision-making process

In this section the main functions needed in order to create a sustainable and reliable global governance will be presented. The functions have to be appointed by different global institutes/institutions/councils, the area of their responsibility being also emphasised. At the same time, if the social/environmental pressure increases, other functionalities that need to be covered will appear; this mechanism gives the model great flexibility and dynamics.

1) THE INSTITUTION FOR SUSTAINABLE DEVELOPMENT

It will have to deal with problems related to:

Leadership crises; tax crises; governmental crises; fiscal crises in key economies; political and administrative crises; hyper-inflation crises; politics and policies controlled by banks, unsustainable economic de-growth crises; social instability crises; corruption crises; speculative capital crises; political selection based on interest groups

2) THE INSTITUTION FOR SYSTEMIC BALANCE

It will have to deal with problems related to:

Political and administrative crises; public debt crises; genetic mutation crises; risky energy exploitation; immigration crises; representative democracy and delegation of decisions; control from external creditors; water pollution; decreasing vitality of the population and diseases; destruction of life conditions; internal unrest and local wars

3) THE NATURAL, CULTURAL AND SOCIO-ECONOMIC ENVIRONMENTAL HEALTH INSTITUTION

It will have to deal with problems related to:

Risky energy exploitation; fiscal crises; energy crises; survival crises; increasing pollution crises; health crises; insufficient energy and external financial control; big external debts; external control; terrorism crises; external pressure; behaviour mutations and degeneration

4) THE INSTITUTION FOR A SUSTAINABLE HUMANITY-ENVIRONMENT RELATIONSHIP

It will have to deal with problems related to:

Increasing pollution crises; biodiversity crises; environmental crises; weather crises; intensive deforestation; diminishing of resources; capital accumulation for multinational companies; imbalance between the birth rate of humans and other species; mass destruction of species; environmental and meteorological war; unsustainable environment;

5) **THE INSTITUTION FOR RE-ORIENTING RESOURCES FOR CRISES SOLVING**

It will have to deal with problems related to:

Intensive deforestation; environmental crises; structurally high unemployment and underemployment; housing crises; social crises; poverty crises; social inequity and low incomes; illegal immigration, and social parasitism; high level of social depression; desertification; primitivism and social inadaptability; re-orientation of prisoners for constructive purposes

6) **THE INSTITUTION OF/ FOR HUMAN EMANCIPATION**

It will have to deal with problems related to:

Social crises; hunger crises; social control crises; hyper-inflation crises; regime change crises; unprofessional vision for the future and improvisation; lack of general public consultation through referendum; autocratic regime; revolutions and social instability; earth, water and air pollution; kamikaze behavior of desperate people

7) **THE INSTITUTION FOR THE PROTECTION OF HUMAN AND NATURAL ENVIRONMENTAL RIGHTS**

It will have to deal with problems related to:

Governmental crises; immigration crises; health crises; biodiversity crises; poverty crises; regime change crises; political crime; government and administration selected by mafia-type regimes; deficiency of social economy politics; depopulation of regions; social pressure of the poor against the rich; educational and social rules crises

The model allows the sharing of responsibilities, so that there will always be a management plan for a problem. The inter-connected paths between institutions can be visualized in the demo model.

Apart from Global Institutions, we propose Global Councils, which act as an interface between the professional networks and the Global Councils. Thus, it will be created a structure of inter-related functions as it happens in a neuronal network.

The Councils will function both separately and together, due to the presence of the connecting paths between them. Their roles will be presented below:

1. **Global Council for Supervising Sustainability** - Its role is to assess the consequences of decisions or actions in order to maintain the sustainability of the components, and also of the whole system.
2. **Global Council for Data Analysis and Data Significance**- Its role consists in analyzing relevant indicators at local or global level, and also in reporting relevant data from networks.

3. **Global Council for Analysis of Evolution Scenarios-** It has the role to analyze and negotiate optimal alternative paths for the management of different evolutive processes
4. **Global Council for Evaluating the Coherence of Local Processes in Global Context-** Its role consists in finding the relevant details of local phenomena which could impact global sustainability, and also in finding ways to solve local tensions.
5. **Global Council for Analysis and Use of Local Historical and Geographical Data-** Its role will be linked to cultural integrity. It will also analyze cultural memes, social behavioral reflexes, and economically trustworthy areas of culture. Moreover, ways to co-ordinate global policies with respect to the local cultural factor (given by traditions and local historical values) will be analyzed.
6. **Global Council for Public Policies and Best Practices** - Its role will be linked to the process of transferring successful public policies to different cultures, respecting local cultural specificity.
7. **Global Council for Assessing Responsible Actions** - Its role is to establish the principles of ethics and the code of moral conduct at global level, in order to obtain global sustainability of the planet and human civilisation.
8. **Global Council of Complex Assessment (correlative, quantitative and qualitative)-** Its role is related to the assessment of long and short-term decisions based on various indicators involved in the evolution of phenomena. Also, reports will be delivered/filed, with the arguments/reasons for the decisions made, the staging of the actions and the management of resources used in order to support the decisions.
9. **Global Council for Strategic Decisions** – Its role will be related to global strategic decisions, with respect to the local (national/regional) decisions. Situations in which cultural habits harm the environment or ecosystem's balance will be analyzed.

F. The innovative concepts of the model

There are four main concepts that differentiate this model from the current approaches:

1. Fractal manifolds and the generative logic

It offers the visualization of interconnected structures at each level of complexity. The structures can be from the social, environmental, technological or economic level. At the same time, through the coherent generation of information, new structures related to the previous ones will appear. This offers the possibility to assess future crises, and to assess the consequences of decisions.

2. Pyramid structures vs networks

By historical tradition, state structures were created based on the pyramid model of thinking. The model has led to two types of consequences:

- a) the accumulation of resources at the top of the pyramid
- b) top tier management of the resources, generating extreme inequality (the richest 1% of the world will own 99% of the world's wealth) [28].

The pyramid structures are generated by an algorithm that can be characterized as follows: A commands B (which is an intermediary), B commands and supervises C (which is the performer and is also supervised by A). This algorithm repeats itself at all levels of the pyramid structure. This approach leads to the “bottle neck” phenomenon, when information and decisions are truncated, with severe consequences for the decision-making process. This approach has had a huge impact on the development of the present crises that threaten the balance and sustainability of life on Earth.

The advantages of a system based on networks reside in many points of progress:

- a) The system is self-instructing, central positions learn from direct support positions
- b) There are well defined functional paths through which a person/institution/organization can move in order to reach a purpose/goal (“initiatory paths”)
- c) The decision making process is not linear and is in relation to the functional networks.

3. Functional networks and collaborative approach

An important advantage of applying this model is accountability and active cooperation of the entire network structures and substructures around a concept or idea. Moreover, switching from the classical system of institutional organization to a network-type system is possible without creating major dysfunctions, even using the existing staff, by developing their existing potentials.

The model has the ability to function as a tool that allows one to see all the existing paths that can shape solutions, thereby enabling sustainable decision-making. In other words, it can act as a framework that can support the decision-making process in institutional structuring and crises solving.

4. Structural isomorphism – mapping informational shapes

- Isomorphism is the formal mapping between complex structures. In science, identifying isomorphic structures is a powerful analytical tool used to gain deeper knowledge of complex objects [29]. Therefore, the structural isomorphism between the criteria that make possible the existence of a living being (cellular organization, reproduction, metabolism, homeostasis, a genetic code, response to stimuli, growth and development, and adaptation through evolution) and the functional characteristics of the model can be identified. Thus, cellular organization can be found in the patterns of hexagonal structures: reproduction is similar to the generative principle; metabolism appears in the patterns of vectors directions; homeostasis is given by the weights of the vectors; the genetic code is given by the property of information structuring

according to the system's adaptive needs; response to stimuli is ensured by the feedback mechanism; growth and development is ensured by the interconnected functional networks; and adaptation through evolution is achieved through the mechanism of gaining complexity at superior levels (higher degree of networking).

H. How the model is meant to manage both current and emerging challenges and risks

In this section, the intention is not to come up with direct solutions to specific problems, but rather to explain how the model meets the required criteria, using two suggestive examples: 1. the importance of interconnected concepts that create informational maps and 2. the dynamics of solving a crisis with this model - the example of the educational crisis.

1. Giving shape through informational maps

The eight types of networks function as informational maps, in which the most pressing interconnected crises, the context that generated them, the myriad of crises that can derive from the present ones, the optimization of the decision-making process, the collaborative mechanisms in order to achieve a common global goal, the implementation and supervision of the decisions made, and also the innovative measures that can be taken to avoid any kind of crisis are highlighted

From the institutional point of view, different structures will perform specific functional roles. The functionality that needs to be covered is the first requirement that needs to be met in order to obtain reliable global governance. Secondly, the people who will occupy the positions will be trained (also with the help of professional networks), and those who prove to have a high degree of integrity and professionalism will be elected in leadership positions. The informational flow follows the paths of the networks, and then it arrives at Global Councils, which act as Central Processing Units which send their outputs to the Global Institutes which will discuss the necessity of implementing decisions at local level (local governments).

One of the most important steps in solving the current crises is to understand the context in which they have been generated. Thus, the present context dominated by an extremely dangerous type of crises was generated by three main inter-related dimensions: 1. diminishing of the spiritual-evolutionary component of human beings from the social, cultural and political context (leaving this responsibility only to the religious point of view); 2. a competition based economy, with resource depletion and with significant environmental consequences; 3. disregard for the role of humanity in the context of the natural environment (Gaia planet) - thus mankind has created an artificial world where it survives and adapts with difficulty when it moves away from nature. If these dimensions are not restored, mankind presents a very high risk of disappearing, as predicted by reports in the multiple directions of evaluation [3-7]. No matter how many local/global decisions will be made, if the global governance is not designed to include important dimensions, its functionality will be diminished.

The present model allows, as a first step, the creation of informational maps, with interconnected semantic concepts/terms. The second step consists in adding the vectors and understanding the dynamics given by the nodes (concepts) and vectors. The third step is to correlate the concepts/terms between networks and to carry out analyses related to their specific functionality.

An example of an informational map, provided in Fig. 1, shows the position of humanity in the context of the global ecosystem. The main hexagon, centered in “planet spirituality” can be described as follows: The fundamental laws of life on Earth, (“adaption to the niche”, “feeding territory”) together with the derived laws, specific to the animal kingdom (“food chain”, “reaction in front of the death”, “mating/multiplying” and “competition”) generate new characteristics (“the complementarity of functionalities”, “biodiversity”, ”optimized ecological footprint”, “genetic variability”, “selection of the fittest”, “selection of the favourable niche”). Within the general functionalities, mankind is placed close to the center of the structure, represented by the hexagons marked with blue, and pink (regarded as the limit of his extension in the ecosystem).The derived characteristics (“evolutionary leaps”, “the transmission of evolutionary leaps to descendants”, “highly spiritual humans”, “environment transformation” and “highly developed human skills”) show the planetary role of mankind in the Gaia system, highlighting the fact that the presence of humans on Earth is not accidental. Also, the centering of the hexagons in "mutual control and elimination of redundancies" reveals that if humans become a redundant species for the planetary ecosystem, a mechanism for their elimination can be applied (see the major risk of human extinction via the outbreak of an epidemic or pandemic [6]).

The fractal mechanism of information generation allows both a vertical approach, deepening the analysis of the phenomenon (similar to an increase of resolution) and a horizontal approach, clustering structures at same level of complexity, with the formation of double or triple hexagonal structures. A triple hexagon structure is shown in Fig. 1 (dashed line), which highlights the relationship between the human species and technological progress. In this analysis, the multiple derived characteristics (“spiritual development - homo spiritualis”, “collective emancipation of consciousness”, “economy based on knowledge and society”, “recovery of the imbalance of the environment”), also reveal the evolutionary vector of the human species and the complex role of humankind in the environment.

Therefore, this model provides, as a first step, an overview of the interconnected concepts, allowing the characterization of a phenomenon by its generators (connected causes). After adding the vectors, in the second step, the functional structures and the communication paths between them can be identified.

2. The dynamics of solving a crisis with this model- the example of the educational crisis

The educational crisis is one of the most important and pressing crises, due to the fact that the educational system hardly meets the requirements of today’s society and, at the same time, without a proper education, leaders with high levels of integrity and professionalism cannot emerge. Historically and geographically, the concept of education has undergone various

transformations that have led to the variation in educational policies. Moreover, due to the different collateral crises that have emerged, the educational crisis could not be properly managed.

At the first level (administrative-governmental type network), the main generators of the “educational crisis” (8) are “regime change crises” (0), “political crises” (7), “poverty crises” (1) and “social pressure of the poor on the rich” (9). At a closer look, it can be noticed that the directions of the vectors form two cycles, which means that we are dealing with a phenomenon of crises self-maintenance. Thus, in the first cycle the “educational crisis” stimulates the “political crisis”, which stimulates the “regime change crisis”, which deepens the “educational crisis”. This pattern of crises is found in most of the countries nowadays. The lack of an education that shapes personalities, focused on human emancipation, leads to poorly trained persons in leading positions, which generates social unrest and regime change crisis. The second cycle is “educational crisis”, “poverty crises” and “social pressure of the poor on the rich”. This pattern can be easily identified in most of the under-developed countries.

At the second level (communication type network), in our case, new concepts (nodes) do not emerge, but there is a change in the vectors direction. There are two commutative diagrams: in the first one the “social pressure of the poor on the rich” and “poverty crises” will be directed to “educational crisis”, meaning that the educational process will be forced to develop through alternative directions of education (on-line learning on different platforms) and in the second commutative diagram the “regime change crisis” will receive the pressure from both “political crises” and “educational crisis”, creating the context for governmental instability in most of the countries, until a sustainable way of governing is found.

At the third level (re-active type network), four nodes emerge: “reorientation of mass media to a positive and proactive direction that will be able to motivate people towards positive actions” (9), “adult education that improves (their) quality of life” (48), “educational programs for school dropout, that will increase the chances for social adaptability” (47), “obligation for the rich people to orient their money to social, educational, and environmental programs capable of rebalancing the present imbalances” (10). The functionality of this network is to emphasize the measures that need to be taken as a reaction to the educational crisis. The two commutative diagrams show that the programs and pressure are oriented toward nodes 10 and 47. This attitude can already be seen around the world, where rich people donate money for the tuition fees of poor children, but its amplitude is very low.

At the fourth level (pro-active type network), six nodes emerge, representing local policies needed in order to solve the educational crisis: “very strict selection of politicians” (34), “educational programs for children and young people designed both by the educational system and the church”(39), “educational programs to maximize inborn potential” (45), “compulsory education must be free for everyone”(44), “second chance programs for young people and adults who need to have professional training directed to new social niches (10),” educational reform, both in

teaching style and system administration” (9). These are the minimum required pro-active measures that will contribute to solving the education crisis.

At the fifth level (collaborative type network) six nodes will also emerge. Their content represents collaborative programs between different social niches: “collaboration programs for increasing innovation in education” (81), “collaboration with remarkable people that can teach history of thinking and history of cultures” (163), “improving cooperation skills through alternative education and online programs” (168), “collaborative programs in order to develop the emancipatory dimension of the educational system” (27), “collaboration with churches in order to promote respect for living beings” (26).

There are also common nodes between networks that allow informational transfer between levels.

This model is suitable for shaping a sustainable humanity due to: 1. the existence of eight types of networks that covers the global functionalities needed in order to develop a global governance system focused on responsibility sharing and collective intelligence; 2. the ability to deeply understand the problems through their complex characterization; and 3. the ability to find decisions/ solutions that are not available at a first evaluation of the problem, but which will appear only after several steps of iteration.

G. The stages of project development:

1. To develop a computer model based on five levels of complexity (five networks). This step is already achieved. A short movie was provided in the supplementary material.
2. To extend the computer program from five to eight levels of complexity (networks).
3. To create the databases that will be used to fill the content of each node.
4. To create a user-friendly interface