Optimization of management of scientific departments in departmental organizations

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Abstract. In the paper current types of the organizational management structures have analyzed as well as typical problems of scientific departments are considered and organizational structure is proposed allowing optimization of management for the research center in the frames of organization in a law enforcement agency.

1. Introduction

Structure of the organizational system represents the management levels and functional areas that are logically interconnected and arranged in a specific form allowing to achieve objectives of the organization in a maximum efficient manner and representing the most significant interrelations between its different elements and subsystems composing the organization itself.

Organizational structure of the department means pattern array assignments of the people to the different occupational positions that have effect on the role relations between them as well as management system implying certain principles and mechanisms of decision making, transfer of the information, planning, motivation and encouragement system. It should be noted that the organizational structure is a dynamic object and it varies along with the development of organization according to the tasks and conditions dictated by the internal and external environment. Objective of the organization or its department should be considered as a guideline for the direction of the links and authority flows.

The need for study of the department organizational structure results from the detailed examination of the objectives of its functioning. Objective of the functioning is implied as a specific state or a certain desired result which tries to achieve the organization. The planning process included the development of the objective and its bringing to every participant of the organization.

The necessity for optimization of the organizational structure appears while in the process of the enhancing problems facing organization (department) there appear: irresponsibility spheres, duplication of the functions, differences in loading of the personnel, as well as when the existing structure does not provided the capability to promptly respond to the negative changes in the working efforts.

Increase of the operation efficiency for the organization (department) is mainly determined just by a good organization of the management system depending as on the structure, as on the operation all of its elements as a whole while moving towards selected objective.
Promptly created organizational structure makes it possible to optimize interaction between the departments, to distribute their load for personnel, to avoid duplication of functions, to eliminate double and triple subordination, to demarcate the scope of the manager’s activity, to determine their credentials and responsibility zone, to increase productivity of labor.

2. Theoretical analysis

The following organizational structures are currently known, bearing in mind that the type of organizational structure depends on the type, objectives and size of the control object and its environment:

Linear structure – multi-level hierarchical management structure that is characterized by the fact that a sole independent leader is at the head of each team or department, the leaders of the lower level are subordinated to the leader of higher level, then follow the lower level leaders and this subordination ensues up to the lowest structural unit of management. Linear structure can be considered as the simplest one among the multi-level structures. This structure is applied for all of organizations in law enforcement departments in various variants: linear one, linear-staff, linear-functional (it is represented in the outlined form in the Figure 1).

![Figure 1. Linear organizational structure.](image)

Advantages of the linear management structure:
- realization of the one-man management principle, unity of the directions, orientation for solution of the operative tasks;
- simplicity of management (one channel link);
- clearly expressed responsibility of the leader for the results of management activity and results of each department;

Shortcomings of the linear management structure:
- a high level of competence for the leader is required meaning a wide set of expert knowledge;
- there are no special levels of planning and preparation of the management solutions in the considered structure;
- an excess of the information links;
- complicated links between the levels of management, impeded agreement of decision making;
- high concentration of responsibility.

Linear-staff – a variant of hierarchical structure, and its essence means formation of additional team at the horizontal level of the structure. It is a staff that participates in the preparation of management decision but it has no right of decision-making (it is considered as a pool of peculiar assistants for the leaders). One can see different examples of staffs – supervisory service, coordination department,
analytical department, network planning subdivision, sociological service and legal department. Layout of the functional elements in the linear-staff structure is presented in figure 2.

Advantages of the linear-staff management structure:

− management of the load reduction for the linear managers;
− possibility of involvement of the specialists and experts for planning and preparation of the management decision.

![Figure 2. Linear-staff organizational structure.](image)

Shortcomings of the linear-staff management structure:

− reduction of the management responsibility since the staff is responsible for the preparation of decision although it does not participate in its realization;
− a trend to the excess centralization of the management activity;
− just as in the linear structure a high competence level of the manager with a wide set of skills is required;
− in case of organization or department growth in scale the linear chain becomes rather long, bulky and inefficient, while development of the departments size makes the requirement of coordination of the large amounts of work thus finally manifesting itself in the low quality of the attained results.

Linear-functional is a hierarchical structure representing a symbiosis of hierarchical ideas and department functionality (functional specialization) (Figure 3). This is most wide-spread management structure and it is frequently used at the big- and medium-scale enterprises in any branch and scope of activity. Staggered principle of the structure underlying in the basis of the linear-functional structure implies formation of a specific hierarchical structure inside each of the department (function). Linear-functional organizational structure is a step-wise hierarchical one ad it is comprised of the linear subdivisions executing the direct work and specialized auxiliary functional departments. This type of the structure is most wide-spread one in the modern capitalist society and it can be applied at the majority of the enterprises of big- and medium-scale enterprises of the industrial business.

Advantages of the linear-functional management structure:

− reasonable balance between observance of the principle of one-man management and rational specialization of some levels of the management activities;
− head of the organization is disengaged from the requirement of a detailed analysis of the problems;
− there keeps a possibility of the involvement for advisers and experts for their participation in the preparation and examination of the management’s decisions;
− partial delegation of authority to the lower management levels in accordance with the lines of the subdivisions activity.
Figure 3. Linear-functional organizational structure.

Shortcomings of the linear-functional management structure:
- an extent of interaction between different subdivisions of organization is reduced at the horizontal levels, their coordination is realized by the upper management departments;
- responsibility of certain managers is reduced;
- vertical management hierarchy is enhanced to the prejudice of the quality of realization of the management decisions.

Functional one is a type of organizational structure where each of the functional unit is realized at each management level (figure 4).

Figure 4. Functional organizational structure.

Advantages of the functional management structure:
- the need in the managers with a high set of competences is reduced in favor of those ones with a high level of just manager’s competence;
- an increase of qualification is inspired for the officials of the management personnel working in the functional management structure;
- a high level of competence for the specialists and functional leaders with the special set of skills is required;
- the need in broad specialists is diminished.
Shortcomings of the functional management structure:
- large amount of work on coordination for all subdivisions of the management personnel;
- strategic tasks are shifted backward, decisions of the current problems are prevailing with a simultaneous aggravation of the enterprise’s capabilities to the adaptation in accordance with the varying management conditions;
- one-man management principle is violated, irresponsibility of the production workers and management personnel grows as well.
- an enterprise with a functional management structure can operate successfully only in the conditions of relatively stable environment;
- management process of the production as a whole is substantially impeded.

Program-targeted type (projected type) management structure means that activity is considered as a couple of the executed projects and each one of them is characterized by the fixed project start date and project finish date (for example, implementation and production of the new product, realization of the new technologies, projects construction and so on) (figure ). Each of the projects is provided with manpower resources, bankrolls, industrial and other assets under the control of the head of project. Each of the projects has its own structure and management of the project includes determination of its objectives, formation of the structure, planning and organization of works, coordination of the executors’ activities. After execution of the project its structure is disintegrated and its components, including the staff are transferred to the new project. If the project organizational form is adopted the structure of enterprise is aligned basing on the executed projects. The project in this case means the process of realization of a set of purposeful measures concerned with the development of a new product or services within the frameworks of the allocated budget, period of time and quality requirements.

Program-targeted type of the management structure arises within the frames of linear-functional structures. Advantages of the program-targeted type management structure: objective orientation; specialization; concentration of resources at the certain program or project; resources, released after finishing the project can be utilized in another project or in the main economic activity of the enterprise.

![Figure 5. Program-targeted type of the organizational structure.](image)

Shortcomings of the program-targeted type management structure:
- resources (backroll, management, man-power, production reserves, etc.) are blocked until all of activities on the current project are finished;
- double subordination of the executors for the period of accomplishment of the works on the project: to the line director – for all of the period of work in the Company and to the head of the project – for the duration of the project. The presence of two leaders at one and the same time results in
the multiplicities concerned with the distribution of the labor time of a certain executor between two different parts of work.

Matrix-type – is a network structure based on the principle of dual subordination for the executors: on the one hand they are reported to the direct leader of the functional service that affords the staff and technical support to the leader of the project while on the other hand the personnel are subordinated to the project leader or a head of the task program who is authorized with the required permissions in order to realize the management process (figure Figure 6). Matrix-type management organizational structure realizes principle of subordination multiplicity when the structural subdivisions of the industrial and economic activity in the system are formed by the linear and functional principles. With such organizational form head of the project interacts with two groups of subordinates: with the permanent members of the design group and with the other workers of the functional divisions who are subordinated to him on a temporary basis and on the limited area of issues. In this situation their subordination to the direct heads of subdivisions, departments and services is kept unchangeable.

Advantages of the matrix-type management structure:
- fast response and adaptation to the changes in the management conditions;
- increase of activity of the managerial personnel due to its active interaction;
- reasonable approach to the responsibility distribution as well as to the rights and duties and the realized functions between the line, functional and special program-task authorities.

![Matrix-type organizational structure](image)

**Figure 6.** Matrix-type organizational structure.

Shortcomings of matrix-type management organizational structure:
- distribution of responsibility and duties between the heads, leaders and subdivisions is very often only formal one, while in reality collective irresponsibility is enhanced;
- complicated structure of collateral subordination resulting in the problems with determinations of the tasks priorities and distribution of the time for the execution of the assignments issued by the leaders;
- system of the work in the new organizational structure is complicated due to the change of the type of management;
- responsibility of departments for results of their work is diffused;
- number of conflicts between the heads of subdivisions and projects is increased.

Analysis of the management structure at the scientific organizations (subdivisions) demonstrated that at present time the problem of formation of the management in science corresponding to the modern conditions of its functioning is a thorny issue and its solution is of a dual character. First, it is necessary
to provide obtaining of the highly-valuable scientific results and, second, to use these results in practice rapidly and in the most efficient manner. Surely, when forming and improving system of measures in the management of science it is required to account for the internal problems in this area. Within this context the problem of management is reduced to the creation of the conditions for scientific research, realization of the professional aspirations by the scientists, to the producing of rather high-quality results of activity by scientific organizations.

The main difference of scientific subdivisions in the organizations of the law enforcement authorities from civil scientific organizations is the absence of departments and services providing activities of subdivisions performing the main kind of activities. It means that scientific subdivision itself is a structural component of some organization (educational, testing and so on) (Figure 7).

**Figure 7.** Typical organizational structure in the system of law enforcement agencies.

Here it can be easily seen linear-staff management structure with its inherent shortcomings: a decrease of managerial responsibility since a staff responsible for a decision making does not participate in its realization; there is a tendency towards excess centralizing of the management activity, and just as in the linear structure high level of the competence for the manager having wide set of skills and references is required.

Moreover, unlike of the organizations where the activity is directed at the profit earning those ones in the law enforcement agencies the staffs (or supporting departments) rather often shift some part of their functions onto the «main» subdivisions. Thus, there appears an additional load in the subdivisions realizing their basic activities. Typical structure of a scientific subdivision in such kind of organization is presented in Figure. In this case the structure is a linear one with some rudiments of the linear-staff one. The staff here functions as the aider of a leader of the element (head of the department) as concerning scientific activities (principal researcher) and office paperwork.

In some cases, deputy leader can be assigned who adds one more level of management while there is already an excess of these levels.

In order to reveal typical appearing issues several research centers in the organizations of law enforcement agencies have been analyzed.

Scientific-research center usually accomplishes the work in the field of design of performance (technical) requirements for the prospective armaments specimens, military and special technique, military-scientific support of R & D, performed by the organizations concerned with the design of the above-mentioned specimens (including participation in acceptance of the stages of work and state testing), validation and military-scientific support of the executed comprehensive task (federal and departmental) programs.
3. Result and their discussion
As a result of analysis of the legacy organizational structures and management systems of scientific-research centers the following problem areas were explored.

1. While employing scientific work in the laboratories the management of research staff is realized according to the principle of multiple (double, triple, etc.) subordination that rather often does not contribute to an increase in the efficiency of this kind of work. In particular, direct subordination to the head of laboratory (according to the principle of a linear project organizational structure) and provisional subordination to the scientific manager of the research work (according to the principle of the project organizational structure), which assumes temporary leadership for the researchers. Moreover, when urgent periodic tasks arise, another subordination is formed (to the head of the center, head of department or division), because, rather often, the tasks are set “directly” without taking into account the worker’s employment. All of these problems form a kind of contradiction between the tasks of linear and project (matrix) structure, an overlapping of the tasks thus resulting in the decrease of the operations activity and facilitates decrease of concentrating on the foreground tasks (including the scientific ones).  

2. The boundaries of responsibility between the heads of the subdivision (head of the department, deputy head of the department, head of the laboratory) are blurred with regard to the determination of targeted indicators for the activities of workers performing out scientific work. In this case, the implementation of the principle of one-man management is not clearly presented. The range of issues that determine the functional block for each of the leaders specified in this paragraph has not been formed; as a result, there is a duplication of tasks of subordinate personnel.

3. Within the framework of the structural elements of the center, a control norm is not observed. One direct leader should have 5-7 subordinates. In fact, there are 2 direct supervisors for 4 researchers (head of department and head of laboratory). In the event of an inadequate excess of the
required number of managers over the number of subordinates, the superstructure begins to exceed the baseline, which contradicts all accepted and scientifically grounded norms.

4. Noticeable number of operational tasks, "unscientific" works that have to be performed for absent officials (vacancies, persons employed in other structural divisions, incompetent employees), as well as when tasks are not explicitly included in anyone's area of responsibility, spend most of the working time of researchers, not allowing them to fully concentrate on the scientific tasks they are performing.

5. There is no fixation of specific qualitative and quantitative indicators of activities representing the labor intensity of the work performed by employees, including the tasks not aimed at performing scientific work. Indicators of scientific and “non-scientific” activities should be clearly comparable.

6. There is no clear division of responsibility for the final product - research report. The contradiction, in this case, arises due to the fact that the supervisor should carry out the control function, and the final decision on the quality of the provided product should be made by the Customer, who is the controller of the highest rank. In the existing scheme, the executor has a simultaneous subordination in the part - the head of the department, the head of subdivision, the head of the laboratory, the scientific supervisor, the representative of the customer, that violates the integrity and logic of the implementation of high-quality and effective controlling.

7. Non-uniform distribution of the main and additional load on the structural elements of the unit. The number of R&D and operational tasks to be carried out mainly depends on the decision of the Customer and can vary greatly for various structural elements, that is not taken into account in the distribution of the additional load, which is fixed randomly according to the “your direction” principle.

8. Increasing the areas of activity for each official by increasing the additional workload. Obviously, it is more efficient to perform a narrow segment of tasks, but deeply, than a wide one - superficially.

Analysis of the identified problems in the divisions, as well as the features of their activities made it possible to determine the ways to improve the management system, which should be aimed at:

1. Improving manageability (decision making, planning, execution, analysis, control) by reducing the excess number of management levels.

2. Realization of the possibility of easily adding functions / directions with the growth of tasks and development.

3. Reducing the number of conflict situations.

4. Conclusions

Thus, when developing a new management structure for a research center, a linear structure model can be applied (to keep the principle of one-man management) with the implementation of a functional one (it is necessary to understand that a functional structure implies different functions for different elements; currently in each element (management, department) the functional is the same) and design structures in functional blocks, which can be implemented by:

1. Assignment of 3 functional deputy heads of a research center in 3 areas: scientific work, technical work, organizational and planning work; each of them manages a functional unit using the project management structure:
   - The head of the "scientific" functional block, carrying out activities together with the chief and leading researchers, are subordinate to the scientific leaders of research works, the editorial group, etc;
   - The planning group, personnel work, communication, process group, etc. are subordinate to the head of the "organizational-planning" functional block:
     - The head of the "technical" functional block is subordinate to the information security, automation, developers, administrative and economic group, etc.
Within the functional groups, a project management structure is applied, which implies the creation of project teams to perform specific tasks. Both the number of groups and the number of personnel involved in them is not strictly fixed and can be adjusted basing on the load in a particular area.

The proposed structure eliminates the disadvantages of the linear structure:

– in connection with the delineation of functions among managers, the requirements for the range of competencies are reduced, which makes it possible to better work out issues in their area;
– a group appears that carries out planning and preparation of management decisions. In order for this not to turn into a minus, it is necessary to coordinate decisions with the heads of functional blocks before they are approved;
– the number of information links, including between management levels, is reduced, which facilitates the coordination of decisions.

It also includes the benefits of functional and design structures:

– there appears a reasonable balance between the principle of one-man management and the specialization of individual levels of management activity;
– the need for multi-functional specialists decreases (there is a target orientation of specialists);
– the number of intermediate managers is reduced, which makes it possible to improve management efficiency.

It will also allow solving urgent non-core tasks.

For the effective functioning of the proposed structure, including, it is necessary:

– introduction of periodic attestation of employees for their suitability for the held position with the aim of transferring them to another group, or dismissal;
– exclusion of rivalry between the elements of the center, since the rating is often based not on the qualitative, but on the quantitative assessments, and it also does not take into account the additional load, which is not uniformly distributed.

The issue of forming groups by employees should be discussed additionally, basing on the specific situation that has been developed. This can be a voluntary decision by each employee basing on his ability, or an appointment based on his past "contributions and merits”.

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