Chapter 1

THE FIELD OF ENGINEERING MANAGEMENT

Engineers are expected to perform a variety of tasks depending on their specialization and job level. It is important to the engineer that he knows what is expected of him to perform his job effectively and efficiently. The next concern will be to identify the skills required which the engineer did not possess. As engineers, they are not directly trained to deal with people, it is expected that their weakness will most often be on people-based skills. This difficulty will be more apparent once they are assigned to occupy management positions. It follows that if the engineer manager would want to do his job well, some exposure to engineering management activities will be necessary.

THE FUNCTIONS OF THE ENGINEER

Even as engineers are currently producing solutions to many of the difficulties faced by mankind, much is still expected of them. Their outputs, new or improvements of old ones are very much needed in the following specific problem concerns:

1. the production of more food for a fast growing world population;
2. the elimination of air and water pollution
3. solid waste disposal and materials recycling;
4. the reduction of noise in various forms;
5. supplying the increasing demand for energy;
6. supplying the increasing demand for mobility;
7. preventing and solving crimes; and
8. meeting the increasing demand for communication facilities.

Specifically, the functions of engineering encompass the following areas:
1. Research – where the engineer is engaged in the process of learning about nature and codifying this knowledge into usable theories.
2. Design and development – where the engineer undertakes the activity of turning a product concept to a finished physical items. Design for manufacturability and value engineering teams (a feature of some companies) are charged with improvement of designs and specifications at the research, development, design, and production stages of product development.
3. Testing – where the engineer works in a unit where new products or parts are tested for workability.
4. Manufacturing – where the engineer is directly in charge of production personnel or assumes responsibility for the product.
5. Construction – this is where the construction engineer (civil engineer usually) is directly in charge of the construction personnel or may have responsibility for the quality of the construction process.
6. Sales -0 where the engineer assists the company’s customers to meet their needs, especially those that require technical expertise.
7. Consulting – where the engineer works as consultant of any individual or organization requiring his services.
8. Government – where the engineer may find employment in the government performing any of the various tasks in regulating, monitoring, and controlling the activities of various institutions, public or private.
9. Teaching – where the engineer gets employment in a school and is assigned as a teacher of engineering courses. Some of them become deans, vice presidents, and presidents.
10. Management – where the engineer is assigned to manage groups of people performing specific tasks.

THE ENGINEER IN VARIOUS TYPES OF ORGANIZATION

From the viewpoint of the engineer, organizations may be classified according to the degree of engineering jobs performed:

1. Level One – those with minimal engineering jobs like retailing firms.
2. Level Two – those with a moderate degree of engineering jobs like transportation companies
3. Level Three – those with a high degree of engineering jobs like construction firms.

Figure 1.1 Types of Organization and the Management Skills Required of Engineers

Management Skills Required at Various Levels

Among the types of organizations, the engineer will have a slim chance of becoming the general manager or president of level one, unless of course, he owns the firm. The engineer manager may be assigned to head a small engineering unit of the firm, but there will not be too many firms which will have this unit.

In level two firms, the engineer may be assigned to head the engineering division. The need for management skills will now be felt by the engineer manager.

Level three firms provide the biggest opportunity for an engineer to become the president or general manager. In this case, the engineer manager cannot function effectively without adequate management skills.
ENGINEERING MANAGEMENT DEFINED

Engineering management refers to the activity combining “technical knowledge with the ability to organize and coordinate worker power, materials, machinery, and money.”

When the engineer is assigned to supervise the work of even a few people, he is already engaged in the first phase of engineering management. His main responsibility is to lead his group into producing a certain output consistent with the required specifications.

The top position an engineer manager may hope to occupy is the general managership or presidency of any firm, large or small. As he scales the management ladder, he finds that the higher he goes up, the less technical activities he performs, and the more management tasks he accepts. In this case, it is but proper that the management functions taught in pure management courses be well understood by the engineer manager.

MANAGEMENT DEFINED

Management may be defined as the “creative problem solving process of planning, organizing, leading, and controlling an organization’s resources to achieve its mission and objectives.”

THE PROCESS OF MANAGEMENT

Management is a process consisting of planning, organizing, directing (or leading), and controlling.

Management must seek to find out the objectives of the organization, think of ways how to achieve them, decide on the ways to be adapted and the material resources to be used, determine the human requirements of the total job, assign specific tasks to specific persons, motivate them, and provide means to make sure that the activities are in the right direction.

REQUIREMENTS FOR THE ENGINEER MANAGERS JOB

Depending on the type of products or services a firm produces, the engineer manager must have the following qualifications:

1. a bachelor’s degree in engineering from a reputable school; In some cases a master’s degree in engineering or business management is required;
2. a few years experience in pure engineering job;
3. training in supervision;
4. special training in engineering management

HOW ONE MAY BECOME A SUCCESSFUL ENGINEER MANAGER

Successful engineer managers do not happen as a matter of chance, although luck is contributory factor. It is very important for the engineer manager to know the various factors leading to successful management.

Kreitner indicates at least three general preconditions for achieving lasting success as a manager.

1. ability
2. motivation to manage, and
3. opportunity
Ability

Managerial ability refers to the capacity of an engineer manager to achieve organizational objectives effectively and efficiently. Effectiveness, according to Higgins, refers to a description of “whether objectives are accomplished”, while efficiency is a description of the relative amount of resources used in obtaining effectiveness.

Motivation to manage

Many people have the desire to work and finish specific tasks assigned by superiors, but not many are motivated to manage other people so that they may contribute to the realization of the organization’s objectives.

John B. Miner, developed a psychometric instrument to measure objectively an individual’s motivation to manage. The test is anchored to the following dimensions:

1. Favorable attitude toward those in positions of authority, such as superiors;
2. Desire to engage in games or sports competition with peers.
3. Desire to engage in occupational or work-related competition with peers.
4. Desire to assert oneself and take charge.
5. Desire to exercise power and authority over others.
6. Desire to behave in a distinctive way, which includes standing out from the crowd.
7. Sense of responsibility in carrying out the routine duties associated with managerial work.

Opportunity

Successful managers become possible only if those having the ability and motivation are given the opportunity to manage. The opportunity for successful management has two requirements namely obtaining a suitable managerial job, and finding a supportive climate once on the job.

Questions for Review and Discussion

1. Why engineers are considered an important segment of the society?
2. What are expected of engineers in general?
3. In what current concerns are engineering out puts needed?
4. In what areas are engineers currently involved?
5. How many organizations be classified according the engineering jobs performed?
6. Which organization level requires the highest management skills for engineer managers?
7. What is engineering management?
8. How one may define management?
9. What qualifications must an engineer manager have?
10. How may one become a successful engineer manager?

SUGGESTED ITEM FOR RESEARCH

1. Prepare a list of ten engineers who became president or general manager of a large company.