MANAGEMENT OF THE AGILE PRODUCTION OF THE COMPUTER ASSISTED INDUSTRIAL SYSTEMS

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Abstract

The essential problems of the communication refer to the following innovative denominations: modelling the agile production systems in the field of industrial engineering, the archemic models destined to optimize the Japanese concept project management, the reconfiguration of the human resources, in the agile production structure, information neuroexpert destined to the computer assisted agile production systems, the profitable inclusion of the systems into the digital economy, conclusions, references.

The computer assisted industrial systems models can be categorized into quantitative models (Belleman, Pontreaghin, Cost – present value), quantitative models (Laplace and Y Transformed and Leapunov – Thorn functions),statistical and dynamic models, determined and probabilistic models, optimization stimulation models. Below we present a few of the basic models:

Keywords*: computer-assisted industrial systems, prevention costs, failure costs, anticipatory management*

THE QUANTITATIVE MATHEMATICAL MODELS

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1. The Bellman functionals for discrete structures (d) and continuous (c) ones:

$$\begin{aligned} &Q_N^{(d)}(X_N) = \min \left[q_N(X_{N}, d_N) + (X_{j-1}) + \Delta X\right] \\ &X_{j-1} = t_j \cdot \left(X_j^{dN}, d_j\right) j = 1(1,......, N) \\ &Q^{(c)}(x,t) = \min_{\substack{u(t)\\ t\in T}} \int_{-t}^{b} q[M(t)u(t), t]dt \end{aligned} \qquad (1)$$

2. The Pontreaghin functionals for discrete structures (d) and continuous ones:(c)

$$\begin{aligned} &J_1^{(d)} \min_{Z_n;Y_n} \sum_{n=1}^{N} g_n(Z_{n-1}, Y_n) \\ &Z_n = T_n \cdot (Z_{n-1}; Y_n); n = (1.....N) \\ &J_1^{(c)} = \min_{y,x} \int_a^b f \cdot [x, y(x); z(x)]dt \end{aligned} \qquad (2)$$

$$j = (1,......N)$$

3. The functionals of the total present cost for discrete structures (d) and continuous

ones:(c)

$$Z_{tac}^{(d)} = \left[\sum_{j=1}^{n} (1+r_a)^{-i} \left(l_j + C_j + D_j - V_j + R_{tac}^{(d)} \right) \right] = \min im$$

$$Z_{tac}^{(c)} = \int_a^b \sum_{j=1}^{n} (1+r_a)^{-i} \left[l_i(t) + C_i(t) + D_i(t) - V_i(t) - R_i(t) \right]$$

(3)

The qualitative mathematical models can be written under the form of transfer functions for discrete structures (Z) and continuous ones (L) as follows:

$$F_s^d = \frac{S_j(Z)}{B_j(Z)} = \frac{1}{(1 - Z + aZ + aZ^2)};$$

$$F_{t_{cs}}^{(d)} = \frac{C_j(Z)}{B_j(Z)} = \frac{aZ(1+Z)}{1 - Z + aZ + aZ^2};$$

$$F_{n(L)}^{(c)} = \frac{0{,}860P(S) + Q(S)}{B(S)} = \frac{F_{t_B} \cdot F_{t_s} \cdot F_{t_{cz}} \cdot F_{t_t} \cdot F_{t_g} \cdot F_{t_c}}{\left(1 - F_{t_r} \cdot F_{t_s} \cdot F_{t_{cz}} \cdot F_{t_t} \cdot F_{t_g}\right)} \qquad (4)$$

$$F_{t_{2(L)}}^{(c)} = \frac{F_{t_s} \cdot F_{t_{cz}} \cdot F_{t_t} \cdot F_{t_g}}{1 - F_{t_t} \cdot F_{t_{cz}} \cdot F_{t_{r1}} \cdot F_{t_g} \cdot F_{t_s} - F_{t_s} \cdot F_{t_{cz}} \cdot F_{t_{r1}} - F_{t_t} \cdot F_{t_g} \cdot F_{t_{r2}}}$$

The problems of controlling industrial systems model with a functional generated by the form:

$$F_g = \int_{t1}^{t2} L[x(t); u(t); t] dt + M(x_0, t_0, x_f, t_f)$$

(5)

Singling out the functional (Fg) we reach the delimitation of the problems under the form:

L = 0, M = 0 – Bolza problem,
L = A, M = 0 – Mayer problem,
L = 0 M = 0 – Lagrange

The systems control optimization can be unilocal, bilocal and multilocal. If the optimization is performed as related to the command then we have to resolve a optimum command problem. If we express the command according to state units then we resolve an optimum control problem. An unilocal system optimization (S) requires resolving the differential equation (x) that describes the behaviour of the system and finding the solution under the form of the trajectory x(t) of the evolution of the analyzed structure, so that to respect the Lagrange type performance indicator (P). The mathematical model for this problem has the following structure:

$$S : x = f(x, u, w, p, t); x(t_0) = x_0$$

$$t \in [(t_0 + \infty)] \in R$$

$$x(t) = x(t_0) + \int_{t_0}^{t} f[x(t); u\theta(\theta w, p, \theta] \cdot d\theta$$

$$P : I_p = \int_{t_0}^{\infty} L[x(t); u(\theta(\theta w, p, t] \cdot dt = \min$$

(6)

where x, u, w, p, are state parameters (x), command ones (u), state ones (w), constructive ones (p):

INDUSTRIAL SYSTEMS OPTIMIZATION MODELS IN THE COMPUTER ASSISTED ARCHEMIC CONCEPT

Although the efficiency of an industrial system was measured always "in the most respected measure unit of all time – namely money" (Crosby), the concept of cost quality is relatively recent, beginning with the '40, was becoming ever more obvious that the enterprises needed a tool likely to evaluate in financial terms the measures taken in the field of quality assurance.

This tool, called "quality cost", got, over a relatively short period, a broad practical applicability, at the same time becoming one of the main subjects debated in the relevant literature.

Lesser defined quality costs as representing the "costs due to refuse, disturbances, inspections, tests, faults found by the purchaser, including the training programs in the field of quality, the product quality audit, the control and statistical analysis."

The methodology adopted by this enterprise was developed in 1957 by Masser and integrated into acost system, called "Quality Cost Analysis" Within this system, Masser delimited the following three categories of quality costs:

5) prevention costs
6) appraisal costs
7) failure costs.

Masser proposed that quality cost analysis should be performed by these categories, monthly or quarterly. The system he designed was taken over not only by the American enterprises, but also by some of the European enterprises, sharing quality cost by the three categories mentioned, being in the end generally accepted in the economic practice, starting from the Juran, Taguchi, Kedala models, and software engineering models.

Juran approaches widely the theme of quality in his work "Quality Control Handbook". In his opinion, carrying out products suitable to be used", that he groups by the following 11 categories.

i) The costs involved in the market study, from the point of view of identifying the customer quality requirements, of determining their probable attitude towards the new quality characteristics of the products.

j) The costs involved in the research and development with a view to transposing the concept of the products into specifications that allow the manufacturing, delivery and assurance of the service operations for the respective product;

k) the costs of the planning and manufacturing activities costs in order to assure some technological processes and equipment able to meet quality provisions;

l) the costs of maintaining the process and equipment working precision;

m) the costs due to human resources and materials necessary for the technological process control.

RECONFIGURING THE HUMAN RESOURCE INTO A NEW HIGH PRODUCTIVITY AGILE OPERATIONAL STRUCTURE

The manager of a company, in an economy dominated by competition, does not need to confine himself to obtaining profit, but to be concerned for his employees to hold the feeling of their total involvement in the future of the company. The motivation is the process by which the managers determine their subordinates to achieve as high a performance as possible giving them good reason to act that way. Renowned companies such as General Motors, IBM, Coca-Cola, succeeded in gaining prestige by personnel training and motivation managerial programs. Managers have the task to create adequate conditions for harmonizing the personal aims of the individuals with those of the organization. Although motivation is an individual experience, managers should find reliable connections between personal motivations and efficient activity.

Motivating the employee into obtaining performance involves two sets of factors:

The motivational optimum can be mentioned in two situations:

a) When the difficulty of the task is perceived (assessed) correctly by the subject, in this case the motivational optimum means the equivalence correspondence relation between the units of the two variables. If the difficulty of the load is high, it means that a high intensity of motivation is necessary to fulfill it, if the difficulty of the load is a medium one, a medium intensity motivation suffices to resolve it.

b) When the difficulty of the load is perceived (assessed) incorrectly by the individual, in that case, the individual either under appreciated the significance or difficulty of the load, or over appreciated.

NEUROEXPERT PROGRAMMABLE LOGIC CONTROLLERS AS A BASIS OF PRODUCTIVITY GROWTH

A programmable controller is an industrial mini-calculator specialized for tackling the sequential and combinational logic problems In a general form, it can be considered to be an equipment that allows the logic connections between a high number of inputs and outputs. Functionally, this equipment simulates logic structures with relays or integrated gates, substituting the cabled configutation by an elastic structure modifiable by programming. The process inputs are given by various command and detection elements included in au automatic installation: buttons (race imitators, position and level detectors, transducers. The controller outputs directs the drive of the execution elements of the types contactors, electrovalves, display elements, etc.

An essential difference between a programmable logic controller and a calculator constitutes the programming language. The programming consists in writing instruction sequences starting from a phase diagram, a state graphic, Boolean equations. Some controllers allow the use of graphic languages, viewing on a monitor the implemented circuit. The introduction of the expert systems into the industrial processes control target the following main aspects: productivity, enterprise organization, human problems, failure impact upon carrying out the system. Expert systems have to be approached by multidisciplinary teams obligatorily including process technologies, expert systems specialist (the knowledge engineer), automation engineers, electronics engineers, managers, in this moment the introduction of expert systems is a complex activity and has to enjoy more understanding on behalf of the managers and a special competence on behalf of the project developer team.

An intense expert systems development, with great financial and human endeavors, takes place in Japan, the USA, England, Germany and Switzerland, but expert systems are approached in much more countries, including Romania.

ANTICIPATORY PILOTING CONCEPTUAL MODELS APPLICABLE TO PRODUCTION AGILE SYSTEMS INCLUDED INTO THE COMPETITIONAL MARKET STRUCTURE

The piloting system of an enterprise that conducts its activity in a complex competitional field and a continuous movement has to foresee, by adequate dispositions,, mechanisms, and procedures for adapting to the environment, likely to ensure the suppleness necessary for being able to adequately answer the variation of its factors. A well designed piloting system has to ensure, for complex piloting decisions, the use of the systemic modelling of the problem or calling upon the economic process simulation for which it is desirable to find an optimum solution, by calling upon artificial intelligence models in any enterprise, the preoccupation for anticipating the evolution of the event occupies a primordial place. No one invests a resource endeavor without balancing with the expected results, as related to the targets. The amplitude and diverseness of the anticipatory works, as well as the terminology accompanying it proved to be a natural result of the development of science and of its continuous ramification. And a science in any domain, has a an imminent function, also that of anticipating the destiny of its own discoveries, innovations, as well as their effects upon human condition. Without this anticipatory capacity, the piloting system of the enterprise risk not to obtain that equilibrium necessary for conducting the activities of the organization processes.

Anticipatory management comprises predicting strategies usable in an organization for the preliminary estimation of what is going to happen in the future, in a certain domain, based on calculations or through extrapolation by using certain mathematical models, by means of intelligence information systems. The predicting activity is a relation of systemic interaction with the information it vehicles. By means of the information it becomes possible to know retrospectively and prospectively any domain. The elaboration and use of an adequate expert system constitutes an essential requirement of anticipatory management, and, consequently, of predicting activity.

Unconventional management has developed both the side of the natural and that of the normal.

Anticipating changes and reactions becomes important in the organization management. However, detectable are the changes expected, and the the managers have to pay attention to all the anticipations of the reactions and changes inside the organization. The disruptive technology captures and introduces new rules, motivating ones, and even if the computerization and automation and control prevail, man feels the need for returning to nature.

CONCLUSIONS

The modelling of the agile production systems calls upon the computer assisted operational research by emphasizing the motivational optimum and the archemic piloting of the agile units included in the digital economy.

Project management is the trend to improve the computer-assisted agile production enterprises by neuroexpert programmable logic controllers, which leads to a high archemic productivity at competitional costs ensuring precalculated profitability.

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