Applying interdisciplinary studies to social systems

Detailed Abstract
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In Social Sciences it is very difficult to find some issue that can only be analyzed from the point of view of one discipline.
Our current social structure is so complex that it demands taking into account different perspectives from different disciplines.
When we observe a social system it is essential to recognize a complex net of interrelationships among its elements, thus a systemic point of view is required:

1. there are circular causal relationships
2. the system is dynamic, it changes in each time unit
3. it has so many elements and interrelationships that it is impossible to cope with them only using our mind or mental models
4. when we analyze the behavior of a social system, usually, we do not want only to know it, but to study alternatives to change it in order to correct non desirable effects
5. it is essential a long term view of the possible scenarios, something that is impossible for only mental models
6. it is necessary to integrate in the analysis all the different disciplinary perspectives that are required, depending on the system and the aim of the analysis we are doing

This framework requires some special tools that enable us to put our research into practice with all these features.
Dynamic System methodology provides that tools.
This Dynamic System tool provides us with a powerful decision support system. The decision makers can support their hypothesis rather then choosing alternatives only intuitively. Sometimes when we make a change, to know if the result will be good or not, we need to wait a period of time and analyze the new state of the system. So, if the results are not like we expected, the system will be worse than before.
Using Dynamic Systems we can build an interesting framework where the different disciplines can share aims, concepts and methodologies, working together on the same object of study at the same time.
The Dynamic System starts from the General System Theory and the Cybernetics of the second order concepts. To put it into practice, we need to build a model where we can include all the perspectives of the interdisciplinary team. So, all the team must agree on the observed behavior and with it representation.

This model, made of causal-effect arrows, joins the elements of the system showing us the interrelationships among them.
This is the first step to allow the team to evaluate the possible effects if some change is introduced into the policies that regulate the behavior of the system.
Deciding means to choose one out of many possibilities. The decision process will depend on the particular interest of the decision maker.
If the decision maker is an economist, he will analyze the financial aspects of the project: investment, profits, the current value of long term cash flow.
In health policies, for example, if the decision maker is a physician, he will focus on the health of the people without considering other aspects like resources, impact on the labor market, etc.
A politician will be interested in the impact of his decisions on public opinion.
The importance of working interdisciplinary rests not on a sum of established rules, but rather on a unique coordination of disciplinary insights where each disciplines plays its own roles in the overall composition.

A real case where this methodology was applied:

In Lisbon Conference, (July 2004), I introduced a paper showing a research where an interdisciplinary team interacted using Dynamic System methodology.
First of all, we analyzed the whole system showing and sharing our mental models.
From this start point we agreed on a causal-effect graph that represented the behavior of the system under analysis. (see figure 1).
After this, a mathematical model was made and calibrated. The calibration was done using statistics based on data collected in previous period.
The mathematical model was prepared from the stocks and flows graph we can see in figure 2.
In this graph we can see all the particular perspectives of the team integrated: the economist, the physician, the politician, statistician and sociologist.
This is only an example, but it can show the usefulness of this methodology. This example shows us how we can use this methodology in all the different situations we may deal with.
In figure 3 we can see the different domains of the interdisciplinary team interacting in the same model. Into the green circle, the physician's point of view; into the red circle the politician's focus; into the violet the economist's position, and into the black the sociologist's interest.
This simulation model aims to introduce and show the interrelationships among the components of the system, and to measure the possible effects when we implement specific health policies. This case takes place en a poor area of the city of Rosario (Argentina). Once the model is finish, it must be calibrated.
Calibration of the model means to adjust parameters in order to obtain the expected results. First, a model was prepared to represent

a period of time already passed. Then, results were compared to real data previous collected. After adjusting some parameters, a model was calibrated. Results from this model were very close to real data.
If this model could represent the different states of the system of a previous period, it could also show what will happen in the in the future, and what will happen if some parameters or policies of the system are changed. To sum up: the simulation of this kind of models answer the question "what would happen if … " from an interdisciplinary perspective.

Causal-Effect graph

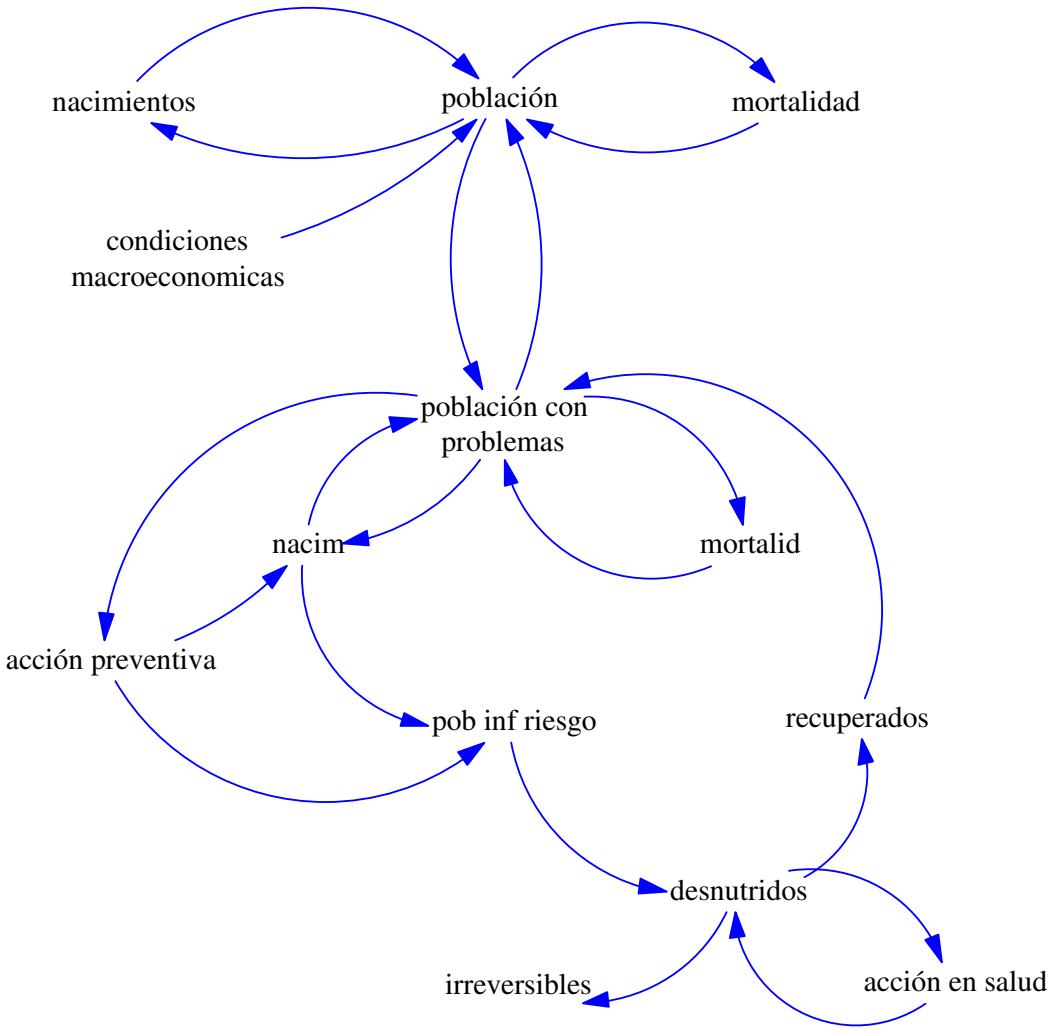

figure 1

Flow and Stocks graph

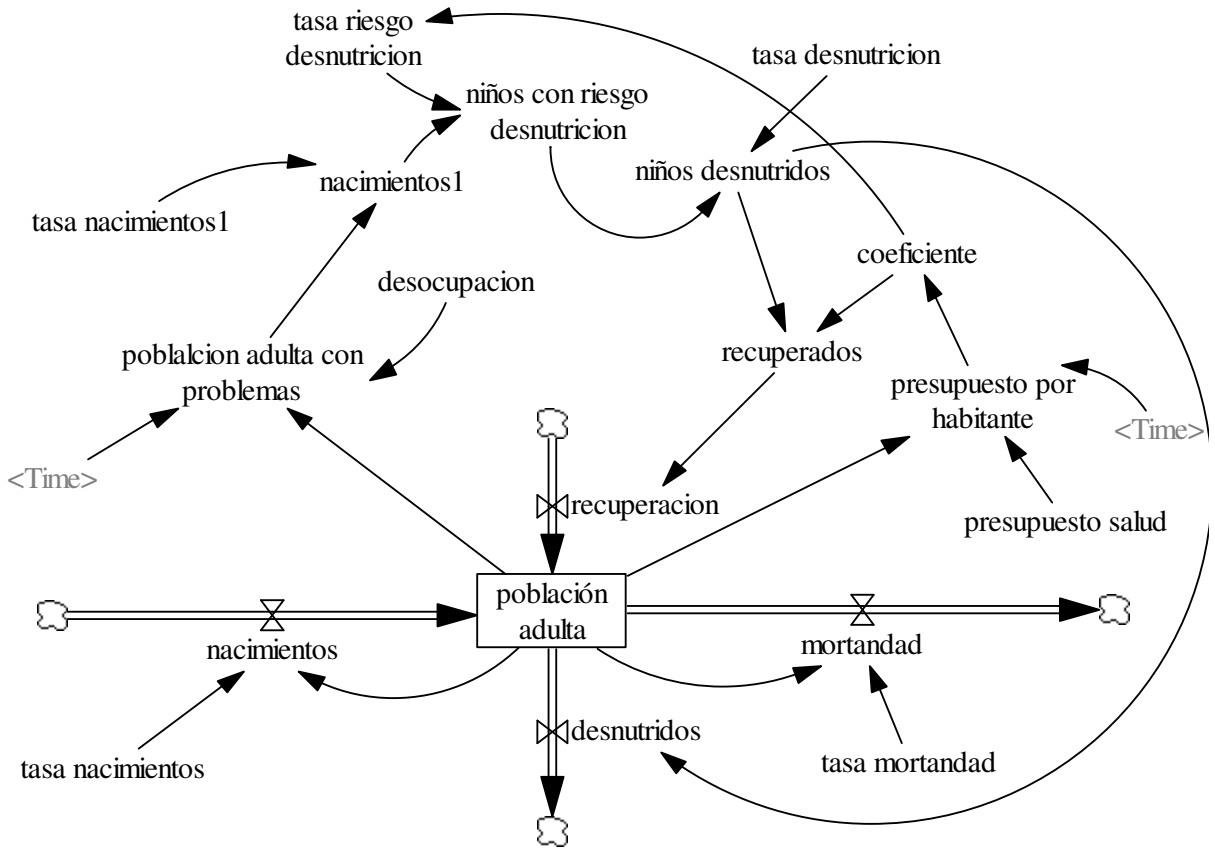

figure 2

Intersection the interdisciplinary domains

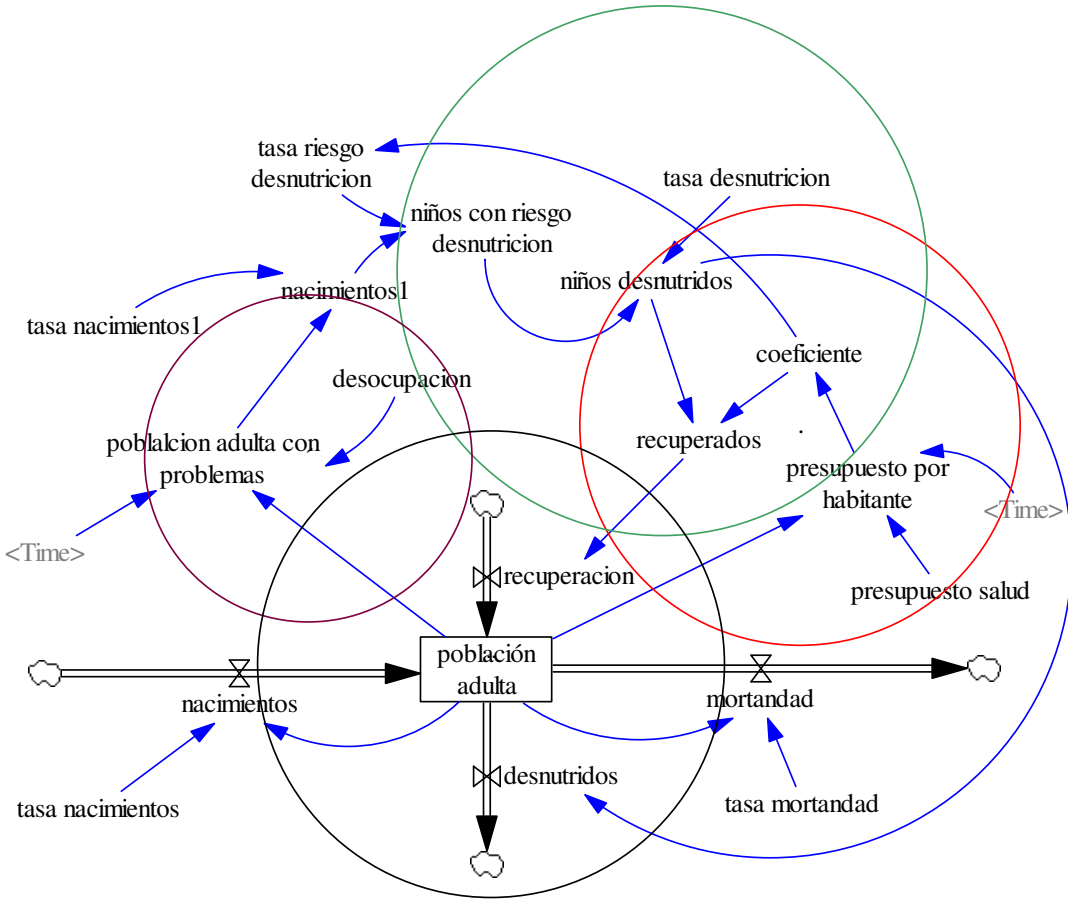

figure 3

Into the green circle, the physician's point of view; into the red circle the politician's focus; into the violet the economist's position, and into the black the sociologist's interest.

To Sum Up:

With the simulation of the model, we can probe our hypothesis without affecting the real system.

This methodology enables us to include all perspectives of the interdisciplinary team.

This kind of analysis enables us to work with the governing concept rather than with the controlling concept:

- Controlling implies getting some feedback; acting AFTER things happen.
- Governing, according to cybernetic, doesn´t depend on previous events, but rather it anticipates them. It implies acting BEFORE things happen, it is a feed forward process.

Somebody can think that this work attempts to improve upon the ability of a model to predict certain events, and this is worthwhile, but perhaps overly optimistic. But, in a real situation, working with a real system, when we, as sociologists, need to propose one alternative to change the system in order to make it better, how we support our decision? Because this alternative is cheaper? Because it is easier? Because we suppose, intuitively, that it is better? Perhaps, all these "methodologies" are more optimistic than using a scientific methodology that provides a decision support system. Or perhaps the problem is to consider that sociologists can only teach or do some research, but we can work in private enterprises or for the government, supporting and making decisions, decisions that will change the system we are working with. And one of the main issues we must take into account is to have an idea of the effects of our decisions, and in order to do this, we need a decision support system.

To make decision without using a decision support system is really "optimistic". We can find a lot of examples of these kind of decisions, made without analyzing its possible effects, or without a decision support system that let us have a long term view of the possible values of the principals variables. Politics and economics are fertile ground for this type of improvisation.

Politicians and economists resort to trial and error, affecting the system on which they operate.

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SOFTWARE utilizado: Vensim (versión académica obtenida gratuitamente de Internet)