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Address: Univerzitetski trg 2, 18000 Niš, YU
Tel: +381 18 547-095, Fax: +381 18-547-950

ANALYSIS OF ORGANIZATIONAL AND MANAGERIAL SOLUTIONS IN AN INVESTMENT STUDY

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Drago Soldat¹, Radojica Dubonjić²

¹Beogradska banka, AD - Institute for Investment Economics,
Knez Mihailova 2, 11000 Belgrade, Yugoslavia

²Faculty of Mechanical Engineering, University of Belgrade
27. marta 80, 11000 Belgrade, Yugoslavia

Abstract. *This paper analyzes the organizational and managerial solutions which are, in comparison with solutions defined by existing methodology for investment evaluation, systematized and analyzed in detail. This analysis is based on the study of the entire organization structure and corresponding project management. As part of the organization structure, information systems are of great significance and as such they define the use of linear diagram - Gantt chart and the Network planning technique in the process of realization of an investment.*

1. INTRODUCTION

According to the valid methodology for investment evaluation (which is in accordance with the World bank methodology), organizational and managerial solutions are presented as resumes in a separate chapter of the investment study (1). Presented in this way, they are not systematized and comprehensive enough in order to provide a detailed overview of the entire organizational structure and successful project management.

Comprehensive nature of organizational and managerial solutions calls for establishment and use of information systems inside the organizational structure where, depending on the complexity of the project it is necessary to apply certain scientific methods in order to plan, realize and control how planned investment activities are carried out.

Investment project realization is a complex process, characterized by high complexity, scarce resources (material input, energy, personnel, finances, etc.), high cost, and large number of participants. Because of all these reasons and in order to achieve the expected

level of efficiency, it is necessary to coordinate individual activities rationally.

The decision to realize a project on the basis of part-time participation of experts who would, aside from their regular work activities also perform special - supplementary activities, or to let department experts perform project activities would most certainly jeopardize the realization of the project. Organizational isolation into separate work units is evident in both cases. This approach does not give successful results in the process of performing planned tasks.

The establishment of appropriate organizational forms, which will allow successful, can eliminate problems of this sort and efficient performance of planned investment activities.

The aim of this paper is to analyze comprehensive organizational and managerial solutions in the process of preparation and evaluation of an investment study in order to familiarize professionals and researchers interested in this field with methodological procedures, requested contents and method of presentation of relevant data. The intention is to upgrade present methodological solutions that are incorporated into the valid methodology.

2. ORGANIZATION AND ITS SIGNIFICANCE IN THE INVESTMENT PROCESS

Having in mind that production and work organization contains all elements of subjective project success factors it can be said that it represents a very sensitive and important issue in the design of future results of an investment program. Personnel, professional and managerial ability of the investor to perform planned work processes is reflected in selected organization models and work methods.

Most complex industrial processes are dependent upon the organization of the elements of the production process, their mutual coordination and integration into a functional system.

Organizational and managerial solutions contain conditions, possibilities, necessary measures and means for rational and efficient performance of (2):

- preparatory activities for the planned investment project,
- realization of the project,
- investment utilization during exploitation period

Definition of organizational and managerial solutions as an integral part of an investment study should offer a clear picture of the organization model and of how to manage a certain activity. Implementation of the newest knowledge on company organization and management will become a necessary characteristic of future investment projects in a reformed trade environment.

3. ORGANIZATIONAL SOLUTIONS

The study of organizational solutions is directly dependent upon the type of investment project from the market point of view (new investment, modernization, expansion and reconstruction) (3).

According to the investment evaluation methodology (3), in modernization, expansion and reconstruction projects it is important to perform coordination of existing

organizational solutions, that was caused by eventual changes due to investment. Organization structure of the existing activity for this type of project, together with certain additions to the organizational chart, due to eventual increase of the number of subordinates, is completely applicable even after the end of realization and start of the work process under the conditions achieved by the investment. The increase in the number of subordinates, as a result of investment of this type, should be determined in a technically acceptable way, and not arbitrarily, as it often happens (4). For projects of new investment type the analysis of important characteristics of trained staff is carried out during the investment process. These characteristics are necessary number of personnel, their training, etc.

Other elements of organization structure (tasks, rights, duties and responsibilities of employed subordinates, information systems and organizational regulations) can easily be adapted to the existing solutions when modernization - type investments are concerned.

Unlike modernization, expansion and reconstruction - type projects, in projects of new investment type it is necessary to perform a systematic study of the entire organization structure according to scientific organization methods.

3.1. Organization chart

Organization chart given in Fig.1 forms the basis for organizational solutions and as such it represents top priority in the organizational structure, especially when projects of new investment type are concerned.

This scheme consists of three levels and it shows lines of compulsory cooperation (1) as well as lines of authority and responsibility (2).

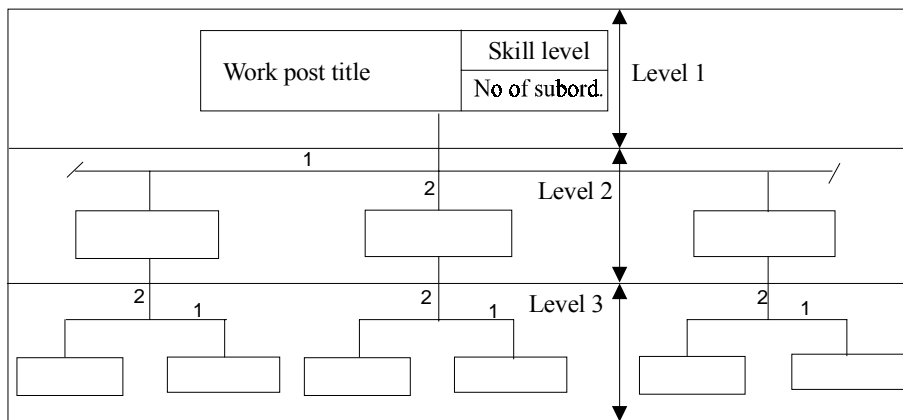


Fig. 1. Organization structure

The organization chart should be outlined in such a way to make it possible to perform planned work tasks without difficulty. This practically means that the organizational chart has to fulfill the requirements set by functional and personal modifications. The chart should be revised and supplemented in order to avoid possible misunderstandings concerning authority and responsibility.

Organizational chart consists of the title of work post, necessary number of

subordinates (staff) and their degree of professional expertise (3). Work post can be defined as an arranged work organization element where various tasks are performed. These tasks have to be planned and described by the pertinent work systematization act.

There are different ways in which organizational charts can be devised and they depend upon project management organization.

The determination of the necessary number of subordinate's means defining the number of workers necessary for realization of planned investment project, which represents the critical moment in the development of market oriented projects.

The need for staff can be evaluated in two different ways (5):

- evaluation by project managers
- evaluation by means of certain methods (analytical, statistical, optimization, simulation method, etc.)

Even though the need for staff is not a subject of this analysis, it has to be emphasized that the choice of the method to be used depends on the aims of the project, available data and project documentation, required knowledge level of personnel specialists, environment, etc. All of these methods are based on the detailed analysis of the production program and technological production process, as well as on the definition of production capacity and scope, etc.

The analysis of employment of necessary staff members includes the strategy of their employment and work distribution in accordance with the project and tasks it consists of.

The following characteristics should be considered in the process of searching for the staff (1, 5):

- the method of staff search,
- necessary qualifications and skill structure,
- names of workers in preparation, control and management of the investment process, together with their work experience in the given field,
- names of management - level staff proposed to lead the production after the end of the investment phase and during the beginning of the regular business activity - production, together with their work experience in the given field.

The required skill structure of the employees is determined depending on the estimated complexity of work that is to be done at a certain work position.

Project manager or analyst must consider possible sources of staff, i.e. means of obtaining necessary workers. Workers can be obtained from investor's own staff (by means of education, requalification, knowledge innovation, training, etc.) or from the outside world (takeover of workers from other firms, from job market, etc.). From the social point of view, most favorable situation is the one where the project stimulates engagement of surplus work force already employed by the investor, and where the project stimulates engagement of new workers who were unemployed before that. However, each of these means of working force engagement contains a great number of variables that influence the cost and profit of the project.

In order to establish the indispensable pattern of personal responsibility, it is important to specify the names of the most responsible professionals in the process of planning, control and management of the investment during construction as well as during production.

The exact number of employees with their essential characteristics is necessary in order to calculate the costs of work force as a financial part of the analysis of the investment study.

3.2. Tasks, rights, duties and responsibilities of the employees

Tasks that are to be performed at work post must be described in detail in order to be done without organizational losses. Work description for a work post is given according to the adopted organizational forms that exist in the company.

Rights, duties and responsibilities of the employees inside the company are directed according to organizational regulations.

Rights pertain to the position of a certain work post and result from the formal authority related to it. Rights have to be precisely regulated and described especially for management work positions.

Duties are, actually, descriptions of tasks that are to be performed, while responsibility means being accountable to someone else for the task that one performs.

Descriptions of tasks, rights, duties and responsibilities relate to all employees. They need to be thoroughly analyzed and presented for personnel who work in preparation and control in the process of performing investment activities as well as for management level during investment activities and production after the completion of the investment.

3.3. Information systems

Information describes work process and relates to the data necessary for successful performance of work activities.

There are three forms of information (3, 6):

- oral,
- signal,
- written.

For complex projects exclusively written information is applicable, because signal and oral info does not produce desired effects and thus errors of subjective nature become inevitable. Written info eliminates such errors because it is permanent and can be analyzed again whenever the need arises, thus achieving better work effects. Information, like work technology contains certain questions: what, who, where, when, how, why? The answers to these questions are essential to the performance of planned investment activities, in the process of investment study elaboration as well as in the process of investment realization (6). There are two methods of communicating written information: linear plan - Gantt chart and the Network planning technique.

3.3.1. Linear plan - Gantt chart

Term plan of the investment realization forms the basis of financial analysis and it is required for a comprehensive overview of investment activities during realization. For less complex projects, term plan is represented by linear - Gantt chart.

Gantt chart is used to plan the scope and order of project activities. It clearly shows the interrelations as well as duration of the activities.

While investment activities (from idea towards realization) are represented on the left side of the Gantt chart, term periods of their realization are given on the right side. Anticipated terms of realization of investment activities are expressed in weeks, months, quarters, semesters, years... - Table 1 (3).

Current investment evaluation methodology regulates the evaluation of feasibility of

the time plan according to (7):

- how complete the investment technical documentation is,
- are the terms set for the beginning and the end of the project feasible,
- is it possible to obtain necessary permits and concords.

Time necessary to complete a project depends directly upon the level of preparation of investment technical documentation and on the degree of complexity of individual investment activities as well as all of the elements considered together.

Table 1. Overview of the realization of investment activities - Gantt chart

| Investment activity | Term of realization years | | | | | | | | | | | |
|-------------------------------------|---------------------------------|----|-----|----|---|----|-----|------|----|---|----|-----|
| | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII |
| Compilation of documentation | | | | | | | | | | | | |
| Preparation of the investment study | | | | | | | | | | | | |
| Financial funds raising process | | | | | | | | | | | | |
| Preparatory investment activities | | | | | | | | | | | | |
| Work and equipment contracting | | | | | | | | | | | | |
| Rough construction works | | | | | | | | | | | | |
| Craft works | | | | | | | | | | | | |
| Finishing works | | | | | | | | | | | | |
| Plumbing and electricity | | | | | | | | | | | | |
| Exterior design | | | | | | | | | | | | |
| Compilation of permits and concords | | | | | | | | | | | | |
| Assembly of the equipment | | | | | | | | | | | | |
| Staff training | | | | | | | | | | | | |
| Trial work | | | | | | | | | | | | |
| Regular activity - production | | | | | | | | | | | | |

3.3.2. Network planning technique

For more complex projects it is most convenient to represent the investment term plan by the Network planning technique. The Network planning technique gives a complete overview of all activities, starting from the initial idea (first piece of information) all the way to the completion (last piece of information) of a certain investment project.

The basic advantage of the Network planning technique, in comparison with classic methods, lies in the fact that it makes it possible to separate structural from time analysis. Structural analysis consists of establishment of the logical order and mutual relations between individual activities that are to be performed as parts of a certain project (8).

Network planning technique is especially efficient when used for planning scientific, research and development projects, as well as when planning to develop a new product.

This method can be successfully applied for completion of planned investment project activities, where planning and follow-up of timetables and realized investments is of special importance. The activity list must be compiled before the network diagram containing all activities can be constructed. For the purposes of the theoretical study that is to be conducted in this paper, the process of compiling the list of the investment activities is left out since this process has already been thoroughly analyzed in the related literature (6, 8):

PERT method and Critical path method (CPM) are two most convenient of all network planning methods for follow-up of timetables and investment costs.

Network planning technique can be adapted for use with the system decomposition

scheme, which decomposes project systems to subsystems, i.e. subgroups of tasks based on multilevel structure.

The determination of terms - times of completion of investment activities for a certain project according to PERT method is given in Fig.2 (10, 11):

The aim of network optimization is to determine the optimum values for given resources taking into account the existing limitations. Thus, the error and the expected duration of investment activity are calculated.

The variance, i.e. error in completion of planned activities (σ) can be found using the following relationship:

$$\sigma = \frac{PT - OT}{6} \tag{1}$$

while the expected duration of investment activities is:

$$t_e = IT = \frac{PT + 4VT + OT}{6} \tag{2}$$

where:

- PT - investment activity pessimistic duration time,
- OT - investment activity optimistic duration time,
- VT - investment activity most frequent duration time.

It is obvious that the variance between in the final event RP (earliest start) and RZ (earliest finish), or between KP (latest start) and KZ (latest finish) is equal to 0, thus making the variance also equal to 0.

The greater the number of limitations, the more complex this analysis becomes.

As shown in Fig. 2, the values for variance are not necessarily greatest along the critical path. Today, network plans are constructed using computer applications, which can be modified in order to reflect necessary changes. Together with the program, software companies supply the customer with handbooks that contain instructions on how to use the network planning techniques. Input information needed to run these programs comprises the list of operations, duration of activities and the nature of their mutual relations.

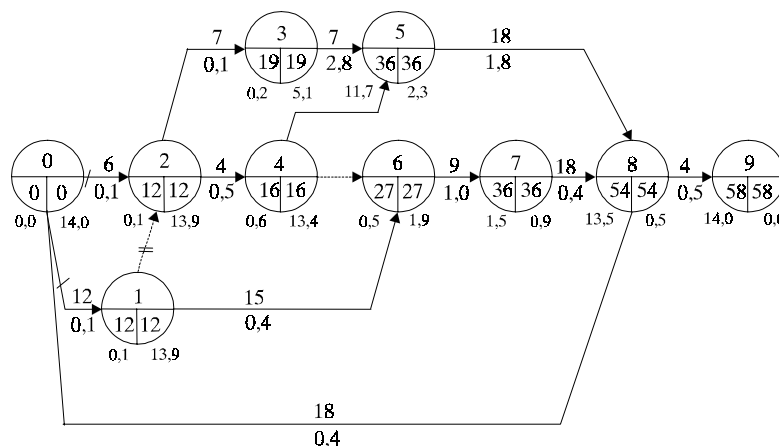


Fig. 2. PERT method applied to a sample project (10, 11)

3.3. Organizational regulations

Organizational regulations are written description or written technology of how to perform activities in a certain organization. From the above stated definition it is obvious that organizational regulations contain answers to all questions related to investment performance - from the initial idea to the completion as well as functioning of the investment during exploitation. Terms set for the completion of the investment (facilities with installations, infrastructure and equipment) are often exceeded, among other reasons, because of so called *organizational chaos*, resulting from not observing the technology described in pertinent regulations or, less frequently, from not being familiar with the technology necessary to realize the investment (2)].

Organizational regulations must provide a clear answer to the following questions related to work realization technology, as well as to investment exploitation technology:

- when are investment activities planned to start,
- how to carry out planned investment activities,
- by which means should planned investment activities be carried out,
- who should carry out planned investment activities.
- how long will it take to carry out planned investment activities.

Most important of these questions relate to *how to carry out the works, by which means to carry them out* and *who should carry them out*. Since the remaining questions are defined by the dynamic investment realization plan, they need not be individually specified in the organizational regulations.

Organizational regulations should contain answers to all issues that arise for a certain technological process (5):

- work operation title,
- order in which work operations are to be carried out,
- devices and tools necessary for the work process,
- number of subordinates and their skill structure,
- storage method,
- internal transport organization method,
- method of obtaining the fuel necessary to conduct the works,
- method of providing for health protection of workers, etc.

It is not always possible to make organizational regulations for all existing work posts in an industrial company, especially if the production process is complex. That is why they should be made for repetitive work activities or for complex non-repetitive work activities.

In this case, organizational regulations should be defined in detail, as a whole, regardless of how many organizational subjects participate in completion of the project.

Beside already mentioned, organizational regulations also include rule books (which regulate certain aspects of business activity, duties, responsibilities and rights of the employees, salary distribution, etc.), that each company is in obligation to derive according to laws that apply.

5. PROJECT MANAGEMENT ORGANIZATION

In order to implement the project management concept it is necessary to define the

appropriate organization structures necessary for completion of the investment project. Depending on the type of the project - new investment - the following should be defined: the appropriate organizational structure containing the number of workers, management level staff included; workers' tasks, rights, duties and responsibilities; coordination method, necessary methods and techniques - information systems.

Organizational solutions already exist for modernization, expansion and reconstruction-type projects, thus they need not be designed from scratch but only adapted to the new situation.

Starting from these assertions and having in mind previously described organizational solutions, this paper will include the analysis of most frequently used organizational forms for project management - project and matrix organization.

Project organization is used when special direction and supervision of the project in the completion phase are needed. The essence of this organizational form is the formation of the expert team to work on a certain project - the investment that is currently being conducted. After the activities related to such a project are concluded, the project team is dismissed.

The advantage of the project organizational form lies in the possibility of successful cooperation between project leader and project subordinates and in the opportunity to be creative because the subordinates can dedicate their forces to a certain aspect of the project.

The disadvantage of the project organizational form is the lack of security - the project team members fear that, after the completion of planned work activities, they will not be able to find another project to work on.

In order to perform planned project tasks according to this organizational form it is required to include specialists from different fields as part-time team members (10).

The above mentioned disadvantages can be eliminated through the use of matrix organizational form. Work activities that form part of the project are classified by sectors (design, purchases, production, finance, staff, sales, engineering, etc.).

In this way, for each particular project, specialized organizational units perform jobs.

In order to realize investment projects, which can be very specific, it is often required to engage external specialists. In such cases, the best solution is to use a combined method (combination of project and matrix organization).

6. CONCLUSION

When compared with the existing solutions proposed by the investment evaluation methodology, this study gives a more argument and comprehensive analysis of the organizational and managerial solutions (these solutions represent one of the possible methods for the realization of the planned investment project). This analysis is performed by systematization of the existing and supplementary activities. Such solutions represent a standardized innovation form that can be used to create methodology for investment study evaluation.

In order to achieve the rational coordination of individual investment activities it is necessary to create adequate methodological procedures and contents of the organizational and managerial solutions in an investment study.

Comprehensive analysis of organizational and managerial solutions requires formation

and utilization of a corresponding organizational structure.

Linear diagrams are used for planning and control of terms and investment costs of less complex projects. For more complex projects, the network planning technique is used. These two methods form part of the information system as one aspect of organizational regulations.

Any investment, regardless of the type it belongs to, cannot be completed without adequate organization for each project. Project management is based on the definition of the appropriate organizational structure needed for the efficient investment realization.

Most frequently used organizational forms of project management are project and matrix organization. Combined method (project and matrix organization form) is recommended for use in cases where it is necessary to engage external experts.

The analysis of organizational and managerial solutions of an investment study shown in this paper represents a model applicable to all industrial branches, regardless of their size, work activity, or project type.

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ANALIZA ORGANIZACIONIH I UPRAVLJAČKIH REŠENJA U INVESTICIONOJ STUDIJI

Drago Soldat, Radojica Dubonjić

U radu se detaljno sistematizuju i analiziraju organizaciona i upravljačka rešenja, kompariranjem sa rešenjima koja su determinisana postojećom metodologijom za vrednovanje investicija. Analiza se zasniva na istraživanju celokupne organizacione strukture i upravljanja projektima. Kao deo organizacione strukture, informacioni sistemi su od velikog značaja i kao takvi determinišu primenu linearnog dijagrama - Gantovog dijagrama i tehnike mrežnog planiranja u procesu realizacije investicije.