Process of Making the Organizational Simulation Modeling at the Microsocial Level of a Faculty

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Abstract

This article proposes to bring to the specialists' attention to the necessity of understanding of any organization as a natural system with complex self-regulation. Basing on such comprehension, the manager is able to conceive descriptive, evaluative and integrator models, by means of study, through simulation on computer, the variation of different parameters of internal working at the modification of the interactions with the medium or at different decisional alternatives. This way is achieved a sufficient precise and flexible conversational forecasting of the ways of functional and economic optimization, available for decisional factors, that avoids significantly the empirical experiments, usually the confusing ones, on the real organization and of course the implicit or explicit inducted loses. It will be showed general considerations of technological and managerial modeling of a faculty and also of the auto-adaptability through negative converse informational reaction, the basis for the understanding of the subjective social and organizational self-regulation.

Keywords: *technological flow, technological modeling, descriptive and evaluative managerial modeling, simulative model of systems with informational reaction, auto-adaptability.*

JEL classification: I21, I29, M15.

Introduction

Ensuring the convergence of the educational moves attempted individually by the teaching staff, by adopting a unitary view of the concepts and terminology at the organizational level, must be one of the topmost priorities of educational managers especially in the higher education, because the nonchalant style can be transmitted along all the indirect amplification loops, towards the pre-academic education system, and, even more seriously, towards the governing system. The systemic approach could be one of the profitable manners of making diverging views and opinions came closer.

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Most references mention the work of the systemic approach as one of the most clear, coherent and effective ways of understanding the socio-economic realities and to increase individual and organizational performance. Systemic approach could be a way to approximate the points of view.

Worldwide use of increasingly more simulation modeling systems to optimize their structural and functional. Method becomes an extension of the increasingly high economic and social, which supports the introduction and its use in education management and especially in investment and formative optimization from higher education.

Knowledge has become so developed that in recent decades have felt the need for systematic information, to be easily verified their authenticity so that the research does not become a redundant process (to rediscover the same level, which is known under different expression) and to avoid unnecessary stress by distorted multiplying of the information about the same reality (the current state of work in higher education, passed in all other social spheres) (Niculescu & Buda, 2010). So huge level of information requires a different approach to knowledge and human behavior.

From this objective need arose knowledge system approach, which starts from general to particular in the ordering information on systems, from the most comprehensive, the universe, to the smallest division, the atom, without being considered limits knowledge (Kezner, 2010).

1. The basic elements of organizational simulation modeling

1.1 The necessity for delimiting the technological model-analyses from the managerial ones

Technological model-analyses are strictly specialized models (i.e. belonging to the field of engineering, economics, finances, etc.), which need a knowledge of a number of highly detailed, as well as mathematical sciences at an expert level, which is unnecessary to general managers and employers. They are significant for the managers of the organizational components.

At the level of any organization a managerial team cannot be set up, who are able to conceive and efficiently use organizational simulative models (Ceauşu, 2002) without basing them of the same general managerial theory. It is obvious that, at the level of the components, there will be different, albeit integrative, theories of expertise deepening, which is impossible currently, through the “playing at concepts”.

The general managers (the top of the managerial career), who, as a general rule, lack sufficient mathematical expertise, take over, in a conscious manner – at the descriptive level, the performance and interconnection parameters established by technological means (Bălăceanu & Nicolau, 1971), and need a simplified, functional model, which should describe the reaction of all the component parts, when the parameters of one or several of them is modified. Such modeling, a purely informational one, would rather be designated by the name of managerial modeling, as it serves to achieve the study of the organizational behavior on making various decisions or / and on being perturbed by those who are in leading positions.

1.2 Technological modeling and managerial modeling

Any organization can be technologically modeled (i.e. starting from the artificial means interconnected and structured according to the posts) (Ghiţescu, 2002) in the components in Figure 1. All the subsystems of the organization are inter-knitted, making up a neuronal-type structure, where the interactions hold between any one of them. Understanding this structural and functional complexity is difficult if there is no systemic approach and suitable delimitation of the technological model from the managerial one (Guiaşu, 1968). In keeping with the size of the organization, the subsystems can exist as distinct, relatively autonomous subsystems, or else in cumulative structures.

Technological optimization by means of simulation can be achieved via the methods of operational calculus, applied in a differentiated manner from one subsystem to the next (in C. Raţiu – Suciu (2001) enough illustrations are presented). It precedes the managerial modeling, because it is now that the optimized (i.e. necessary) functional parameters of state are established. It does not fall under the scope of the present study.

1.3 The managerial modeling of the informational reaction (i.e. social) systems

1.3.1 General considerations

A general theory of organization (or system) managerial modeling is put forward by Forrester (1979), presented in Raţiu – Suciu (2000) and in other papers and studies as a conversational simulative modeling method of maximal generality and managerial usefulness.

Essentially, it simplified the understanding of organization functionality and self-regulation, through studying and analyzing at least 6 integrating flows: the order and production flow, the personnel flow, the equipment flow, the raw material flow, the money flow, and the information flow (Forrester, 1979). These flows are to be found in all the circa 13 component parts (see Figure 1.) of any organization, and can be detected on a social scale, as well as in the family (the primary social component).

Any general manager must have a minimal level of professional information coming from all the technological components in order to correctly understand the functional parameters and their degree of inter-connectivity, and also in order to have a productive type of communication with the specialists who designed and executed the various expert systems in use, or who are exploiting them. This is one of the issues that are not part of the current academic training, and this is the basic reason why the theory of simulative modeling, an extremely simple theory, cannot become an instrument of managerial practice, as well as of governing.

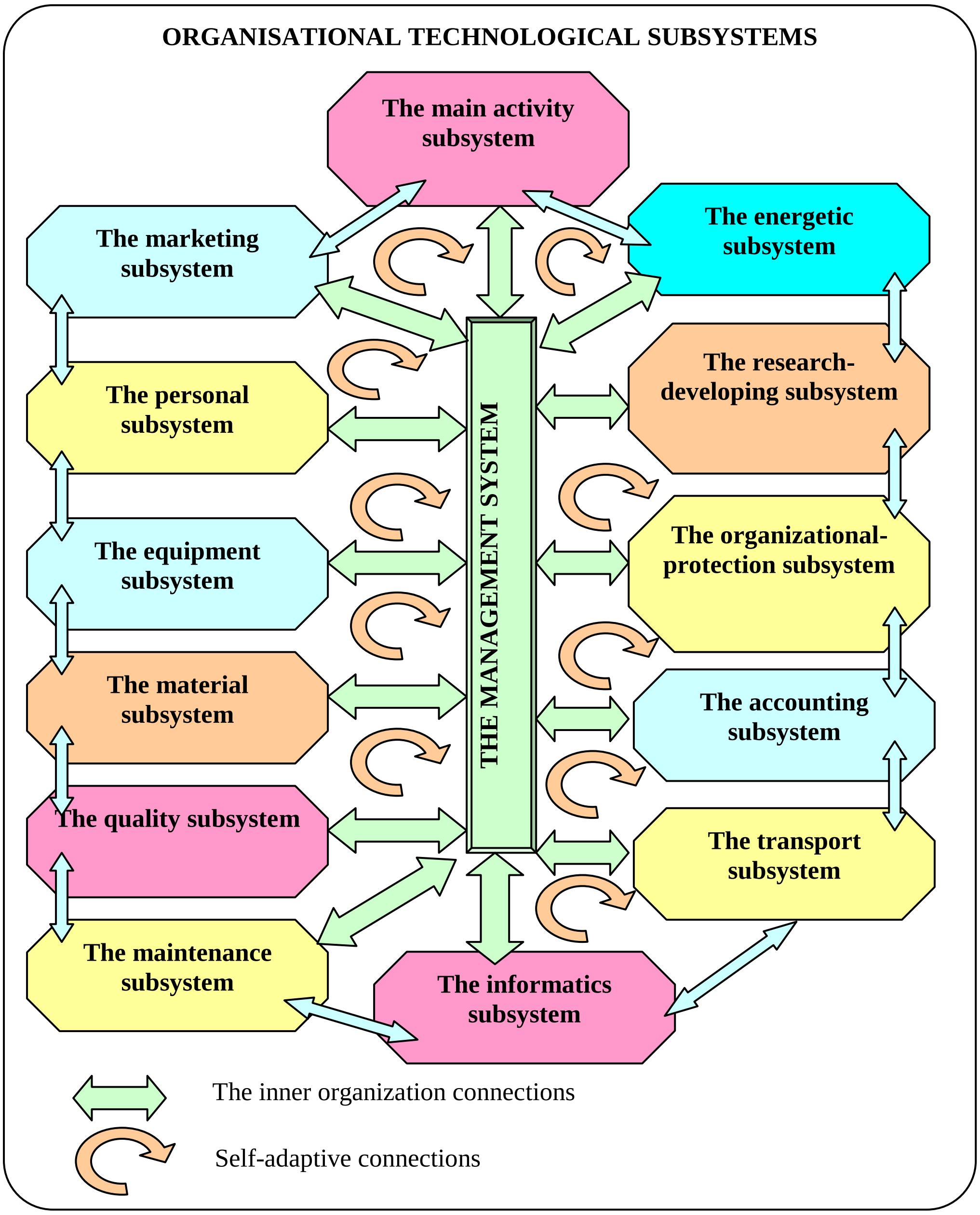

Figure 1 The simplified technological model of any organization

An organization's technologies do not change continuously, but at well defined intervals, and they represent an important factor of labor productivity, as well as other indices of economical and social performance. That is why only seldom it is necessary to introduce the equipment flow into the model as a distinct entity.

Once a technology purchased, the performances of the organization are conditioned by the appropriate manner in which it is run, that is by the harmonization of the interaction of the technologies with the other components, and the mutual inter-action of the components, which can be made efficient through the simulative modeling of the organization.

A high-performance, efficient organizational simulative model cannot be realized without all the managers knowing the same general modeling theory, apart from those appertaining to their professional fields. Once put into place, and updated, it becomes an important source for diminishing managerial intellectual stress, on account of its possibilities of anticipating, in a sufficiently accurate manner, the complex consequences of a certain decision or perturbation (Kezner, 2010)

1.3.2 The managerial descriptive model of a faculty

After the technological optimization, the approx. 13 components described in Figure 1. is it wise to achieving managerial descriptive simulation model of the faculty, by representing the principal flows of it and how they interconnect.

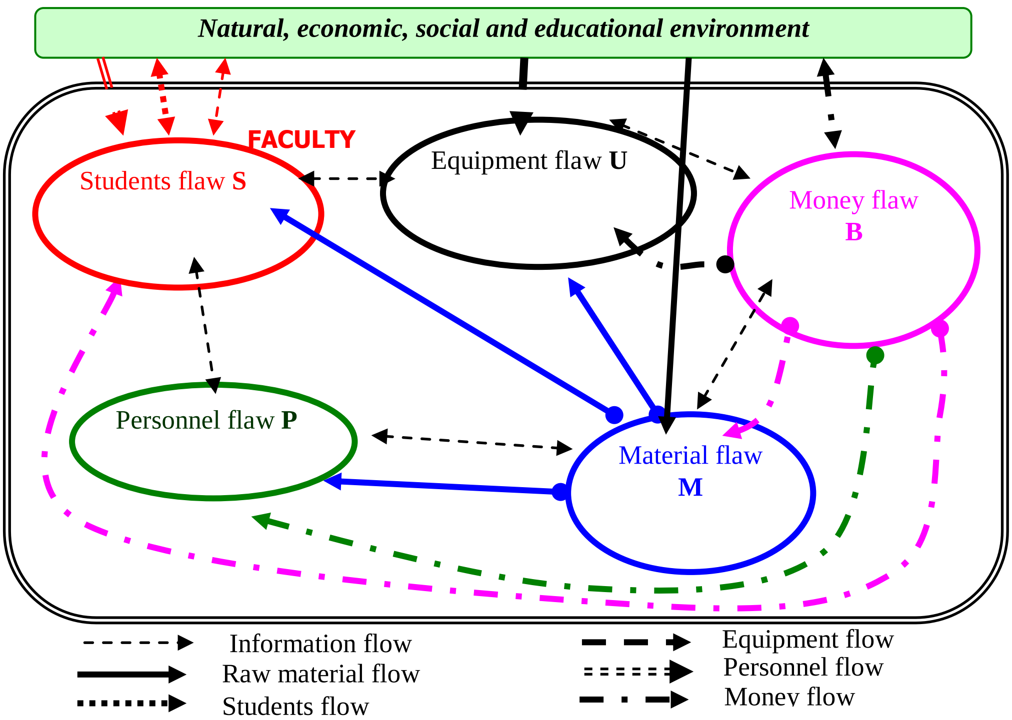

Figure 2: Simplified descriptive managerial model of the Faculty of Mechanics and Technology

The main flows the faculty leadership must acknowledge and study them through simulation modeling, are presented in Figure 2.

The main flows represented in the scheme are**:**

- ✓ The orders and their fulfillment;
- ✓ Personnel flow;
- ✓ Equipment flow;
- ✓ Raw material flow;
- ✓ Money flow**;**
- ✓ Information flow.

The flow of information, computerized system component, makes the informational, negative reverse connections, for all other flows.

1.3.3 Description of the main flows of the faculty

Flows shown in (Figure 2) have the following features, at an educational institution level, to economic or social organizations:

✓ *The orders and their fulfillment flow* = stream pupils (students) flow, is composed of students of bachelor, master and doctoral;

- o an amalgamation level included in the study: 100%.

✓ *Personnel flow*:

- o Staff: teachers, teaching aids, logistics.

The teaching staff includes teaching post holders on 4 levels: professor, associate professor, lecturer and assistant. Teaching aids staff, it is considered necessary to cover staff teaching fractions loads from all disciplines. Logistics staff includes post holders of the secretarial and lab workers;

✓ *Equipment flow*, is simplified and includes two categories:

o teaching *spaces*, which mean the classrooms (amphitheaters), seminar/applications rooms and laboratory halls on disciplines. Analyses are not taken into administrative areas (offices for management, teaching, warehouses etc.).

o *modern teaching technologies*, which include:

- technological resources for teaching and learning disciplines, in equipping laboratories and other teaching areas: machine tools (lathes, milling, planers, drilling machines, universal machines, presses, dies, grinding, welding machines, milling machines by copying, industrial robots, etc.), automotive parts, teaching models, stands diagnostic instrumentation research, etc.. Some machine tools, vehicles and parts are cut, in order to study their actual structure and functions. The others are used for practical work;
- electronic procurement and processing of technical information, electronic teaching and learning (computers, projectors, video cameras), general and specialized software for design and management assistance, electronically copying (xerox, printers), servers, networks etc.

- ✓ *Raw material flow*:
  - o *teaching*: refer to books, courses, consumables (paper, chalk, markers etc.).
  - o *logistics*, include maintenance consumables for indoor and outdoor;
- ✓ *Information flow:*
  - o Classical library, with works from specific disciplines and research of FMT;
  - o Virtual libraries, include information in electronic form on the work of undergraduate, master, doctoral, and course materials provided by teachers of the FMT to the virtual environment;
- ✓ *Money flow*:
  - o *financial sources* are located in the state budget for scientific research (grants), European funded projects, counseling contracts, sponsorship and donations, driving schools, micro-production;
  - o *money necessary* is determined as the sum of all expenses necessary to carry activities and development objectives of FMT. Education institution is not producing profits, so the difference between revenues and current expenses are invested in developing and expanding activity;
  - o *financial obligations* include all categories of expenses to the state, staff, students, suppliers of raw materials and consumables, to project and contracts partners**.**

1.3.4 The phases of the making of the organizational simulative modeling

a. Those flows are identified that had an insignificant dynamics over the period of interest, in order not to be explicitly included in the model;

b. The integrated descriptive managerial model of the organization is drawn, as well as the symbolization of each flow included;

c. Within the technological model of the subsystem specific to the basic activity concerned (commerce, production, education, transport, etc.) the signification is localized of the functional of the main indices: real level, necessary level, real stock, necessary stock, adjustment time (of shifting from the real level to the necessary level), the level of the orders which failed to be accomplished, the level of the orders which were accomplished, the parameters that condition the carrying out of the orders, etc.;

d. The descriptive managerial modeling is realized of the most important flux, on which all the other flows depend: the flow of orders and that of their carrying out, and, starting from it, the mathematical model of simulation;

e. The other flows in the integrated model are modeled;

f. A comparison is made between the dynamics of the organization, after the utilization of the model for maximizing its results, with the history of the organization, with its actual evolution, and the respective, justified corrections are added;

g. The decisions optimized through simulation are applied to the real model, and the differences are analyzed, which occur over a significant period of time;

h. The simulative model is corrected, with a view to minimize the differences.

2. The auto-adaptability through negative converse informational reaction, the basis for the understanding of the subjective social and organizational self-regulation

Auto-adaptability or self-regulation is the capacity of living creatures to modify the parameters of the various flows in keeping with the interactions with the environment. Such modification takes place permanently, and keep the respective parameters around average values that differ in accordance with the individuals, species, etc., as well as the biological periods involved. For instance, bears, snakes, frogs and other suchlike creatures have periods of hibernation, when all their bio-functional parameters are minimized. The modification of the food inflow, the adjustment of the bio-rhythms of respiration and blood-circulation to effort, and of body temperature in keeping with that of the environment, are a few examples of natural auto-adaptability. The processes of natural self-regulation can also be found in humans and human society.

Self-regulation through informational reaction is specific only to man, and springs from the intellectual energy acquired through education. It is due to it that the educated human individual (one’s personality) becomes aware of both the loops of natural self-regulation, and those determined by the own interaction (human communication). Thanks to self-regulation, the human individual and the organized human group can modify their specific form of auto-adaptability: the behavior, across an extremely broad range, situated between normality (rationality), and abnormality (irrationality). Self-regulation through consciousness and rationality is spiritual in nature, and will be henceforth designated by the name of subjective or spiritual self-regulation.

The descriptive model of self-regulation through negative informational reaction, lying at the basis of managerial simulative modeling, is proposed by Forrester (1979) and processed in Figure 3, for a learning process. It is composed of only one loop, that of the flow, which contains: a decision (pace, LP), a level (RL), and a negative converse informational connection. A system that can be modeled only through these three elements is called a first-order system.

The mathematical model does not start from a formal mathematical logic, as in the cybernetic models, but from the real connections between parameters, identified through the descriptive model, in this way:

- The student who wants to reach the NN of their knowledge over the period of time TA must periodically compare NR with NN, and adopt a learning pace LP over a time interval (i,j)=dt, dependent on the TA parameter, having the following form:

$$LP.ij = (NN - NR.i) / TA, \quad [\text{units / week}] \qquad (3, R)$$

• The level of the knowledge at the end of the interval whose duration is dt∈ TA will be:

NR.j = NR.i + dt*LP.ij , [units] (4, N)

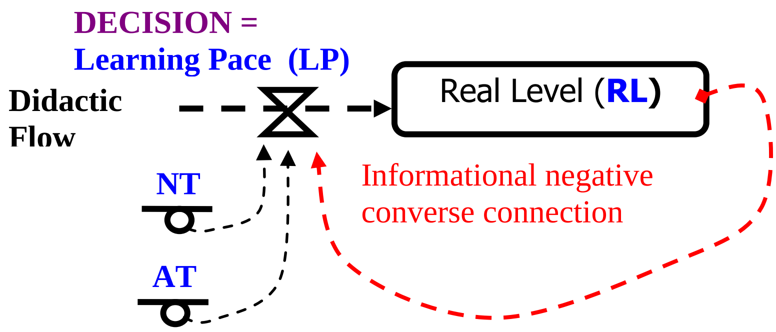

Figure 3: Self-regulation through informational negative converse connection

By integrating the two equations (3,R; 4,N), which is done by utilizing the facilities of the Excel programmer, over the time interval wanted, and by making a graphical representation, the resulting diagram is that presented in Figure 4.

The reaction is said to be negative if the pace adopted through the decision, LP, is in converse variation as to the variation of its effect, NR. The system's reaction is informational, as the form of energy of the reaction is human information (intellectual energy).

It can be noticed that, irrespective of the duration of the system's (i.e. the studies) existence, the real level of the NR flow will not exceed the necessary one, NN, so it limits itself.

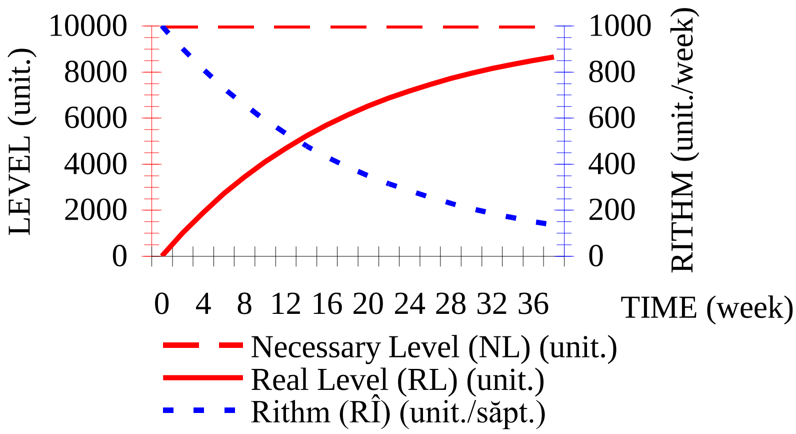

Figure 4: Dynamics of first-order self-adaptive systems

To conclude, the functional variables (RL, LP) of the first-order self-adaptive systems *vary in a non-oscillating manner*, and are dependent on the following parameters: NN and TA.

Conclusions

❖ Organizational simulation modeling can't be applied without a systemic approach to knowledge and management;

❖ Organizational simulation modeling allows not only increasing the overall efficiency of investment process and micro-level education, but also study the dynamics of indicators to assess the efficiency of investments in modern academic training;

❖ In terms of management, by simulation modeling can be identified more easily than in any other way, the main ways of achieving policy objectives;

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