8. Software Engineering Project Management

8.1 Definitions:

Management: The activities and tasks undertaken by one or more persons for the purpose of planning and controlling the activities of other in order to achieve objectives that could not be achieved by the others acting alone.

Project Management: A system of management procedures, practices, technologies, skills, and experience necessary to successfully manage an **engineering project**.

Software Engineering Project Management: Project management where the product is **software**.

Software Development: The process of developing or modifying a software-intensive system to meet the acquirer's contractual requirements. The process of developing this system to deliver on time and within budget

Software Acquisition: The process of contractually obtaining, from a supplier, a software-intensive system for use by another groups or organization

8.2 Universality of Management:

What does the Universality of Management mean?

- Management performs the same functions regardless of organizational position or enterprise.
- Management functions are characteristic duties of all managers.
- Management practices, methods, activities and tasks are specific to the enterprise.

8.3 Project vs. Acquisition:

❖ Two types of software projects
- Development projects.
- Acquisition projects.

- Two types of software project managers
  - Project managers.
  - Acquisition managers.

8.4 Issues with Software Engineering:

- 70% of software organizations have no defined methods.
- Process is defined during the development.
- Software ends up as:
  - Late
  - Over budget
  - Fails to meet requirements

This is why we need project managers. They provide the processes and methods and continually check to ensure that the organization is on schedule. Today's major problems with software development are not technical problems, but management problems.

8.5 Management Functions & Activities

The Functions of management are the following:

1. **Planning** – predetermining a course of action for accomplishing an objective
2. **Organizing** – Arranging the relationships among work units for accomplishment of objectives and the granting of responsibility and authority to obtain those objectives
3. **Staffing** – Selecting and training people for positions in the organization. (Also eliminating positions as necessary)
4. **Directing** – Creating an atmosphere that will assist and motivate people to achieve desired end results
5. **Controlling** – Establishing, measuring, and evaluating performance of activities toward planned objectives

Each management function can be broken down into individual tasks or activities.

8.6 Planning Activities:

1. **Set objectives and goals:** Success criteria for objectives and goals should be specified.

2. **Develop strategies:** Strategies are long-range goals and the methods to obtain those goals.
3. **Develop policies:** Policies are predetermined management decisions.
4. **Forecast future situations:** Forecast future situations-predict the future and plan accordingly.
5. **Conduct a risk assessment:** **Risk** is the probability of an undesirable event occurring. A problem is a risk that has occurred. Contingency plans are what will be done in the situation where the risk becomes a problem.
6. **Determine possible courses of action.**
7. **Make planning decisions:** In making planning decisions, the manager consults upper management, the customer and others.
8. **Set procedures and rules:** Procedures establish customary methods and provide guidance for project activities. Process standards can be used to define procedures.
9. **Develop project plans:** The project plan will specify the: tasks, the cost, and the schedule.
10. **Prepare budgets:** Budgeting is the process of placing cost figures on the project plan.
11. **Document project plans.**

8.7.1 Organizing Activities:

Organizing a software engineering project involves developing an effective and efficient organizational structure. The purpose is to focus the efforts of the many on a selected goal. The activities as the following:

1. Identify and group project function, activities, and tasks.
2. Select organizational structures.
3. Create organizational positions.
4. Define responsibilities and authority.
5. Establish position qualifications.
6. Document organizational decisions.

8.7.2 Organizational Structure:

- ❖ Conventional organization structure:
  - Line organization
  - Staff organization
- ❖ Project organization structure
  - Functional
  - Project
  - Matrix
- ❖ Team Structure
  - Egoless team: decisions made by consensus, group leadership rotates
  - Chief programmer: is not often used because of the difficulty in finding someone experienced enough to be a chief programmer
  - Hierarchical: is most commonly used. Project leaders -> Senior Engineers -> Junior Engineers.

8.7.3 Establish Position Qualifications:

These are some examples of positions. The project manager must define the requirements to fill the positions.

- Project managers.
- Software system engineers.
- Scientific/engineering programmers, programmer-analysts.
- Verification and validation engineer.
- Software quality assurance engineer.

8.8.1 Issues in Staffing:

- Lack of project management training.
- Greatly varying skills.
- Inability to predict productivity of engineers.
- Lack of experience.
- Turnover.
- Not enough software engineers.
  - Most graduates are theoretical
  - Or just coders

8.8.2 Staffing Activities:

1. Fill organizational positions
2. Assimilate newly assigned personnel
3. Educate or train personnel
4. Provide for general development
5. Evaluate and appraise personnel
6. Compensate
7. Terminate assignments
8. Document staffing decisions

8.8.3 Filling Positions:

The manager must look for the following:

- Education
- Experience
- Training
- Motivation
- Commitment
- Self-motivation
- Group affinity
- Intelligence

8.9 Directing Activities:

1. Provide leadership
2. Supervise personnel
3. Delegate authority
4. Motivate personnel
5. Build teams
6. Coordinate activities
7. Facilitate communication
8. Resolve conflicts
9. Manage changes
10. Document directing decisions

8.10 Providing Leadership:

- Positional Power
  - Power derived from having a leadership position
  - Not always effective
- Personal Power
  - Charisma or personal charm
  - Sometimes more effective than positional power

8.11 Job Motivations:

In the following table all the attractor and dissatisfies things for the staff members are listed.

Job Attractors	Job Dissatisfiers
Salary	Company mismanagement
Chance to advance	Poor work environment
Work environment	Little feeling of accomplishment
Location	Poor recognition
Benefits	Inadequate salary
Facilities/equipment	Little chance to advance
Job satisfaction	Poor facilities/equipment
Company management	Poor benefits
Job responsibility	Poor career path definition

8.12 Controlling Activities:

1. Develop standards of performance.
2. Establish monitoring and reporting systems.
3. Measure and analyze results.

4. Initiate corrective actions.
5. Reward and discipline.
6. Document controlling methods.

- A standard is a documented set of criteria used to specify and determine the adequacy of an action or object. A software engineering standard is a set of procedures that defines the process for developing a software product and/or specifies the quality of a software product.
- The most important software quality attribute is reliability.