



## The Second Function of Engineering Management: Organizing

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**Abstract** – In this study, the organization method which is one of the 4 main functions of engineering management is emphasized. In order to examine the present state of the organization methods, recently published articles have been scanned. Important and basic terms used in organization field, especially organization models, organizational culture and project delivery models are mentioned. Finally, today, especially in the fields of technology, examples of differentiated organizational structures are given. In this study, traditional methods and different methods that are being used today are shown together.

**Keywords**— *Engineering, Management, Organizing, Projects*

## I. INTRODUCTION

Individual and team level factors affect projects. But the issue which is more influential than this is the organizational structure. The organizational structure is set up to work together in a coordinated manner between individuals and teams. Individual work within the team is also supervised by this structure [1]. Organization structure by L. Antic; is defined as the whole of relationships between individuals, factors and activities [2].

The main goal of the projects is cost-saving and efficient operation. In this context, detailed descriptions of the tasks should be made by the manager for each employee [3]. In addition, the configuration of the project team and decision authorities should be elaborated [4].

When deciding on a project organization, it is necessary to consider personnel restrictions and organizational requirements and to avoid ambiguous job descriptions. In addition, the relevant departments and project members should be given maximum freedom in their decisions [4]. Today, the general consensus is that there is not a single best organizational option under a project. In the world where technology and human psychology are constantly changing, it is preferred that the organization can keep up with these changes and update itself [5].

**The structural organization** is at the core of the organization. The structural organization defines the distribution of tasks to individuals or departments and the relationship between individuals/departments. Definitions of

some of the individuals/departments involved in the organization are given below:

**The Project Sponsor** does not directly participate in the project work, but usually the project manager appoints a proxy. The project sponsor gives advice to the project manager when necessary [4].

**The Steering Committee** is responsible for commercial affairs. At the same time, it has budget approval authority. Helps to solve problems and risks at strategic level [4].

**The Project Manager** is the most important person in the project organization. It is directly responsible for the success of the project within the timeframe, cost, scope and quality constraints of the project plan.

**The Team Leader** is responsible for managing a section of the project or a subproject. A team leader should also know how to manage human resources in addition to the technical skills involved.

At the bottom of the structure there is a **team member**. Having it underneath does not mean it's not trivial. It is the responsibility of the project to carry out the tasks defined for it. The success of his task directly affects project success.

## II. ORGANIZATIONAL MODEL

Organization methods generally fall into two categories: The Pure Line Organization (PLO) and The Pure Project Organization (PPO). There is also the Matrix Organization (MO), a combination of these [4].

In the PLO (see Figure 1) project managers do not have a fixed location, they can support different departments/people. The project was separated according to specific tasks and these tasks were delivered to the relevant departments. Its main advantages are; it is flexible against changes, increasing the level of knowledge of collaborations in departments. The main disadvantages are; communication and interaction between departments is difficult. For this reason, troubles and delays can be experienced in common affairs.

In the PPO (see Figure 2), the project manager is interacting with specific experts in each department. Advantages; the work of each section is directly under the control of the project manager. Interaction between

departments/individuals is much easier. The disadvantages are; they are not flexible to changes due to specific tasks/patterns. Excessive ownership and authority of the project manager may hinder original and innovative designs.

The MO shown in Figure 3 is a combination of the two methods. It is especially preferred on large projects. More

contributions are made from expertise and experience. It has both flexibility and communication convenience. Sources are used more effectively. On the other hand, conflicts between project managers may occur. A large number of managers means more cost.

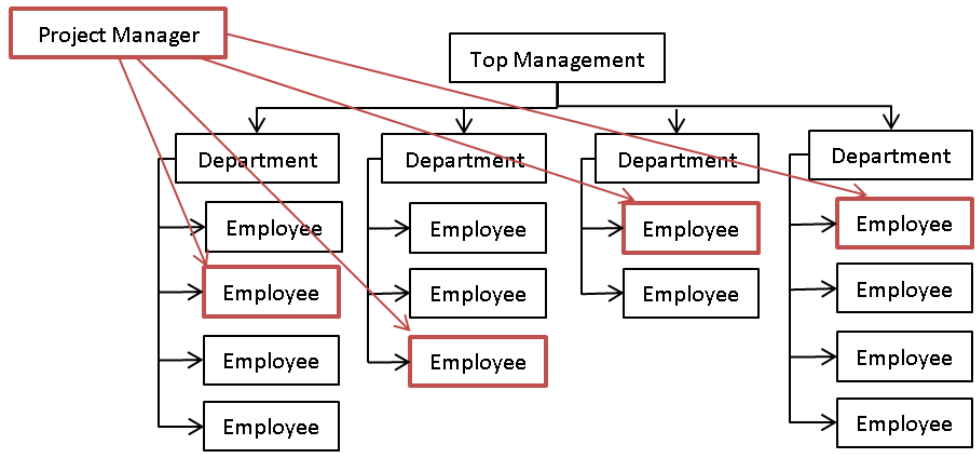


Figure 1. The Pure Line Organization

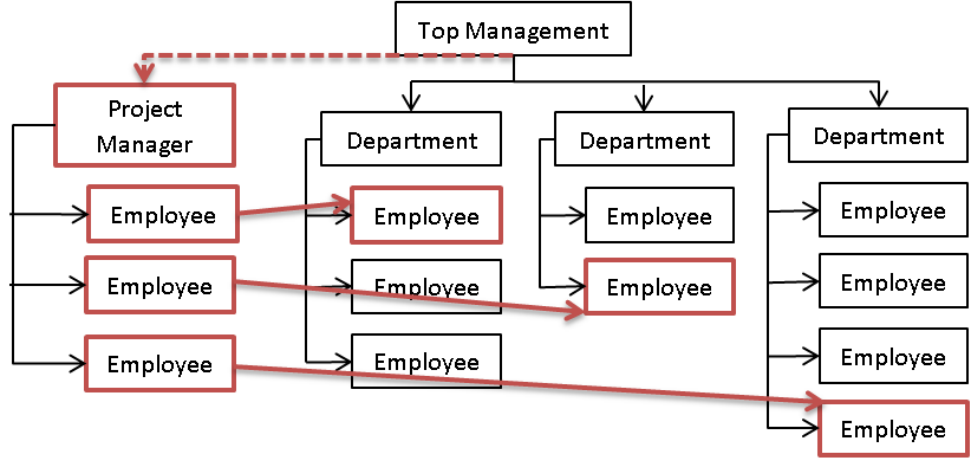


Figure 2. The Pure Project Organization

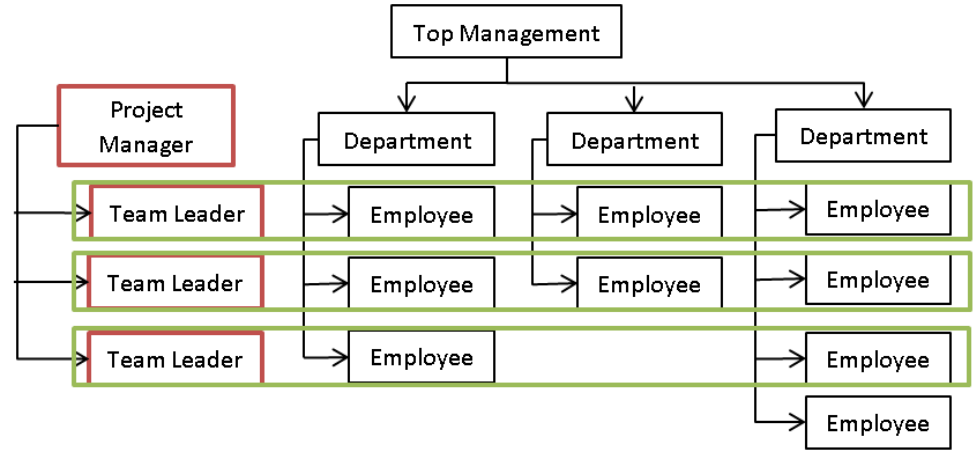


Figure 3. The Matrix Organization

### III. ORGANIZATIONAL CULTURE

Organizational culture means a system of shared assumptions, values and beliefs among people. These values affect the organizational performance. Organizational culture is a young but fast developing field in terms of management.

Organizational culture is an effective control mechanism that determines the behavior of employees. Culture; It is a way to control and manage the behavior of employees more strongly than organizational rules and regulations. Keeping employees happy is preferable to other concerns. Culture is largely invisible to individuals. Nevertheless, it directly affects all employee behaviors, thoughts and behavior patterns [1].

Organizational cultures are specific to the business environment. Copying intercultural cultures is not always possible to show the same success. It is important that the culture is in accordance with the requirements of the company environment. When this compliance is achieved, the performance of the company will be affected positively. For example, it should promote the culture, innovation and viability of a company working in high-tech areas [1].

The organizational culture consists of three interrelated levels. There are basic assumptions in the first level. These include the beliefs of the human nature. In the second level, values, principles, standards and targets are found. At the final level there are concrete directions [1].

### IV. PROJECT DELIVERY METHODS

Another important concept within the organization is project delivery. Project delivery covers the time from the beginning to the end of the project. For this reason, all phases of planning, design and construction are included. One of the main decisions made within project management is to choose the project delivery method.

When choosing the best project delivery method for projects, it is necessary to understand the available options. Because this choice will directly affect the projects contract and its costs. In this case, outstanding criteria are; a realistic budget, a reasonable schedule, a clear and high quality design, and detailed risk assessment [6].

Project delivery methods are generally divided into four categories: traditional, construction management at risk, design build, and multi prime [7]. The manager should make a detailed assessment when choosing the method, and may use multiple methods in a hybrid if necessary.

#### Traditional

There are three stages: design, offer and build. It has a very common usage. There are clearly defined roles for employees. These roles are : business owner, designer and manager [7, 8]. And these roles are very important.

The firm guarantees the manager's plans and qualifications. The manager is obliged to produce the project as designed. The designer is obliged to design according to professional standards.

This method can have longer reinforcements than others. The duration is extended due to reasons such as direct supervision of each employee by the manager and lack of communication between the participants. In addition, the designer is not provided with much input by other employees. This limits the effectiveness and implementation of the design. In addition to these disadvantages, it has the advantages of early cost identification, contract protection for the firm and easy bidding. But it is difficult to use for complex and large projects [6, 8]. A schematic view of the method is given in Fig.

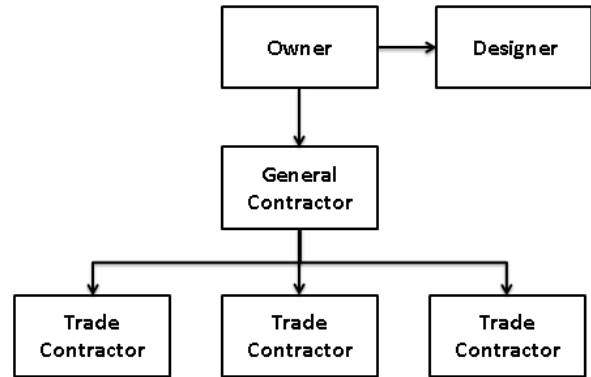


Figure 4. Traditional

#### Construction Management at Risk

This method commits the project to be completed at a fixed schedule and cost [8]. Therefore, when making subcontractor selections, they must adhere to quality standards. In addition to the company manager, there is also a second manager in risk management [7, 8]. The price guaranteed within the scope of the project is the maximum price (GMP). The managerial risk is the most unimportant targets, which prevents the increase in the maximum price on this count [8].

The biggest disadvantage is that there is no direct relationship between the designer and the contractor. At the end of this, customer requests may be missing in the product [6]. A schematic view of the method is given in Figure 5.

#### Design/Build

In this method, the requirements and contract are given by the firm to the designer. The designer is in direct contact with contractors [8]. The designer performs the work based on the performance requirements. The firm follows both the designer and the contractor [6, 7]. Better cost-effectiveness can be achieved because the designer and contractors are in direct contact [6]. The biggest advantage is fast feedback and good interactions between participants. The biggest disadvantage is that the quality can be compromised to reduce costs. For this reason, customer demands and quality requirements should be closely followed by the firm manager [6, 7]. A schematic view of the method is given in Figure 6.

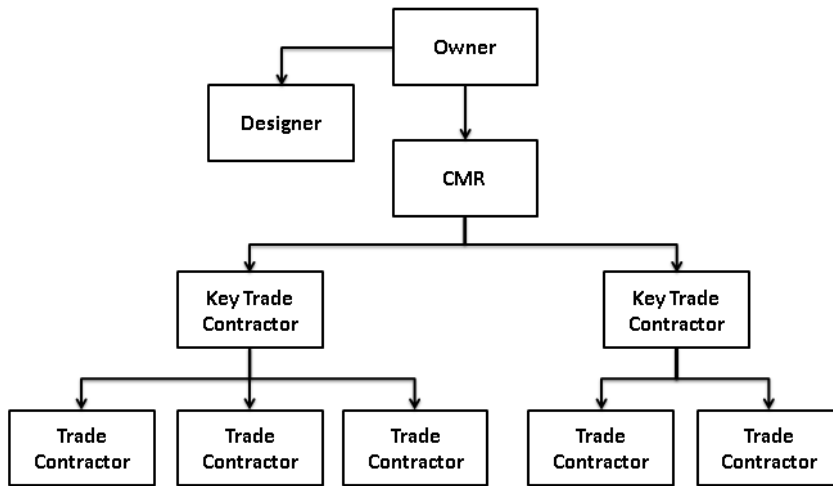


Figure 5. Construction Management at Risk

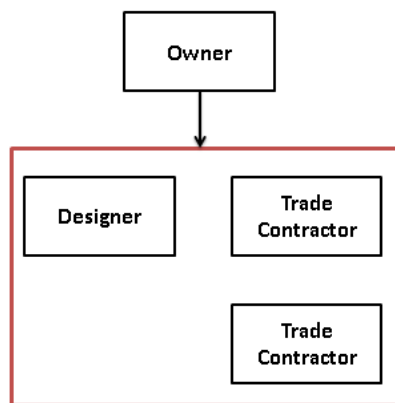


Figure 6. Design/Build

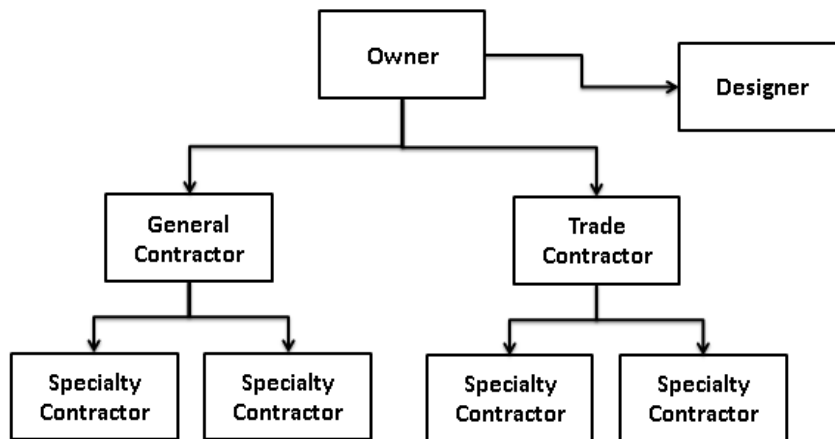


Figure 7. Multi Prime

### Multi Prime

This method is similar to the traditional method. But there is more than one sub-contractor management. These managers depend on the firm. In their subspecies, they identify special subcontractors who can take part in the project [6, 8]. All employees are directly connected to the company through the

managers. In the same way, the designer also works in conjunction with Direction. It may be preferred in large projects where the traditional method is desired to be used. A schematic view of the method is given in Fig.

## V. DIFFERENT ORGANIZATION METHODS

Today, it is defined as "internet age". People are interacting with other people/machines, even machines and other machines via the internet and doing business. Different organization methods are being developed considering the needs of this age. One of them is the "Big Organization" which is in "Complexity Science Management" (CSM). Within the CSM; perspective, idea, platform, mode of operation, and theory. The Big organization method has three main elements: element, structure and function. Apart from these visible elements; buildings, people, computers, books, etc. and invisible elements; culture, innovation, creativity and so on. located. The basic view of the organization structure is given in Figure 8 [9].

According to U. Vijayakumar, in the organizational structure of the information systems company, the function of each position must be clearly defined and these positions should be given to the right persons. At the beginning of the organizational structure IS Manager is the chief officer of all activities. The job descriptions of the responsible officers are

given below depending on the manager. There are other subordinate responsibilities under his responsibility [10].

- System Analyst is responsible for analysis and design of applications,
- Database Administrator is responsible for creating and managing databases,
- System / Network Administrator is responsible for the installation, management and security of systems and networks,
- IS Auditor periodically monitors the operation of systems and safety,
- End User Support Specialist is responsible for delivering and teaching systems to end users.

Figure 9 shows the organizational structure of IS department.

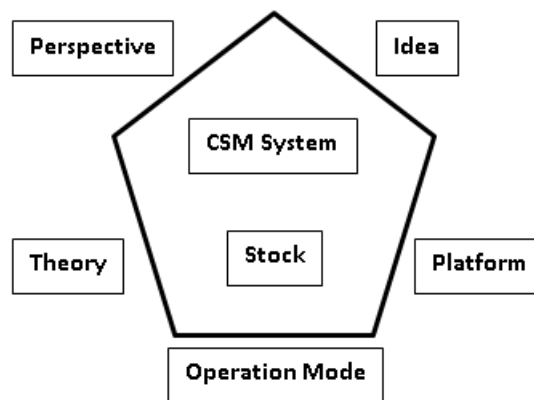


Figure 8. Big Organization Smart Body

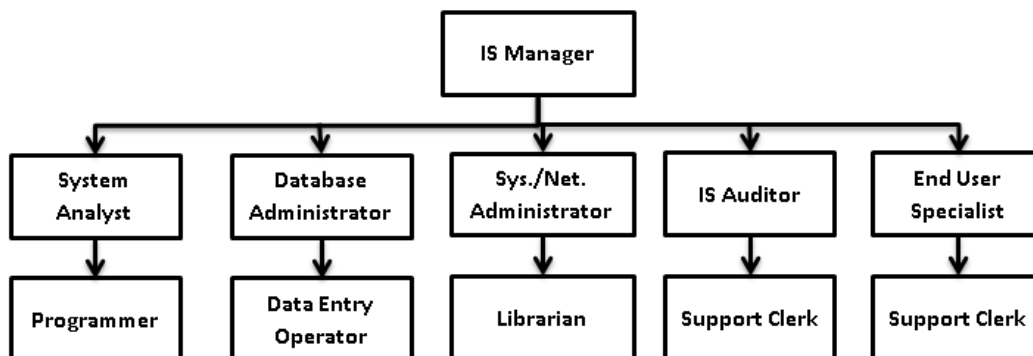


Figure 9. Organizational Structure of IS department

## VI. CONCLUSIONS

The success of the engineering projects is due to the correct management. One of the basic functions of engineering management is organizing. There are different organization methods. This study focuses on 3 main methods which are generally preferred by firms. Another concept that is as important as the method is the culture of shared assumptions, values and beliefs among people. When establishing the

organization structure, attention should also be paid to the culture of individuals/departments. In the last part of the work, delivery methods are also emphasized. Delivery to each buyer is an important process, and different methods are used to manage this process correctly. It is not the solution of the problem that is expected from the employees. At the same time, it is a fast and efficient solution within the existing organization. Because nowadays, time has become more precious than money.

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