

Globalization and Sustainability

Can the present globalization process be reoriented?

Antonio Caselles

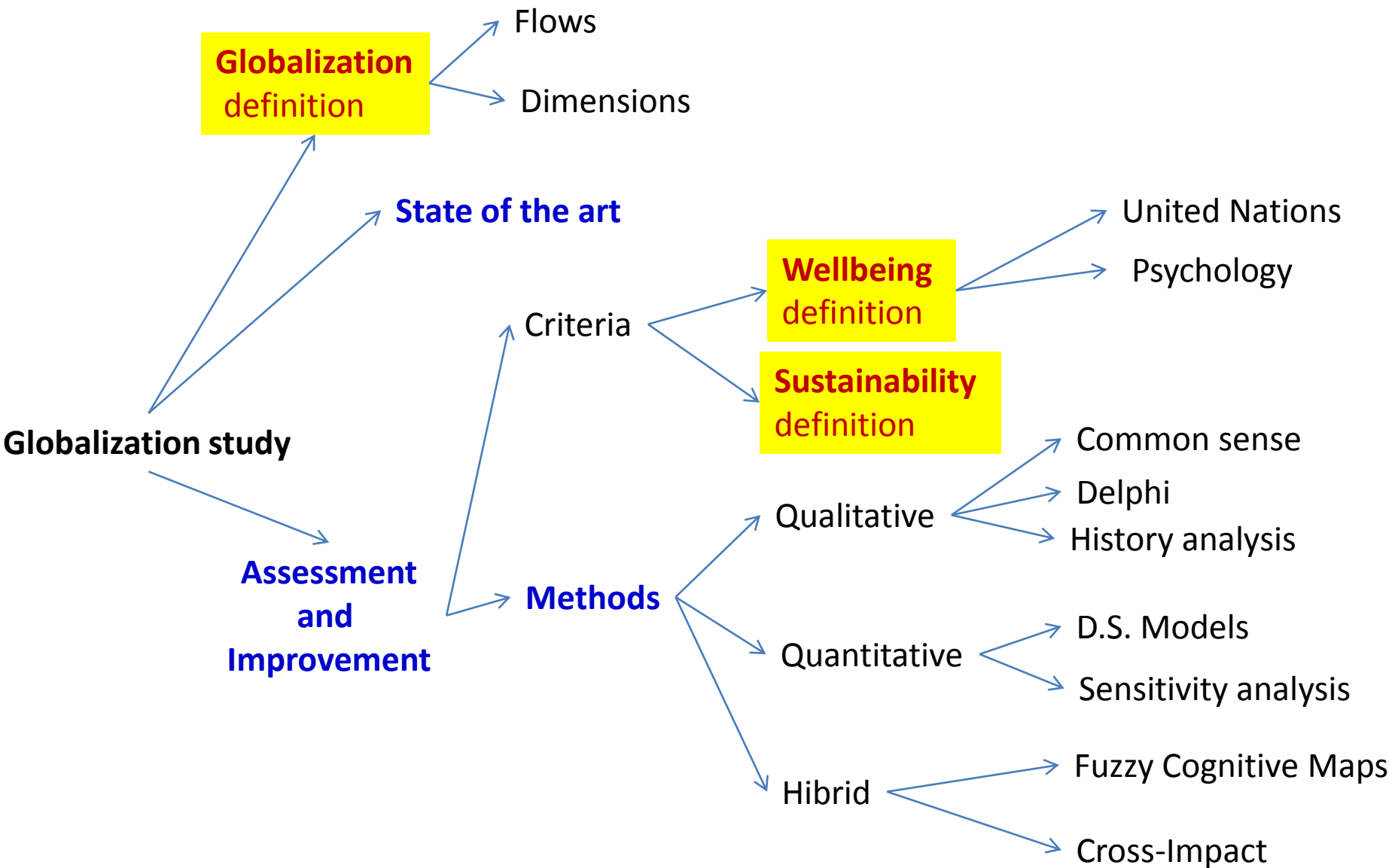
*Sociedad Española de Sistemas Generales
(SESGE)
Spain*

Contents

- I. Introduction
- II. **Wellbeing** as an objective
- III. The concept of **globalization**
- IV. The concept of **sustainability**
- V. **The present situation of globalization**
 - A. **Assessment** of the globalization process
 - B. **Are real** its theoretical advantages and disadvantages?
 - C. **What to do** to reorient globalization?
- VI. **Improving the globalization process: the ways**
 - A. **Common sense**
 - B. **Experts consulting**
 - C. **Historical analysis**
 - D. **Fuzzy cognitive maps**
 - E. **Cross-impact**
 - F. **Systems Dynamics**
 - G. **Sensitivity analysis**
- VII. **Conclusions**



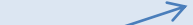
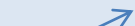
I. Introduction: the aims

- Globalization: State of the art.
- Its repercussions on human wellbeing and sustainability.
- Advantages and disadvantages.
- Causes and solutions.
- Methods to try to find the best way: its classification and outline.



II. Wellbeing as an objective

- **The United Nations indices: HDI, ...**

- Life expectancy at birth.  HEALTH
- Adult literacy rate.  EDUCATION
- Combined gross enrolment ratio.  RICHNESS
- Gross domestic product (PPP, US \$).  RICHNESS

- **Psychology: happiness; winner/loser; success/failure.**

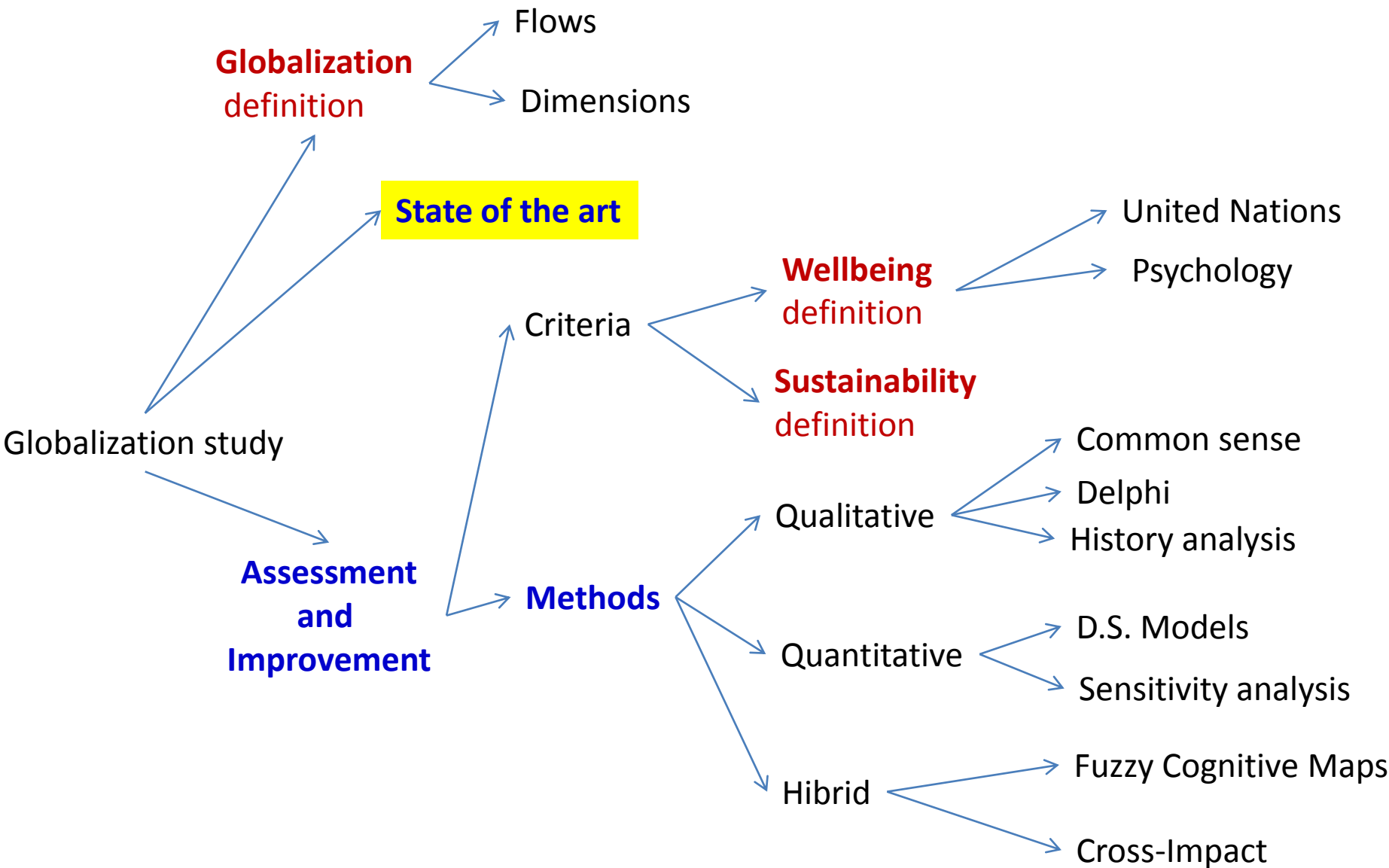
- “A poor person is not who has a little but who needs a lot and wishes more”.
- “Richness consist on having the basic needs satisfied and time for children, human relations and enjoyment”.
- The concept of happiness depends on the individual or group.

III. The concept of globalization

- **Trend towards liberalization** (openness, connection and integration) of movements of: capital, financing, goods, services, persons, cultures, ideas, technology and knowledge.
- **Irreversible process** to construct a **global social reality** (not necessarily uniform).
- **Measurement: flows** (openness, connection, integration).
- **Dimensions: demographic, economic, ecologic, political, social, cultural.**

IV. The concept of sustainability

- **Definition:** a characteristic of human activities.
 - During a theoretically infinite amount of time.
 - Without exhausting the needed resources.
 - Without damaging the environment.
 - Without damaging the pursued objective.
- **Measurement:** long term repercussions (+,-) over resources, environment, its objective, human wellbeing.
 - Availability of a dynamic mathematical model.
 - Diverse indices related to different aspects or perspectives.



V. The present situation of globalization

The Whashington consensus (1989)

1. Budgets without **deficit**.
2. Prioritization of **research and infrastructures** over other areas such as education and public health.
3. Tendency to **tax** reduction.
4. Liberalization of **interest rates**.
5. Competitive **exchange rates**.
6. Reduction of **customs** difficulties.
7. Openness to direct **foreign investments**.
8. **Privatization** of public companies.
9. **Deregulation** of markets.
10. **Private property** protection.

Modifications (from 2002)

11. Legal and political **reform**.
12. Setting up **regulator entities**.
13. **Anticorruption** policies.
14. **Flexibility** of the labor market.
15. **Trade agreements** inside the *WTO* frame.
16. **Regulation of finance** transactions.
17. **Regulation of the capital** account.
18. **No intermediate** exchange rates (controlled floating, ...).
19. **Social security nets**.
20. **Poverty reduction**.

V. The present situation of globalization

A. *Assessment of the globalization process*

- **Statical**: diverse indices of openness, connection, integration, sustainability, wellbeing, opinions, etc.
- **Dynamical**: evaluation of its characteristics (laws, uses, ...) by its repercussion over wellbeing and sustainability at short and long term.

Possible methods:

- qualitative,
- quantitative,
- semi-qualitative.

V. The present situation of globalization

B. Are real the theoretical advantages and inconveniences of globalization?

Theoretical effects of globalization

Positive

- It **fosters economic activity** where production is less costly.
- It **reduces prices** and stimulates consumption.
- It **facilitates competition and diffusion** of technology and management capacity.
- It **increases security**, property right, transparency and quality of public services.

Negative

- It produces **unemployment** where production is more costly (delocalization and deindustrialization).
- **Loss of local cultures.**
- **Injustice and militarism.**
- **Exhausting of resources.**
- **Contamination and degradation of the environment.**

V. The present situation of globalization

B. Are real the theoretical advantages and inconveniences of globalization?

Proved advantages of globalization

- **It fosters the development of poor countries.**
 - Positive case of China [1].
 - It depends on the context [35].
 - It increases salaries and productivity (Indonesia) [48].
 - It depends on the right state is consensus (previsibility of legal rules)(Chile/Argentina) [23].
- **It improves general wellbeing.**
 - More that of the most prepared people (USA: [22]) and that of workers with more adaptability, in the services sector, and most mental activity [53].
 - Yes if it affects economy, health and education but not if it affects to politic (integration) or social (norms and values) aspects (92 countries: [4]).

V. The present situation of globalization

B. Are real the theoretical advantages and inconveniences of globalization?

Proved advantages of globalization

- **It reduces corruption** (abuse of public power for particular benefit).
 - Proved in several countries [26].
- **About the local market in rich countries:**
 - Illegal immigration increases inequality, the legal one decreases it (USA: [51]).
 - Delocalization and deindustrialization do not affect those earning more and decreases inequality between those earning less (USA: [51]).

V. The present situation of globalization

B. Are real the theoretical advantages and inconveniences of globalization?

Proved disadvantages of globalization

- **It does not correct inequality in many cases:** The GDP per capita in many african countries and of the ancient SSRU has not grown or has lowered and its public debt has grown [31].
- **It affects gravely to sustainability** [39].
 - The techoindustrial society is essentially unsustainable (it exhausts resources, which is fostered by low cost transportation and emigration).
 - Different cultures in the same territory produce instability in the bad times.
 - It is not possible to control the global economy like a functional unit (problems of scale and complexity).

V. The present situation of globalization

C. What to do to avoid globalization inconveniences without renouncing to its advantages?

Search for causes

- **Public and market failures** that prevent accumulating capital, increasing productivity and respecting environment.
- Possible **exploitation of underdeveloped countries** by multinational companies.
- **Deficient mutual knowing between cultures.**
- **Deficient mutual respect between human beings.**
- **Deficient knowledge about behavior of nature** and consequences of human intervention (resources, contamination, climate change, etc.)
- **Possible deficiencies in behavior of world control entities** (WB, IMF, etc.).
- **Deficient local and global control.**

V. The present situation of globalization

C. What to do to avoid globalization inconveniences without renouncing to its advantages?

Search for possible correcting actions

- **Improving the ethics of human beings**
 - To promote common values [32]. Figure 1.
 - Characteristics of a just globalization [42].
 - To satisfy human needs.
 - “Constructive heroism”: altruism, family help, etc.
 - To promote common values: justice, love, respect, ...
 - To avoid what fosters “relevance of mortality”
 - To combat those inducing fear.
- **Legislation, control (monitorization of the real situation, statistics and its diffusion), rewards and penalizations**
 - Characteristics of adequate legislation [40].
 - Trade agreements and distributing environmental deterioration and regeneration costs [25].
 - Benefits of a world federation [33].

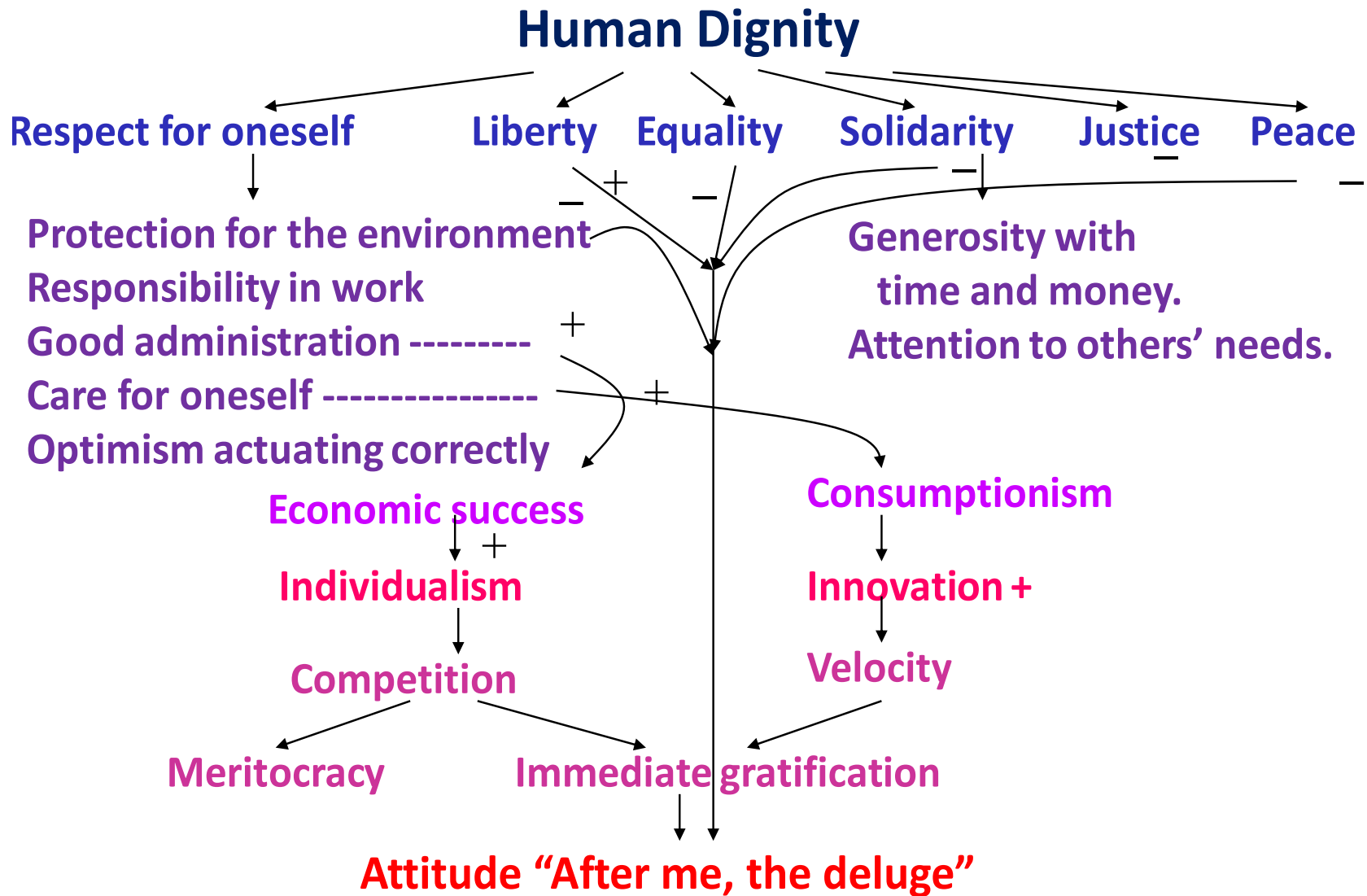


Figure 1. A hierarchy of values (Human Rights) and an application instance.

V. The present situation of globalization

C. What to do to avoid globalization inconveniences without renouncing to its advantages?

Current search for the best set of correcting actions

- **Mathematical models and simulation.**
 - Models must be dynamic and adequate for the human control of sustainability [47].
 - Quantitative models perform good predictions at short term and when no surprises are possible [19].
- **Analysis of opinions of experts.**
 - Classic Delphi, interactive Delphi and construction of scenarios methods are used in the Millenium Project [19] [20].

V. The present situation of globalization

C. What to do to avoid globalization inconveniences without renouncing to its advantages?

Current search for the best set of correcting actions

Advantages of mathematical models and simulation

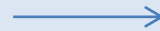
- **Obtaining precise estimations**, and with confidence intervals in the case of using stochastic models.
- **Precise determination of intervention strategies:** numerical values for the control input variables of the model and probability distributions for random variables.
- **Precise determination of the possible conditions of the uncontrollable environment:** numerical values for uncontrollable input variables in each possible scenario, as well as probabilities for scenarios.

Current search for the best set of correcting actions

Disadvantages of mathematical models and simulation

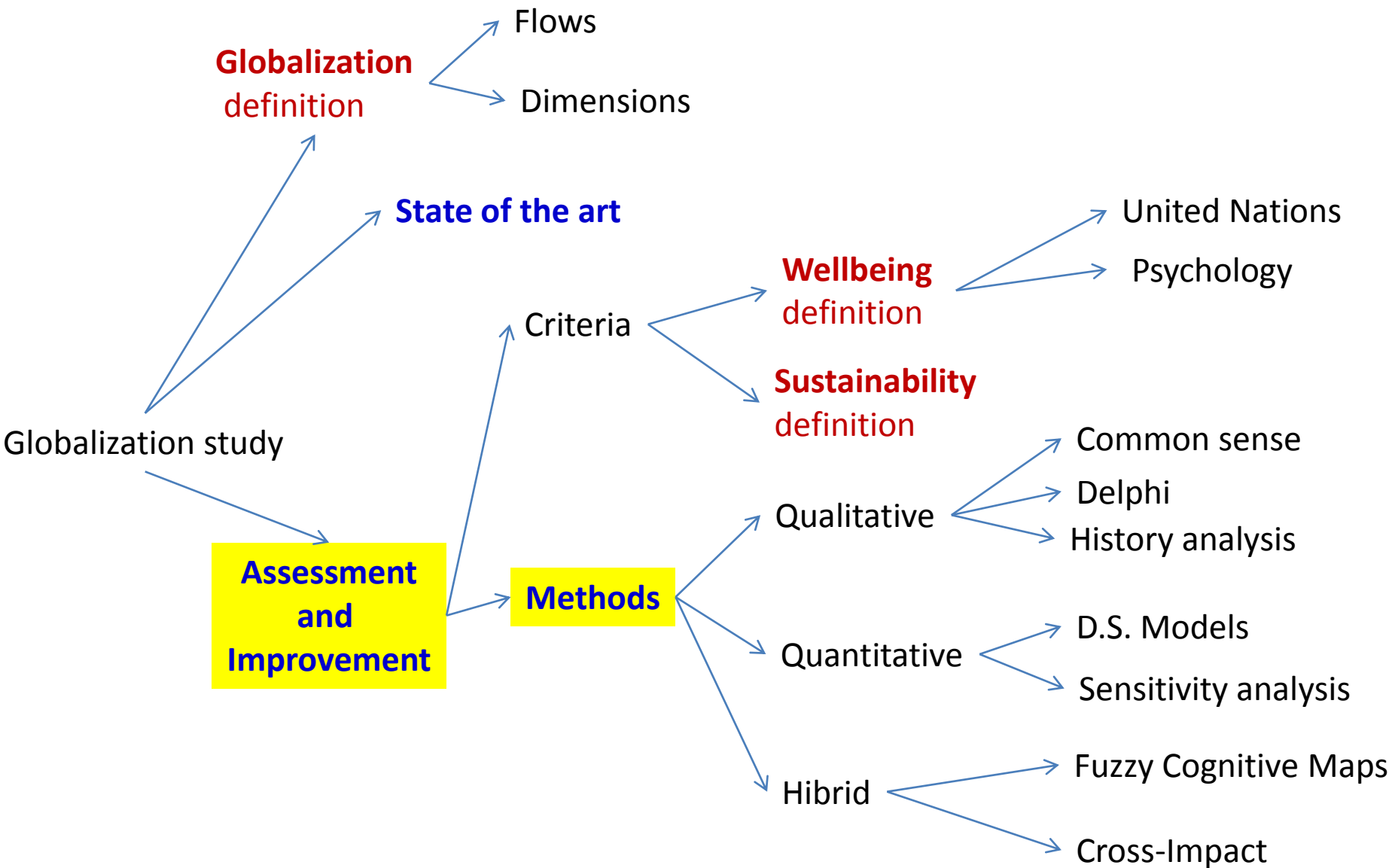
Disadvantages

1. Possible **inexact real data** (measurement errors, falsity, bias, etc.).
2. Models are **simplifications** of reality.
3. Possible **wrongness** in the modeling team.
4. Possible detection of **instability and chaos**.
5. The relationships assumed as permanent (derived from the past or hypothetical) **may change** in the future.



Correctives

- Constructing **stochastic models** (previsions with confidence intervals).
- **Adequate control** for the team.
- Appearance of chaos or instability determines the **end of the prevision period**.
- Imaginable changes must be introduced in the model.
- Parameterable changes: genetic algorithms and learning.



VI. Improving the globalization process

- **Qualitative methods**

- *Common sense*: advantages, disadvantages, ...
- **Experts consulting**: Delphi, scenarios, ...
- *History analysis*: hegemonies growing and descent.

- **Semi qualitative methods**

- *Fuzzy cognitive maps*: direct + indirect influences.
- *Simulation with a cross-impact model*.

- **Quantitative methods**

- *Simulation with a system dynamics model*.
- *Sensitivity analysis*: a black-box model assumed .

VI. Improving the globalization process

Results from the common sense analysis

Proved Advantages

- Creates jobs and raises salaries in poor countries.
- Reduces corruption in rich and less poor countries.
- Fosters competition, and diffusion of technology and management ability.
- Fosters security, property right, transparency and quality of public services.
- Reduces prices and raises consumption.

Proved Disadvantages

- Produces unemployment in rich countries.
- Frequently does not reduce inequality.
- Fosters exploitation of the weak (militarism, injustice).
- Leads to a uniform culture (loss of cultural richness).
- Excessive consumption and growing that:
 - Exhausts resources.
 - Contaminates.
 - Degrades environment.

VI. Improving the globalization process

Results from the common sense analysis

- **First causes.**
 - **Cheap transportation and communication** (energy and technology).
 - **Insufficient control** (less in less developed countries).
- **Last causes: ethical deficiency and lack of a common ethics.**
 - **To pursue earning money without qualm.**
 - **Excessive individualism.**
 - **Disregarding non-immediate future.**
- **Possible actions tending to correct disequilibrium.**
 - **To monitor parameters** representing advantages, disadvantages, sustainability and wellbeing.
 - **To adequate the laws** of each country for better local control.
 - **To achieve new international treaties and agreements** for better global control.
 - **To inform and to motivate people** about consequences of the dominant way of life.

VI. Improving the globalization process

Outlining possible methods: **Experts consulting**

- Methods used by the *Millenium Project: state of the future* [19] [20].
 - **Classic Delphi**: experts answer four successive questionnaires defined by the research team.
 - **Real time Delphi**: experts consult in real time the answers of the other experts and improve their own ones.
 - **Construction of scenarios** about possible futures.

VI. Improving the globalization process

Outlining possible methods: **History analysis**

- Method suggested by Lorenzo Ferrer [14] [15].
 - Studies the causes of the evolution of the different hegemonies or empires in the past.
 - Assumes that each hegemony dominates militarily and imposes or promotes its culture and values.
 - Assumes that the evolution of all hegemonies has an inverted U shape, with an ascending period and a descending period; and when an hegemony is descending another one is ascending.
 - Tries to analyze the circumstances leading to ascensions and descents of hegemonies, searching for common features (isomorphisms).

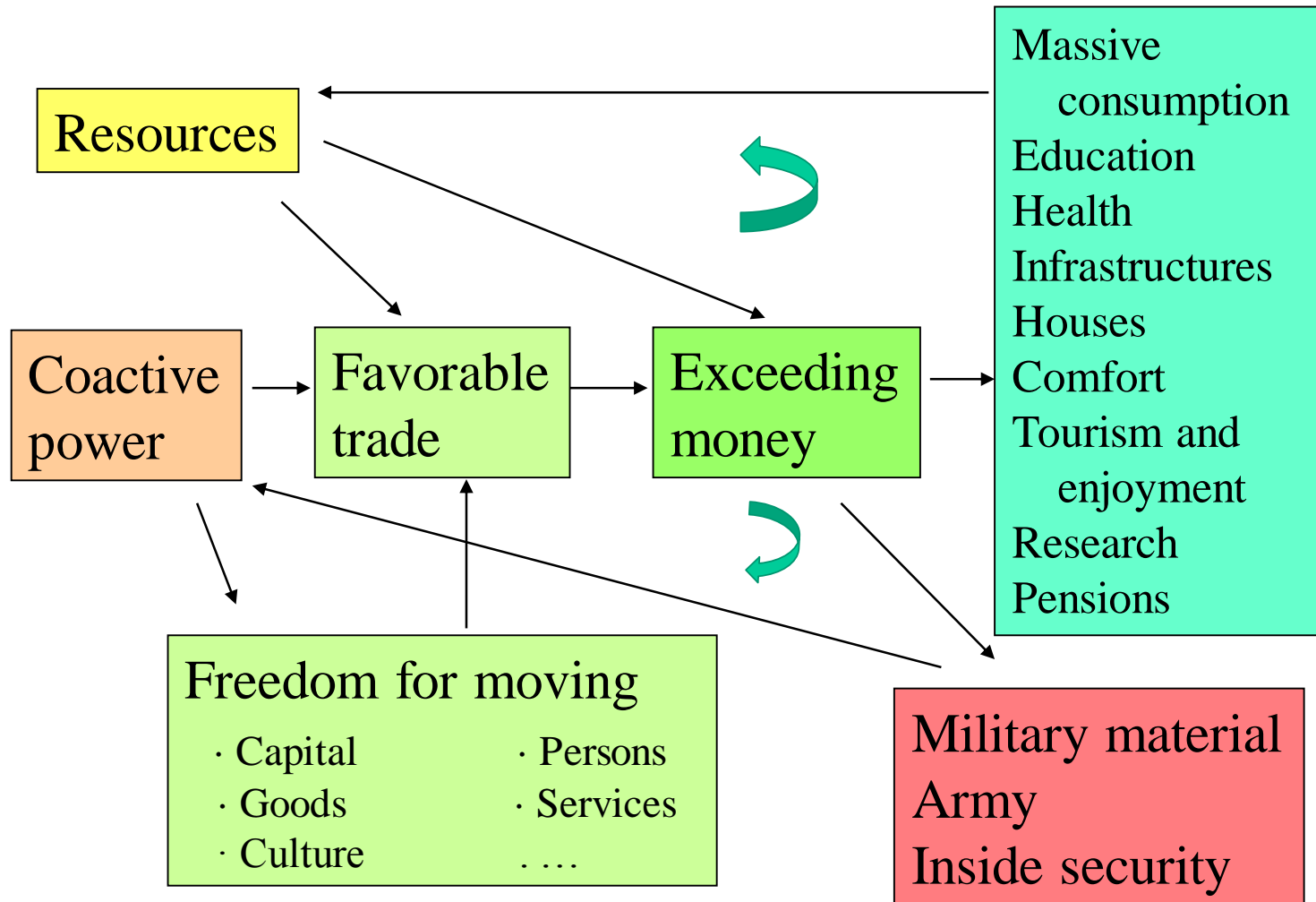


Figure 2. The effect of hegemonies

VI. Improving the globalization process

Outlining possible methods: **Fuzzy cognitive maps**

- Computer program in <http://www.uv.es/caselles>
- Steps detailed by [7] [50].
 - 1. To set up a list of relevant variables** representing the factors intervening in the globalization process (may be by consulting to experts).
 - 2. To assign a numerical value to the degree of direct influence** (positive or negative) of each variable over each other one (also by consulting to experts and using a qualitative scale that next will be converted into a quantitative one).
 - 3. To find the more influencing variables** (positively or negatively) over each variable of interest, after considering the accumulation of all impacts (direct plus indirect) received by that variable.

VI. Improving the globalization process

Outlining possible methods: **The cross-impact method**

Computer program in <http://www.uv.es/caselles>

Steps detailed by [7] [11] [3].

1. To set up a **list of relevant variables** (trends) and events representing the factors intervening in the globalization process (may be by consulting experts).
2. To assign a numerical value to the **degree of direct influence** (positive or negative) of each variable or event over each other one (also by consulting experts and using a qualitative scale next converted into a quantitative one).
3. To assign a value to the **initial and previous state** of each variable and an initial probability of each event (by experts).
4. To define **strategies** with the controllable input variables (those not receiving influences) **and scenarios** with the non-controllable input variables.
5. A computer program determines the **evolution of the output** variables and probabilities of events.
6. Possible production of results with its respective **confidence interval**.

VI. Improving the globalization process

Outlining possible methods: **Dynamic systems simulation**

- The constructed mathematical model theoretically may be reduced to **a system of differential equations** or finite difference equations [30] [7].
- **Uncertainty** may be localized in input variables (its probability distribution may be known) or in functions determined by regression fitting (linear or non-linear) [6].
- **The model has to be validated**, normally by simulation of the past and comparing simulated results with real data.
- **Intervention strategies** are defined by assigning future values to controllable input variables, and scenarios are defined by assigning future values to non-controllable input variables.
- From these data, **the evolution of each output variable** (with its corresponding confidence interval, or other uncertainty measure, in stochastic models), is obtained.
- Other optimization methods may also be applied.

VI. Improving the globalization process

Outlining possible methods: **Dynamic systems simulation**

Some current instances from different perspectives

- *The Regional Earth System* elaborated by the Earth System Science Interdisciplinary Center of the University of Maryland [34].
- *The Millenium Project* promoted by the World Bank in 1996 (it prefers qualitative methods)[19] [20].
- *The Integrated Global System Model* driven by the MIT [45] [52].
- *The Australian Stocks and Flows Framework (ASFF)* [49].
- *GUMBO* [5].
- *FUGI* [36] [37] [38].

VI. Improving the globalization process

Outlining possible methods: **Dynamic systems simulation**

Requirements from the globalization perspective

- **Exhaustivity.** To include all relevant factors that the definitions of globalization, human wellbeing and sustainability directly and indirectly imply.
- **Multiplicity.** To construct several models with the same objectives and assumptions, from different paradigms and methodologies, and from quantitative, semi-qualitative and qualitative approaches (It reinforces conclusions).
- **Uncertainty.** Quantitative and semi-qualitative models would have to produce results with its respective confidence intervals or, at least, with a dispersion index. Qualitative models would consider the factors where uncertainty appears.
- **Constructivism.** In order to obtain early useful partial results, the degree of detail of the model would be the minimum to serve the proposed objectives; and disaggregation and validation would be made step by step.
- **Participation and free disposition.** Given the complexity of the model and the modeling process, and given the general consequences of intervention strategies, it seems convenient to state its openness to participation and its free disposition. In addition, these characteristics would produce synergy, mutual control, credibility and guaranty of non-appropriation.
- **Updating and upgrading.** It is obvious that technology evolutions continuously as well as the structure and behavior of the global system. The models need adaptability, that may be handmade (changing the model and the study when non-imaginable events occur) or automatic in some cases (for instance, introducing genetic algorithms in it).

VI. Improving the globalization process

Outlining possible methods: **Sensitivity analysis**

- **It assumes the presence of a black-box model**, that is, only the values of the input variables and relevant output variables are considered, without interesting the internal structure of the model.
- **To fit a linear or non-linear function to a series of data** of an input variable and an output variable.
- **To infer the effect of a unit more in the value of an input variable over the corresponding output variable** from this kind of relationships .
- It may work with real data or with simulated data.
- An application case can be found in [10].

VII. Conclusions

- **A summary state of the art about the present globalization process**, its advantages, disadvantages, suggested causes and possible methods and actions to reach an effective control of this process, empowering its advantages and palliating its disadvantages.
- **The objectives suggested for assessing the globalization process** have been wellbeing/happiness and sustainability of human activities.
- **A list of possible consensus advantages, disadvantages, causes, and possible general actions** to correct the present situation in the future.
- **A list of outlined possible consensus methods to design** precise and programmed strategies to find the globalization way with maximum general wellbeing/happiness and sustainability.

References

1. Aizenman, J., & Sun, Y. (2010). Globalization and the sustainability of large current account imbalances: Size matters. *Journal of Macroeconomics* 32, 35–44.
2. Arribas, I., Pérez, F. & Tortosa-Ausina, E. (2009). Measuring Globalization of International Trade: Theory and Evidence. *World Development* 37-1, 127–145.
3. Bañuls, V.A., & Turoff, M. (2011). Scenario construction via Delphi and cross-impact analysis. *Technological Forecasting & Social Change* 78, 1579–1602.
4. Bergh, A. & Nilsson, T. (2010). Good for Living? On the Relationship between Globalization and Life Expectancy. *World Development* 38-9, 1191–1203.
5. Boumans, R., Costanza, R., Farley, J., Wilson, M.A., Portela, R., Rotmans, J., Villa, F. & Grasso, M. (2002). Modeling the dynamics of the integrated earth system and the value of global ecosystem services using the GUMBO model. *Ecological Economics* 41, 529–560.
6. Caselles, A., (1992), Simulation of Large Scale Stochastic Systems. In Cybernetics and Systems'92, R. Trappl (Ed.). World Scientific, pp. 221-228.
7. Caselles, A. (2008). *Modelización y simulación de sistemas complejos*. Valencia (España): Editorial de la Universitat de València.
8. Caselles, A. (2008). Globalización y sostenibilidad. Hacia un modelo lógico-matemático del mundo. *Revista Internacional de Sistemas* 15, 10-19.
9. Caselles, A., Micó, J.C., Soler, D., & Sanz, M.T. (2008). Population Growth and Social Well-being: A Dynamic Model Approach. *Proceedings of the 7th Congress of the UES (Systems Science European Union)*. Lisbon, Portugal.
10. Caselles, A., Ferrer, L., Martínez de Lejarza, I., Pla, R. & Temre, R. (1999). *Control del desempleo por simulación*. Valencia (España): Editorial de la Universitat de València.
11. Caselles-Moncho, A. (1986). An Empirical Comparison of Cross-Impact Models for Forecasting Sales. *International Journal of Forecasting*, 2(1986), 295-303.
12. Clark, J.D. & Themudo, N.S. (2006). Linking the Web and the Street: Internet-Based “Dotcauses” and the “Anti-Globalization” Movement. *World Development* 34-1, 50–74.
13. Curtis, F. (2009). Peak globalization: Climate change, oil depletion and global trade. *Ecological Economics* 69, 427–434.
14. Ferrer, L. (2008). Discurso de Lorenzo Ferrer en Universidad Autónoma de Ciudad Juárez con motivo del *I Seminario Internacional: “Diálogos y reflexiones sobre la globalización. Pasajes del Mediterráneo a la frontera Norte”* (23-26 de Octubre de 2007). *Revista Internacional de Sistemas* 15, 1-9.
15. Ferrer-Figueras, L. & Caselles-Moncho, A. (2008). Contribution to the design of a world-model-globalisation-sustainability. *Proceedings of the 7th Congress of the UES (Systems Science European Union)*. Lisbon, Portugal.
16. Ferrer-Figueras, L. & Caselles-Moncho, A. (2010). Contribution to the design of a world-model-globalisation-sustainability. *Revista Internacional de Sistemas* 17, 01-10.
17. Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change* 16, 253–267.
18. Ghaffaury, A. & Fadardi, J.S. (2010). Role of social psychology in protecting native values in the process of globalization. *Procedia Social and Behavioral Sciences* 5, 1961–1966.
19. Glenn, J.C. & Gordon, T.J. (1997). The Millennium Project: 1997 State of the Future-Implications for Actions Today. *Technological Forecasting and Social Change* 56, 203-296.
20. Glenn, J.C., Gordon, T.J. & Florescu, E. (2009). The Millenium Project:2009 state of the future. ISBN: 978 0 9818941-2-6.
21. Hernández, G.M., (2005). *La condición global. Hacia una sociología de la globalización [The global condition. Towards sociology of globalization]*. Alzira (Spain): Germania.
22. Hessami, Z. (2011). Globalization’s winners and losers—Evidence from life satisfaction data,1975–2001. *Economics Letters* 112, 250–253.
23. Isern, P. (2005). Del “consenso de Washington” al “consenso de Chile”. *Perspectiva* 6, 47-49.
24. Kapetanios, E. (2008). Quo Vadis computer science: From Turing to personal computer, personal content and collective intelligence. *Data & Knowledge Engineering* 67, 286–292.
25. Kissinger, M., Rees, W.E., & Timmer, V. (2011). Interregional sustainability: governance and policy in an ecologically interdependent world. *Environmental science & policy* 14, 965–976.
26. Lalountas, D.A., Manolas, G.A., & Vavouras, I.S. (2011). Corruption, globalization and development: How are these three phenomena related? *Journal of Policy Modeling* 33, 636–648.
27. Leidner, D.E. (2010). Globalization, culture, and information: Towards global knowledge transparency. *Journal of Strategic Information Systems* 19, 69–77.

References

28. Micó, J.C., Caselles, A., & Soler, D. (2006). *Age-Structured Human Population Dynamics*. *Journal of Mathematical Sociology*, 30, 1-31.
29. Micó, J.C., Caselles, A., Soler, D., Sanz T., & Martínez, E. (2008a). *A Side-by-Side Single Sex Age-Structured Human Population Dynamic Model: Exact Solution and Model Validation*. *Journal of Mathematical Sociology*, 32, 285-321.
30. Micó, J.C., Caselles, A. & Romero, P.D. (2008b). Space-Time Dynamical Models. *Kybernetes*, 37(7/8), 1030-1058.
31. Milanovic, B. (2003). The Two Faces of Globalization: Against Globalization as We Know It. *World Development* 31-4, 667-683.
32. Moncho, J.R. (2003). *Teoría de los valores superiores*. Valencia (España): Campgràfic Editors.
33. Moshirian, F. (2003). Globalization and financial market integration. *J. of Multi. Fin. Manag.* 13, 289-302.
34. Murtugudde, R. (2009). Regional Earth System prediction: a decision-making tool for sustainability? *Current Opinion in Environmental Sustainability*, 1, 37-45.
35. Nissanke, M. & Thorbecke, E. (2010). Globalization, Poverty, and Inequality in Latin America: Findings from Case Studies. *World Development* 38-6, 797-802.
36. Onishi, A. (2005). Futures of global interdependence (FUGI) global modeling system Integrated global model for sustainable development. *Journal of Policy Modeling* 27, 101-135.
37. Onishi, A. (2007). The impact of CO2 emissions on the world economy Policy simulations of FUGI global model. *Journal of Policy Modeling* 29, 797-819.
38. Onishi, A. (2010). A new challenge to economic science: Global model simulation. *Journal of Policy Modeling* 32, 1-46.
39. Rees, W.E. (2006) Globalization, trade and migration: Undermining sustainability. *Ecological economics* 5-9, 220-225.
40. Rock, M., Murphy, J.T., Rasiah, R., van Seters, P., & Managi, S. (2009). A hard slog, not a leap frog: Globalization and sustainability transitions indeveloping Asia. *Technological Forecasting & Social Change* 76, 241-254.
41. Rojas, M., (2007). Heterogeneity in the relationship between income and happiness: A conceptual-referent-theory explanation. *Journal of Economic Psychology*, 28, 1-14.
42. Saltzman, M.B. (2008). Globalization, religious fundamentalism and the need for meaning. *International Journal of Intercultural Relations* 32, 318-327.
43. Sanz, M.T., Micó, J.C., Caselles, A., Soler, D. (in press). *A stochastic model for population and well-being dynamics*. *Journal of Mathematical Sociology*.
44. Singh, R.K., Murty, H.R., Gupta, S.K. & Dikshit, A.K. (2012). An overview of sustainability assessment methodologies. *Ecological Indicators* 15, 281-299.
45. Sokolov, A.P., Schlosser, C.A., Dutkiewicz, S., Paltsev, S., Kicklighter, D.W., Jacoby, H.D., Prinn, R.G., Forest, C.E., Reilly, J., Wang, C., Felzer, B., Sarofim, M.C., Scott, J., Stone, P.H., Melillo, J.M. & Cohen, J. (2005). MIT Integrated Global System Model (IGSM) Version 2: Model Description and Baseline Evaluation. *Report No. 124 July 2005*.
46. Swart, R.J., Raskin, P. & Robinson, J. (2004). The problem of the future: sustainability science and scenario analysis. *Global Environmental Change* 14, 137-146.
47. Todorov, V. & Marinova, D. (2011). Modelling sustainability. *Mathematics and Computers in Simulation* 81, 1397-1408.
48. Tomohara, A. & Takii, S. (2011). Does globalization benefit developing countries? Effects of FDI on local wages. *Journal of Policy Modeling* 33, 511-521.
49. Turner, G.M., Hoffman, R., McInnis, B.C. Poldy, F. & Foran, B. (2011). A tool for strategic biophysical assessment of a national economy: The Australian stocks and flows framework. *Environmental Modelling & Software* 26, 1134-1149.
50. van Vliet, M., Kok, K. & Veldkamp, T. (2010). Linking stakeholders and modellers in scenario studies: The use of Fuzzy Cognitive Maps as a communication and learning tool. *Futures* 42, 1-14.
51. Wallace, M., Gauchat, G. & Fullerton, A.S. (2011). Globalization, labor market transformation, and metropolitan earnings inequality. *Social Science Research* 40, 15-36.
52. Webster, M., Sokolov, A.P., Reilly, J.M., Forest, C.E., Paltsev, S., Schlosser, A., Wang, C., Kicklighter, D., Sarofim, M., Melillo, J., Prinn, R.G. & Jacoby, H.D. (2009). Analysis of Climate Policy Targets under Uncertainty. *MIT Report No. 180 September 2009*.
53. Wilpert, B. (2009). Impact of globalization on human work. *Safety Science* 47, 727-732.

**Contribute to construct a better
Wellbeing/Happiness
World**

Join a global modeling team

Many thanks for your attention