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# OPERATIONAL RESEARCH ON PRODUCTION ORGANIZING

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ABSTRACT

*Operational research, a new domain in science, having a complex character, studies and analyses the phenomena appeared within a economical unit for the production organizing.*

*The application of the operational research requires the following main stages: formulating and specification of the problem to be studied and resolved; construction of the mathematical model of the studied phenomenon or operation; gathering and processing of the initial information; model analyze and obtaining of the solution (decision); verifying the modus in which the model corresponds to the studied phenomenon and analyze of the decision quality, correction of the model and of the decision, if necessary.*

*In fact, the operational research is a new tool characterized by a meritorious effort to escape from routine, appealing to judgment and scientific methods.*

KEY WORDS

*operational research, decision, production organizing*

## 1. INTRODUCTION

### 1.1. FUNDAMENTAL NOTIONS OF OPERATIONAL RESEARCH

*The operational research,* a new field in science, with a complex character, which object is the study and analyse of the economical phenomena, their objective estimation, quantitative especially, in order to prepare the managerial decisions and the comparison of their alternatives and variants.

The application of operational research needs the following main stages: formulation and specification of the problem to be studied and solved; the construction of the mathematical model of the phenomenon or of the studied operation; collecting and processing the initial information; the analyse of the model is adequate to the studied phenomena and the analyse of the decision quality; the correction if it is necessary, of the model and of the decision.

To take a decision means to choose between more variants, which on the basis of some calculus made with measurable and quantifiable magnitudes, present complex information regarding the expected results. Taking into account the pre-established objective it is chosen that variant which can predict an optimum result, such as, for example, a more efficient use of the production factors. In this respect, a special support is offered by the mathematical and scientific methods, namely the Operational Research.

The methods of the operational research become auxiliary of the decision. That is why many authors call the operational research the *science which optimises the decisions.*

It can be said that *the decision act is an attribute of man*, as the decision implies the conscious choosing of some of more possible solutions. Although the decision is situated at the antipode of the instinct and reflex, it is dictated, many times, in variable proportions, by intuition.

The Operational Research is, in fact, a new working instrument, characterised by a valuable effort to escape from the routine, appealing to judgement and scientific methods.

Firstly, it urges on studying the problems in a special spiritual state, which could be characterised *as following a target and oriented to efficiency.*

## 1.2. APPLICATION FIELDS OF THE OPERATIONAL RESEARCH

The researcher has to define, firstly, in a precise way, what is his goal; then he has to find the scientific terms to define precisely and finally to enunciate mathematically the problem. Only after that he will try to solve it.

The following main problem groups can be considered:

1. ALLOCATION (DISTRIBUTION) PROBLEMS

Mathematical programming solves the allocation problems, namely by optimising an economic function, which variables are subjected to a restriction system.

2. COMPLEX ACTIONS PLANNING

Out of the necessity to plan and follow the complex tasks in different activity sectors: production, investments, scientific research etc., there appeared a class of processes under the general designation of ”critical way method”. Knowing the critical activities, the managing personnel can focus on them in order to have an efficient control.

3. PHENOMENA IN WAITING

The mathematical apparatus, which solves the phenomena in waiting, is ”the theory of in waiting thread” which is also called the theory of tails or the theory of in mass serving. Knowing the waiting duration of the consumers and of the service station for a given system the total cost of waitings van be calculated. By studying more variants, modifying the arrival rhythm or the serving one, the optimum solution is established.

4. STOCKS MANAGEMENT

The stock notion refers to: the stock of the raw material necessary in the production process, the stock of the intermediary products created for a better development of the technological flux, the finite products stock necessary for the customs orders.

5. RENEWING PROBLEMS

The equipment in operation is subjected to wear and its value decreases in time. As the equipment becomes older, the maintenance expenses increase. The problem in this case is to determine the replacement optimum time, so that the total expenses are minimum.

6. SEQUENTIAL DECISIONS

Problems of this kind interfere in the case when some systems develop in time and are subjected to transformations (determinist or probabilistic), so at certain intervals there are a lot of possible transformations with the possibility to choose one or another from these transformations.

## 2. STRUCTURAL ORGANISATION OF ECONOMICAL UNIT

### 2.1. DEFINING THE ORGANIZATIONAL STRUCTURE AND ITS FUNDAMENTAL ELEMENTS

*The organizational structure* of enterprise represents the assembly of working posts and compartments which form it, the constitution mode, their grouping and subordination, as well as the main links which are established between them in order to assure the meeting of the best conditions of the economical unit objectives. This is the main component of the general structure of the enterprise. The place in the general structure frame is presented in figure 1:

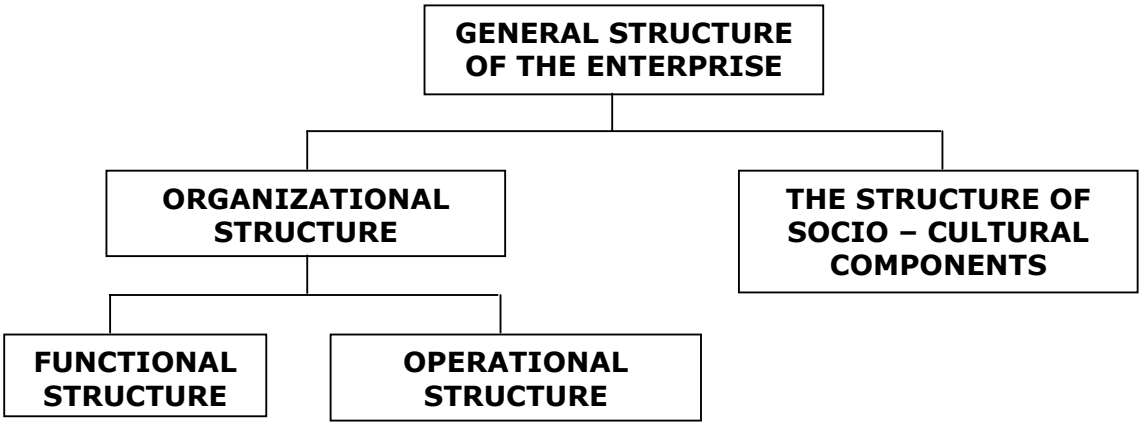


FIGURE 1. GENERAL STRUCTURE OF AN INDUSTRIAL PRODUCTION ENTERPRISE

Functional structure represents the assembly of the leading staff and of compartments (technical, economical and administrative), their construction and grouping mode, as well as relations between them necessary to the corresponding development of the managerial and

execution process. Production and conceiving structure, reflects the place where develops the production activity, quality technical control and research within some well-limited fields.

The organizational structure is based on several fundamental elements of which the following are underlined:

1. THE POST;

The POST represents the primary element of the organizational structure (or the simplest organizational subdivision) and is defined by assemble of established objectives, tasks, competencies and answers (on a certain period) for each person in the organizational structure of the firm.

2. WORKING BODIES OR COMPARTMENTS;

The working body or compartment represents the constitutive element of the enterprise structure. It can be defined as a coherent persons group reunited under a single authority, which assumes permanently a well-determined role.

3. STRUCTURAL LINKS;

The normal development of activity in an enterprise needs frequent information changes between the different compartments (leading, functional and execution). Through the mutual emitting and reception of information regarding the field and the results of developing the activities the links between the compartments are materialized.

4. ORGANIZATIONAL TYPE STRUCTURES;

To group the activities in accordance with the enterprise functions and the management functions, the constitution of working compartments and the establishment of the links between them, the subordination and the grouping of compartments, there are a diversity of possibilities of which in practice only some have been imposed, which led to the establishment of a limited number of organizational types of structures.

5. THE ATTRIBUTION DELEGATION SYSTEM;

The authority represents the right to lead, namely to decide, to give compulsory dispositions and to control the fulfilment of the tasks, within the enterprise, this right belongs in its plenitude to the general assembly of shareholders.

6. LEADING NORMS (STRUCTURE)

The structure norms are a category of norms by which some elements and the methodology for the elaboration of structure in a certain period are regulated.

## 2.2. CONCEIVING AND REPRESENTING THE ORGANIZATIONAL STRUCTURE

The representation and description of the operation mode of the organisational structure is made by means of two instruments: the structure organizational diagram: the organization and operation regulation. Synthesising the specialists opinions we can define the organigram as being the graphical representation of the organisational

structure of a economical and social units, enterprise/firm, or of some of their components, which show the way the working compartments have been built and grouped, their subordination to some managerial functions as well as the hierarchical authority links within the organisational structure frame.
Example:

- **Circular organigrams** are graphical constructions of the organisational structure where the hierarchical levels are situated in the concentric rings starting from the centre to the exterior, and the hierarchical ways are represented in broken continuous lines, which start from the centre to the exterior, as it can be seen from the picture.

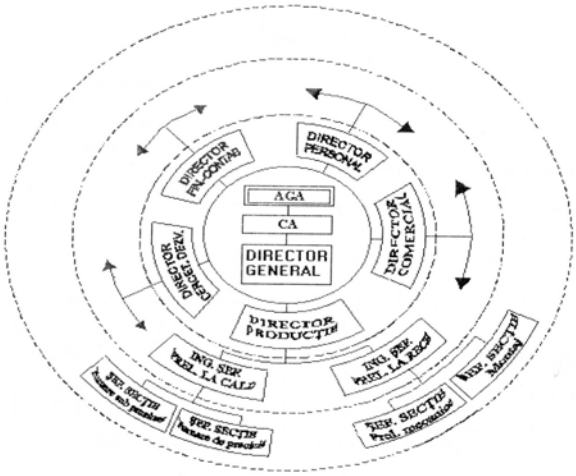


FIGURE 2. CIRCULAR ORGANIGRAM

- **The organigrams ordinated from left to right** are characterised by the fact that the hierarchical levels are ordinated in columns from left to right from their importance point of view in decreasing order. The hierarchical ways are continuous broken lines, which start from left to right as is results from the picture.

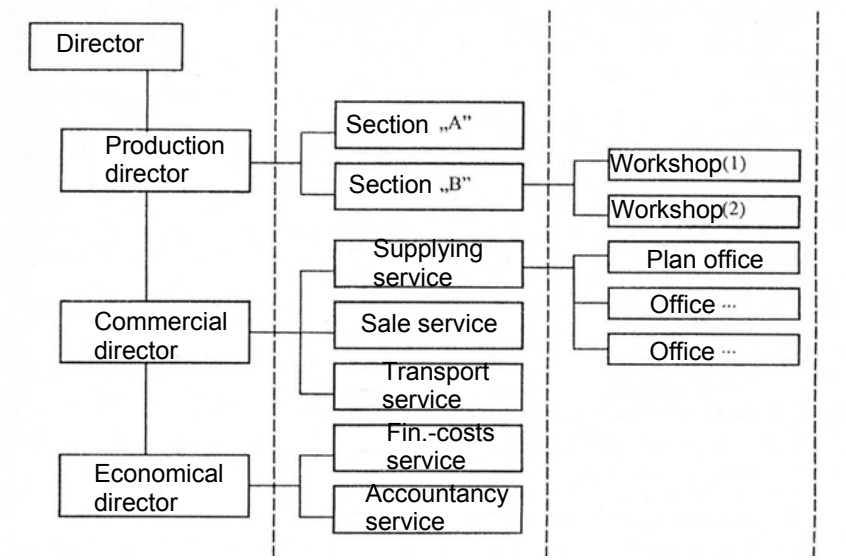


FIGURE 3. THE ORDINATED ORGANIGRAM FROM LEFT TO RIGHT

## 3. DECISION THEORY ELEMENTS IN ORGANISING THE PRODUCTION

The decision can be defined as being an action line, consciously chosen from more possible variants in order to achieve a certain target or objective.

From this definition we can evince the following *characteristics of the decision:*

- The decision is *an act of choice* from more possible variants, only one is chosen. The simplest decision is that which has at least two variants;
- The decision is a conscious thinking process based on evaluation criteria, which act at the individual level, mental or on the basis of a program, but which needs specific knowledge;
- The decision is an individual or collective *will act*;
- The decision always has *a finality*, namely it aims the achievement of an objective or of more;
- The decision always refers to *a future state*, even if it is based on present or past information

The figure represents symbolically, the decisional volume resulted following a decision taken at the superior level in a firm.

In other words, a decision of the general director draws a volume of ulterior decisions at all levels for all the employees in order to achieve it. The responsibilities and rewards in a firm have to be established according to this decisional volume, which that who decides draws by his thinking.

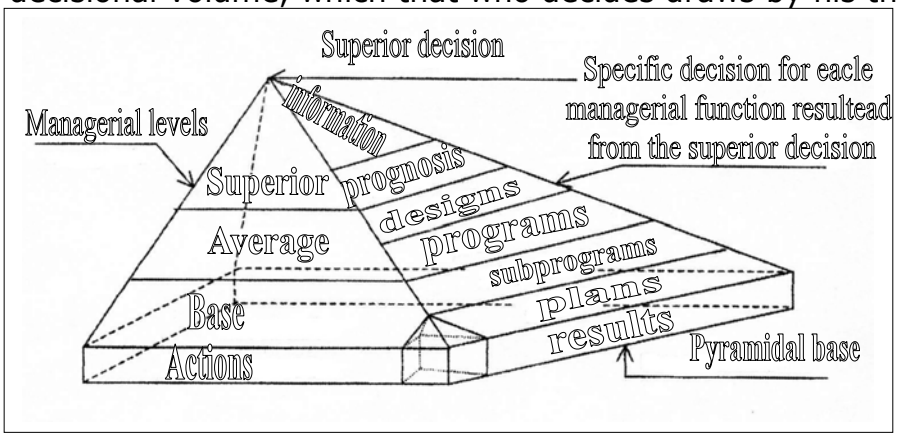


FIGURE 4. THE PYRAMID OF THE SUPERIOR DECISION VOLUME

The classification of the decisions can be made according to several criteria:

a) According to the knowledge degree of the environment and the nature of variables which influence the potential results, there can be:

- certitude conditions decisions – each variant has only one consequence within a decisional criteria;
- risk conditions decisions – each variant is characterized by different consequences within a decision criteria;

- incertitude conditions decisions – variables are partially non-controllable.

b) According to the time horizon for which the decision are adopted and their implications on the driven object, there can be:

- strategical decisions – which aim large time horizon (more than a year, 3-5 years usually);
- tactical decision – which aim a relatively shorter period of time (a year);
- current decisions – they refer to short periods, usually days or hours, and most often they refer to tasks, attributions or some activities in the firm.

c) According to the number of persons participating in taking the decision, there are:

- uni-personal decisions – in their elaboration and substantiation participates only a person, they refer to the current problems of the firm ( their weight should be reduced);
- participant decisions – in their elaboration and substantiation there participate more persons ( collective decision).

d) According to the number of decisional criteria which are at the basis of decision, there are:

- uni-criterional – the decision substantiation is made on the basis of a single criterion;
- multi-criterional – more independent criteria are considered (have the largest weight).

The order of the temporal flux of the managerial decisional process is presented in the figure:

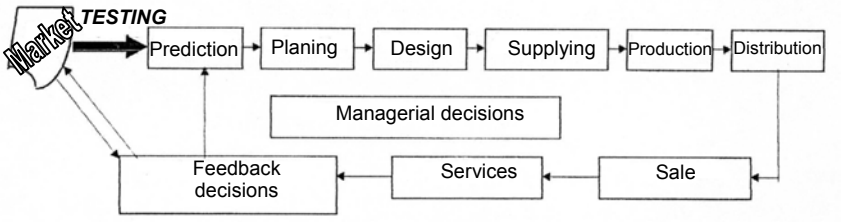


FIGURE 5. THE TEMPORAL FLUX OF THE MANAGERIAL DECISIONS

## 4. CONCLUSIONS

The management of a productive economical unit is regarded as a system, which has in its componency the following subsystems:

- organizational, represented by the organisational structure of the unit in which the managerial processes take place as well as the operation of the structures by their grouping and subordination;
- informational, concretised in all information which circulate in both senses between the component subsystems; the informative system is an important component of the informational system;

- decisional, made out of the assembly of the elaborated decisions, adopted and applied within a productive unit.

The decision is a base component of the managerial process.

Depending on the knowledge level of the condition complex there are decision taken under certitude conditions, under risk conditions and under incertitude conditions. The decision can be also individual or collective (administration board).

- management methods and techniques, which group the whole methodology, all the methods and specific techniques used in managerial processes.

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