THE MODELLING OF DECISIONAL PROBLEMS

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Abstract: *The clear formulation of the problem and the construction of its descriptive model make up the main working tool for assessing the potential consequences of decisional alternatives.*

Keywords: *descriptive model; decision theory.*

The decision-making process includes the procedures used to solve efficiently and in a timely manner the problems encountered in the operation of an entity or organization, meaning an orderly sequence of logical actions, from identifying the problem to solving it, meant to trigger the system of obtaining, storing and processing information.

In order to ensure the achievement of the objectives pursued through decisions, it is necessary to include certain principles, the most important being the following:

- *The scientific substantiation of the decision*, resulting from the requirements of logic: the decision making process and its components take into account the realities of the market economy; managers must have the ability to know, understand and use market economy mechanisms, to demonstrate that they respect and take into account the laws of the market economy, the system of values and the individual and collective behavior of employees as well as the restrictions or, on the contrary, the inherent freedoms. More than in any other field of activity, the professional competence of the manager results from the harmonious blending of native qualities (intelligence, communication and relational skills, character and correctness) with the depth and continuity of managerial knowledge and skills;

- *The legality of the decision*, in the sense that the choice of the optimal variant must be made by persons legally empowered for this purpose. The legality of the manner of acting, expressly stated in the internal organization and functioning rules, is claimed by at least two factors: the sphere or the decision-making field (the weight of the organizational structures that fall under the effects of the decision) and the decision hierarchies involved. For example, as the sphere of influence (share of affected structures) expands, so does the position (level) of the manager entrusted with the decision;

- *The decision-making option*, as a principle of decisional logic, reflects the timing of setting certain measures, depending on the correlated action of temporal and qualitative factors (the quantity and quality of similar products on the market, the evolution of competition, the business environment). A decision is only appropriate if, before being adopted, the management team has examined the costs associated with its implementation;

- *The completeness of the decision*, i.e. the possibility of examining all the factors (segments) influenced by the application of the decision. Therefore, the manager must assess in advance the social problems that may arise as soon as the decision is made;

- *The efficiency of the decision or the extent* to which the objective has been achieved by its achievement by improving the two components: effectiveness (measuring and comparing the performance with the objectives, criteria and rules established at the time of launching the decision making operational program) and decisional efficiency;

- *The coordination of the decision*, provided by the manager or management team who designed

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and implemented the line of action in which other persons with operational management responsibilities take part.

The canonical form of decisional problems

The clear formulation of the problem and the construction of its descriptive model make up the main tool for the evaluation of the potential consequences of decisional alternatives, a logical and rational approach that has to meet certain requirements, of which[1]: coherence (ensuring the harmony which the normal evolution of the system depends on; correctness (the property of not distorting the real character of the relations presented); consistency (the estimation of the degree to which the components of the process modeled by the links and relationships between them were identified and represented); completeness (inclusion of all component elements and relationships between them); efficiency or design of the model with minimal human and material effort.

In fact, the model is a faithful but simplified representation of reality, allowing for conscious action, based on logical reasoning. In such circumstances, a phenomenon or process (P), characterized by the set of component elements (E) and their relations (R), can be expressed sufficiently well by a model (M) consisting of a set of elements (E) and the other of the relations between them (R), if it permits the establishment of the two-way correspondence between E and E' between R and R'. Thus, the representation P = {E, R} can be considered as a general model of the examined process (P); the identification of the elements of the set E and of the relations R, concretized in the sets E' and R', for which the correspondence and the information-decisional bonds are performed as:

$$\begin{array}{ccc} P = & \{E, & R\} \\ \updownarrow & \updownarrow & \updownarrow \\ M = & \{E', & R'\} \end{array}$$

The satisfactory expression of the model consists of an iterrative process with successive improvements, more specifically from the collection and interpretation of data and information in order to know the E and R sets, as a sine qua non premise,

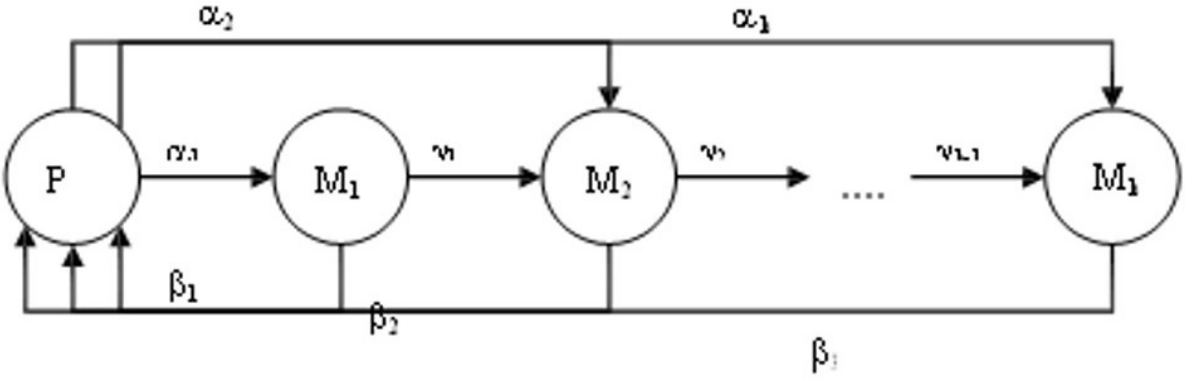

Fig. 1. The descriptive form of the model M[2]

of the realization and validation of the M model (fig.1).

MOperators are considered $\alpha_1, \alpha_2, \ldots \alpha_x$ for the interpretation of relevant information, and $\gamma_1, \gamma_2, \ldots \gamma_{k-1}$ for the representation of alternatives of the process of learning and assimilation of the model attested by the set of operators $\beta_1, \beta_2, \ldots, \beta_k$.. The construction of the M model suggests the conceptual convergence whose canonical form of the problems to solve is a logical expression of the form: knowing r, ω must be found out, written as an abbreviation, <r, ω>. In this context, *r* represents the set of given conditions, and ω the purpose of the problem, achieved through a time sequence of trajectories in the state space. In the construction of the model R^s is considered the set of possible states and R^p the set of operators transferring the object to the state $r' \in R^s$.

[1] M. Andrașiu ș.a., *Managementul schimbării*, Scientific Publishing House, Bucharest, 1996.

[2] M. Andrașiu ș.a., *Managementul schimbării*, Scientific Publishing House, Bucharest, 1996.

The achievement of the goal (solving the problem) is ensured by choosing the operator or their sequence that leads the organization in the desired state. The solution is reduced to identifying the construction and demonstration procedures of the problem in accordance with certain requirements. As the removal of uncertainty, specific to the passing of the state from the present to the future through the making of the decision, is made only in particular cases and on short term. As a rule, action is taken to reduce the degree of uncertainty when the information obtained from the environment is complete and the means of receiving and processing it do not distort its content, clarity and completeness. Particular attention in the formulation of the problem is given to the analysis of the set of conditions r and the definition of possible states ω, with the help of the logical form expression[3]: „"to determine ω" $\Leftrightarrow \langle -;\omega \rangle$"; as the set of conditions r is not specified, the expression becomes the objective pursued. Considering that this is incomplete to solve the problem, the next step is to establish conditions r, having the form: giving $\langle -;\omega \rangle$ $\langle r;\omega \rangle$ must be found, which, in turn, has the logical expression $r \Leftrightarrow \langle r;- \rangle$, called the situation. As this form does not determine a solution to the problem, the following hypothesis is formulated: being given $\langle r;- \rangle$ $\langle r;w \rangle$ must be found. Thus, combining the two logical expressions $\langle r;- \rangle$ and $\langle -;w \rangle$ we can define the problem whose logical model is found in graphic form in fig. 2.

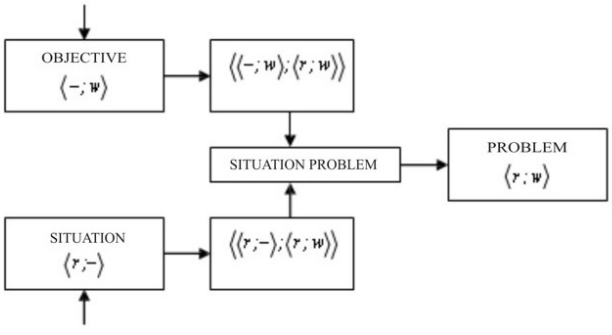

Fig. 2. The logical representation of the M model after[4]

If the problem is correctly formulated, then the ways of passing from conditions to purposes are determined, consisting of identifying in the set R^p of the operators that transfer the object in the desired state $r' \in R^s$, favoring the goal ω. In other words, uncertainty is not reflected in the states of the objective R^s, but in the operators R^p. It can be noticed that the operators R^p which facilitate the passage of logical objects from one state to another are not always identified with problem solving procedures. While the set of operators concerned refers to the conditions given in the problem, the procedures ensure the choice of their set $R_0^p \subset R^p$ *a*nd the assessment of the achievement of the goal ω. Thus, the formulation and solving the problem is, in essence, an *information process*, which induces another kind of uncertainty, one belonging to the set of settlement procedures.

An issue whose solution starts from the canonical form[5] <r,ω> has the following logical structure: "being given X, X', Y, Z, C we must find out $\omega'' \Leftrightarrow \langle X, X', Y, Z, C;\omega \rangle$ when:

- X and X' are the set of controllable and non-negative input factors and the set of uncontrollable and non-negative input factors;
- Y is the set of output factors or possible outcomes, so of the solutions depending on the controllable and uncontrollable factors;
- Z is the set of transformation operators or the transition from one physical state to another of input factors (the elements of this set Z:X*X' → C are operators or functions defined by the Cartesian product of controllable and uncontrollable factors with value in the set of solutions;
- C is the set of criteria set for choosing the crowd Z, according to the preference of the decision maker, given by the set of objectives ω.

Comparing the generic decisional issue $\langle X, X', Y, Z, C;\omega \rangle$ with <r,ω> it is noticed that, in fact, the crowds X, X' and Y match R^s and R^p totally to r. We consider that the set of conditions encompasses the set C, but the elements that make it are of different nature (fig.3).

[3] Y. Allaine, M. Fârşitoru, *Managementul strategic*, Scientific Publishing House, Bucharest, 1998, p. 63.

[4] E. Scarlat, *Teoria deciziei*, ASE Publishing House, Bucharest, 1995, p.16.

[5] E. Scarlat, *Teoria deciziei*, ASE Publishing House, Bucharest, 1995.

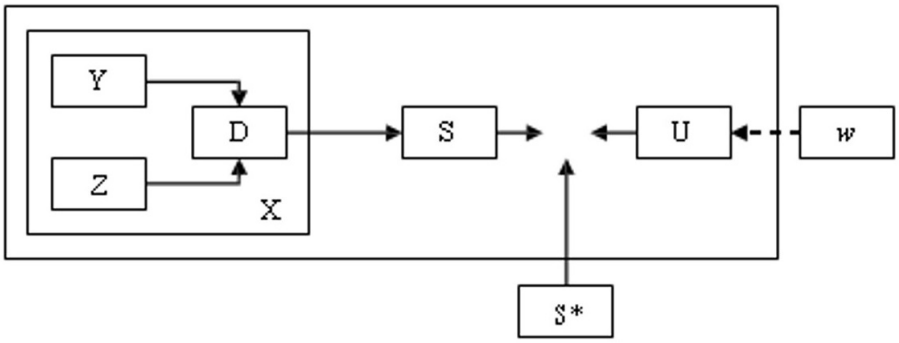

Fig. 3. Representing the canonical form of the M model[6]

As the elements of these sets depend on the time, as it can be seen, the crowds can see X, X and the relationships between them, like the Y set, are before the set of Z solutions. That is why the component parts are written x(t), $x^{'}$ (t), z(x+ τ), $z_1(t+\tau)$, $z_2(t+\tau_2)$,..., if all the solutions are not held at the same time. At the same time, in relation to the objectives, the criteria of the C set and the preferences of the decision-maker form the interface.

In this context, the criteria of the C set and the preferences of the decision-maker form the interface between the objectives ω and conditions r, criteria that are expressed in the form of rules (utility functions) by which the elements of this set are compared, which means that the preference is the most general form of manifestation of the elements of the Y-set, thus removing the uncertainty in the choice of the subset Z.

In such conditions, the optimal alternative of the decision is given by the pair d=(x,y) with $x \in X, y \in Y$ and each alternative $d \in D$ matching a solution $z \in Z$. When the composition is unambiguous, in the sense that each alternative corresponds to only one y result and only one, it means that we are surely faced with a certain decision-making problem.

CONCLUSION

In terms of theory, the decision-making activity at the micro- and macro-social level, in which mainly actors with leadership responsibilities are involved, as well as some specialists belonging to the operational structures of execution, is mainly devoted to the correct identification and formulation of the problems, the substantiation of the probable and possible alternatives, and the adoption of the optimal action line, based on explicit criteria.

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[6] E. Scarlat, *Teoria deciziei*, ASE Publishing House, Bucharest, 1995.