# SIMULATION MODELS FOR THE KNOWLEDGE MANAGEMENT AND ITS MEASUREMENT (How can we apply the theory of the sociocybernetics in our concrete professional work or empirical research?)

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All action of management requires of feedback processes that allow to control the results that are obtained, and that make possible remedial actions before the verification of deflections with respect to the established goals. It cannot either be omitted to have in consideration that the knowledge management will be carried out within a structure, where a system develops his drives. Therefore, it is essential to analyze the effects that this management can cause in the other elements of the system, like also, the way that the rest of the elements of the system act on the management processes of the knowledge, or by its specific activity like by the consequences that on them generate the actions of the knowledge management.

Of such way, it will be important to elaborate a model of analysis and measurement that operates like a sysstem, considering the organization like a whole, and that allows to articulate the mutual influences between its constituent elements.

**The Simulation Models:** Since it is tried to analyze the behavior of the system in the time, and its reaction before different stimuli caused by decisions taken by his directors, the Systems Dynamics, by means of the simulation models, facilitates the technical tools necessary to make specific this one work.

The Systems Dynamics provides conceptual and methodologic elements that allow: a) to analyze the possible effects of decisions to take as far as its repercussion on the system in the medium term. b) to consider the delays between the decision making and the effect of the same one. c) to corroborate our hypotheses outside the real system. The model to elaborate will have to allow to articulate different the subsystems from the organization showing the existing network of interrelations among them.

In addition, of the causal relations (cause - effect) that are detected will arise in natural form the actions to be measured by indicators. A permanent one will settle down therefore to calibrate the model on the basis of the measurements of the indicators, which will allow to maintain updated the possibility permanently in front of of simulating behaviors caused by possible decisions new alternatives or changes in the institutional policy.

**Construction of the Model:** The model that appears in this article, follows the conceptual scheme proposed by Kaplan and Norton that in their publications relative to the control panels (balanced scorecard) consider possible to present/display an organization like the joint of four perspective: 1. - financier 2, - clients or public 3, - internal, processes 4, - learning and growth

They were prepared in the first place, and to the single effect to facilitate its understanding, the diagrams of levels and flows (produced from the respective causal diagrams) of each one of the 4 perspective before indicated, presenting/displaying them like independent organizations. Of such way the flow of relations within each subsystem could be observed in detail. Next the 4 sectors were united appearing this way the flows of existing relations among them (to see diagram). It is demonstrated the degree of mutual dependency of his elements thus, and how, an action (decision) that affects some will repel in another one, even of another subsystem.

In order to be able to simulate this one model (to prove the effect of a possible decision) it is necessary to express the interrelations of its elements in form of mathematical equations. Once calibrated the system of equations, it will be possible to be proven in the model which will be the behavior of the main variables submited to some change in one or several of them.

**Virtues of the Simulation:** When simulating the effect of decisions in a model is obtained:

1. - not to incur the dangers to experiment on reality

2. - to immediately observe the effects of the changes proposed without waiting for the course of the time to measure them.

(SEE CAUSAL DIAGRAM)

THREE SIMULATIONS WITH THE MODEL: We could summarize mentioning that is wanted to verify two hypothesis, or to choose between two alternatives the best one from the point of view of the intellectual capital: Hypothesis 1: the contribution of the State in their present two forms (expenses of operation and infrastructure investments) impels to the increase of the intellectual capital and the pick up of public. Hypothesis 2: the contribution of sponsors takes to the increase of the intellectual capital of the institution and to a greater pick up of public, causing therefore the possibility of increasing the contributions by sponsors.
The simulation and the same structure of the model would quickly allow to corroborate second of the hypotheses. Observe in the flows and stocks chart the loop conformed by the following variables: Intellectual Capital > projects > pending projects > finalized projects > public cattle B to B (boca.a.boca) > cattles > users > donations > knowledge management > scholarships > (Intellectual Capital) cattle > Intellectual Capital. In this one tactical mission of the Museum, although the state contributions are essential for the maintenance of an suitable structure, others are the slopes that mobilize the work properly intellectual-professional who gives dynamism to the institutional activity.
The charts would show to us:
m0 (in red): it reflects the evolution of the variables with the exposed original values in the set of you formulate mathematics corresponding to the calibration of the model.
m1 (green): the variable tsubsidios in periods 5 and 10 changes. In t=5 one goes from $10,000 to $20000; in t=10 á $15.000 goes of $ 0. It is observed that the variations of the impact of the introduced changes are of very little meaning, since, the measured values are almost coincident with those of the original bullfight.
m2 (blue): The change that is analyzed here is given in the variable tdonaciones; one assumes that as of period 3 an additional constant contribution of $ 10,000 originating ones of a sponsor is obtained. Such contribution would produce a fort increase of the intellectual capital and therefore of the internal processes, with an interesting repercussion on the public gained by diffusion “boca.a.boca”.

(SEE SIMULATION CHARTS)

**As a CONCLUSION:** An important aspect to stand out: the boarding of qualitative variables essential in the consideration of a social system. The análsis of the simulation allowed to corroborate hypothesis 2 that it attributes greater weight to the obtaining of sponsors and its affectation to qualification, as far as the impact in the level of intellectual capital, at least in the present institutional conditions of the Museum. And this has been corroborated analyzing the nonsingle behavior of Intellectual Capital variable, but also the one of the Public variable that would almost present/display a growth of the same magnitude that the reflected one by the scene of hypothesis 1. In addition, it also is in evidence that before the increase of the intellectual capital greater professional requirements will arise and more projects will be generated, as it can be observed in the curl conformed by the following variables: Intellectual Capital > projects > pending projects > hirings > cattle > Intellectual Capital. Although this one loop appears at first like booster, its balance is determined by the use of a table that reasonably regulates the incorporation of professionals based on the pending projects. Another interesting observation can be obtained if it gambles with different values for the “grado from advance variable” (originally fixed to 1, with which one assumes that the initiated projects are finalized within the fixed temporary period - a year).
When the advance degree is superior, when finalizing itself quickly the projects, the requirements of intellectual capital are reduced, reducing in addition the necessity to professionals; whereas when the advance degree extends a period, the accumulation of pending projects requires of greater amount of professionals impelling to raises it the Intellectual Capital. Here it would be necessary to sharpen the analysis, and to consider diverse types of

projects (short, medium and long term) with the object of correcting own anomalies to consider them globally. In short, the possibilities of combinations of different alternatives are showing after each simulation, the reactions of the simulated system, allowing to draw conclusions and to know their behavior intimately.

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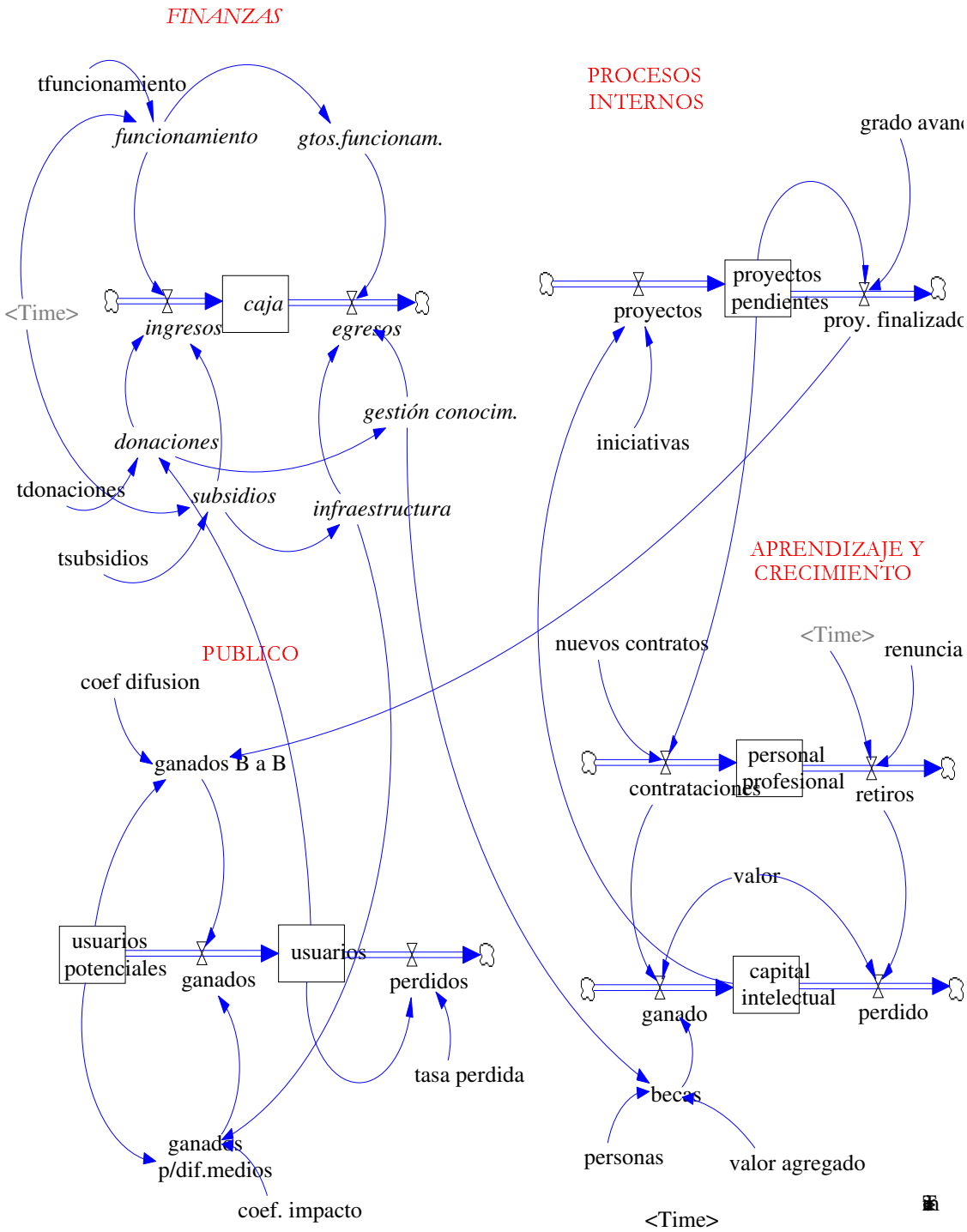
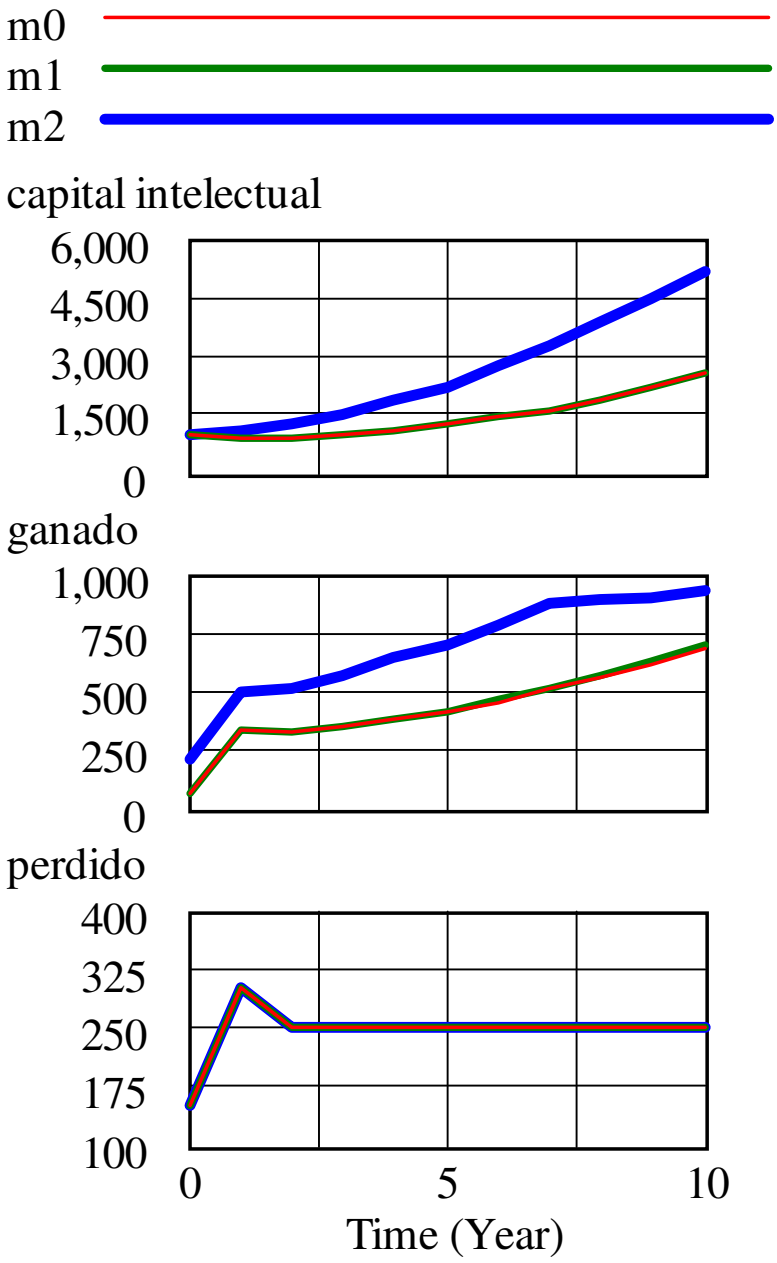
SOFTWARE UTILIZADO: Vensim PLE, versión académica

CAUSAL DIAGRAM:

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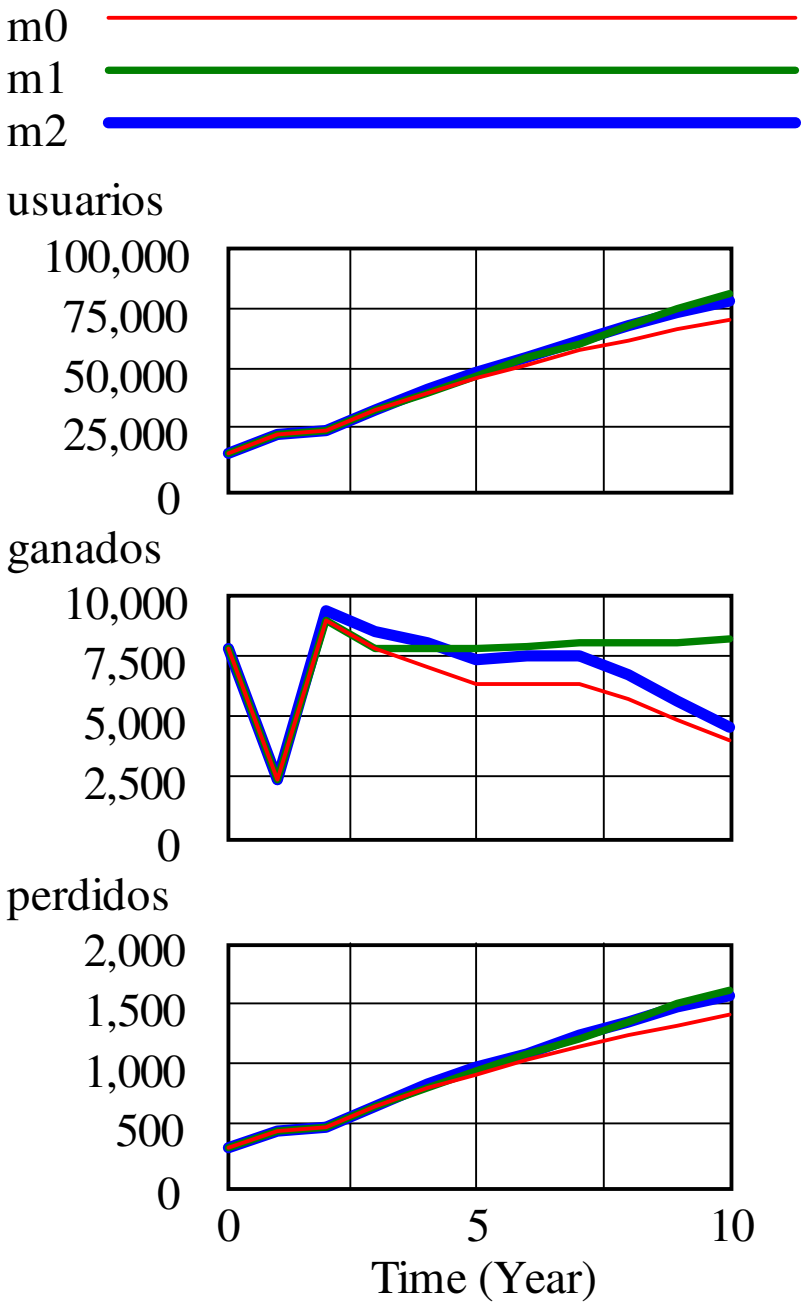
0
5
10
Time (Year)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0
5
10
Time (Year)