Unit: II
Software Project Management

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CSE: 0326 Software Engineering

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Outline

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- Team Processes and responsibilities
- Participation and conflict resolution
- Effort estimation
- Risk categories and management of risks

Software Project Management

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- Software projects need to be managed:
  - Building computer software is a complex undertaking task; and
  - It involves many people working over a relatively longer time.
- Software project management is the first layer of software engineering process.
- Crucial activity:
  - success and failure of the software is directly depends on it.
  - budget constraints, schedule constraints, and quality oriented focus.
- Definition:
  - Planning, monitoring and control of the people, process and events that occurs as software evolves from a preliminary concept to an operational implementation.
  - Umbrella activity within software engineering.
  - It begins before any technical activity is initiated and continues throughout the definition, development and support of computer software.
  - Project management activity encompasses measurements and metric estimation, risk analysis, schedules, tracking and control.

Four P's

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- Effective software project management focuses on four P's: people, product, process, and project.
- People: software engineering work involves intense human endeavour.
- Product: encourage comprehensive customer communication early in the evolution of a project.
- Process: reduce the risk of inserting competent technical methods and tools into a vacuum.
- Project: embark with a solid project plan for success of the product.

People

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- Importance: Software Engineering Institute (SEI) has developed a **people management capability maturity model** (PM-CMM).
- Measurement: readiness of software organizations to undertake increasingly complex applications.
- Objective: attract, grow, motivate, deploy, and retain the talent needed to improve software development capability.
- PMM is a companion to the software capability maturity model that guides in creation of a mature software process.
- Areas:
  - Recruitment, selection, performance management, training, career development, and team culture environment.

Product

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- Before planning the project:
  - Product objectives and scope should be established.
  - Alternate solutions should be considered.
  - Technical and management constraints should be identified.
  - Software developer and customer must meet to define product objectives and scope.
  - Objectives identify the overall goal for the product from customer's point of view.
  - Scope identifies the primary data, functions and behaviours that characterize the product and bind the characteristics in a quantitative manner.

Process

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- A software process provides the framework from which a comprehensive plan for software development can be established.
- A small number of framework activities are applicable to all software projects, regardless of their size or complexity.
- Task set: tasks, milestones, work products and quality assurance points–enable the framework activities to be adapted.
- Umbrella activities: software quality assurance, software configuration management, and measurement.

Project

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- Planned and controlled software projects: it is the only known way to manage complexity.
- The overall development cycle is called as Project.
- In order to avoid project failure, a software project manager and the software engineers must avoid
  - a set of common warning signs,
  - understand the critical success factors that lead to good project management, and
  - develop a commonsense approach for planning, monitoring and controlling the project.

Software Team

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- The best team structure depends on
  - nature of the project and product; and
  - individual characteristics of the team member.
- Basic team structures are
  - Democratic teams
  - Chief programmer teams
  - Hierarchical teams

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- Basic team structures are
  - Democratic teams
  - Chief programmer teams
  - Hierarchical teams
- Democratic Teams:
  - Also known as **Democratic Decentralized (DD)**.
  - The team leader position does not rotate among the team members because
    - a team functions best when one individual is responsible for coordinating team activities and for making final decisions in situations where collective decisions can not work.
  - All the decisions are made by collective effort of the members.
  - All the activities carried out during project are collectively discussed and handled.

Software Team

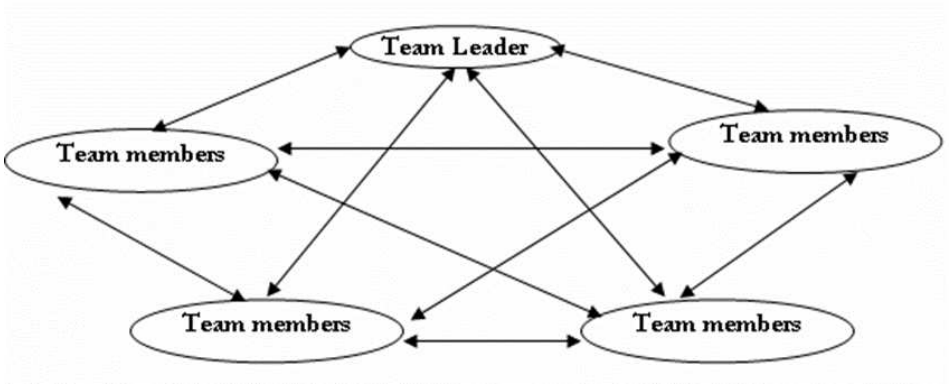

Figure 1: Democratic Team Structure

Software Team

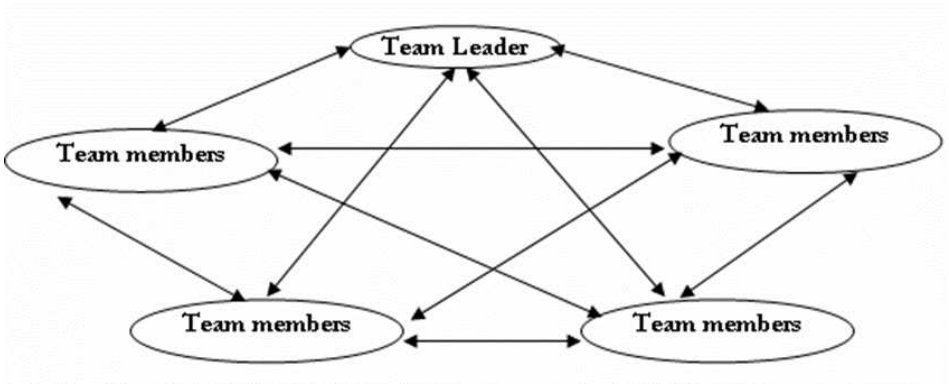

Figure 1: Democratic Team Structure

- Advantages
  - Opportunity for team members to contribute to decisions.
  - Opportunity for team members to learn from each other.
  - Increased job satisfaction due to equal importance and non threatening environment.
  - These teams can stay together for several years and may work on several different projects.

Software Team

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- Disadvantages
  - Communications overhead required for reaching to collective decisions.
  - A lot of coordination required between team members.
  - Less individual responsibility and authority results in less personal drive and initiative from team members.

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- Chief Programmer Teams

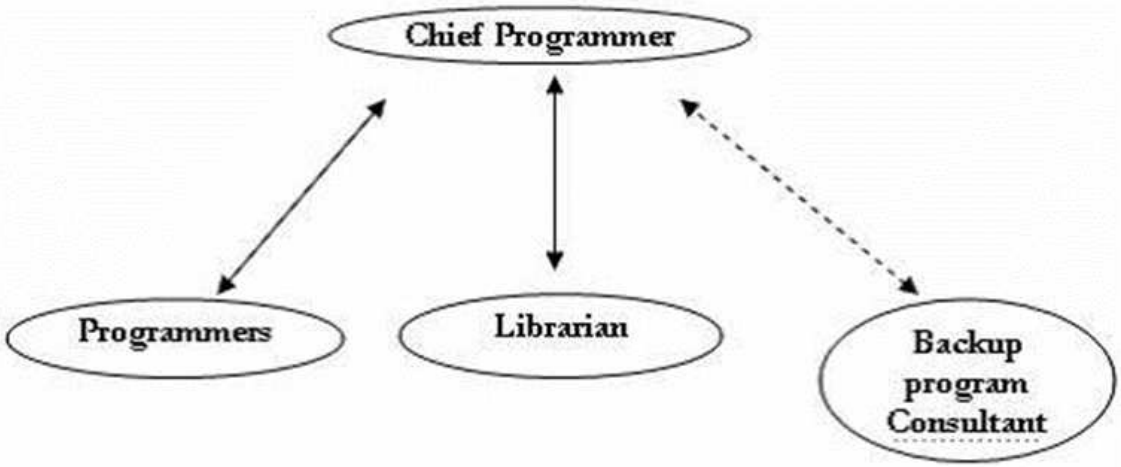

Figure 2: Chief Programmer Team Structure

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- Also known as **Controlled decentralized (CD)**.
- They are highly structured.
- The chief programmer designs the product and makes all the decisions.
- The chief programmer implements the critical parts of the project.
- The chief programmer allocates the work for the individual programmer under him.
- Usually the number of programmers ranges from 2 to 5 only.
- The programmers do the coding, debug; document and unit test the system.
- The chief programmer is assisted by a backup consultant programmer on various technical problems, provides connection with the customer provides interaction with quality assurance group and may participate in analysis, design and implementation phases.
- The chief programmer is also assisted by an administrative program manager, who handles the administrative details which includes time cards for the employees, sick leave and vacation schedule.

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- Disadvantages
  - As all the decisions are taken by the chief programmer, hence it results in low moral among the programmers.
  - The effectiveness of this structure depends solely on the efficiency and knowledge of the chief programmer.

Software Team

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- Hierarchical Team
  - It is a mixed approach of Democratic and Chief programmer team structures.
  - The project leader has under his control, 2 to 5 senior programmers who individually have 5 to 7 junior programmers under their control.
  - The various jobs of the Project leader includes
    - Assigning tasks
    - Attending reviews and walkthroughs
    - Detecting problem areas
    - Balancing of the work load
    - Participation in various technical activities
  - The major decisions are taken by the Project leader and who in-turn gives some decision making power to the senior programmers also.

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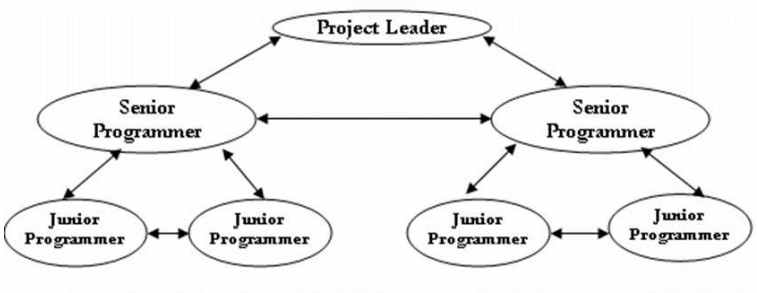

Figure 3: Hierarchical Team Structure

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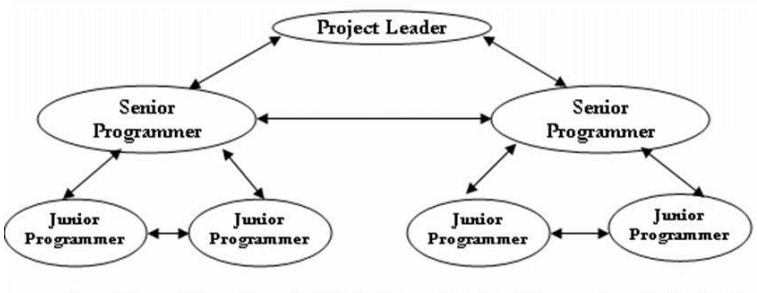

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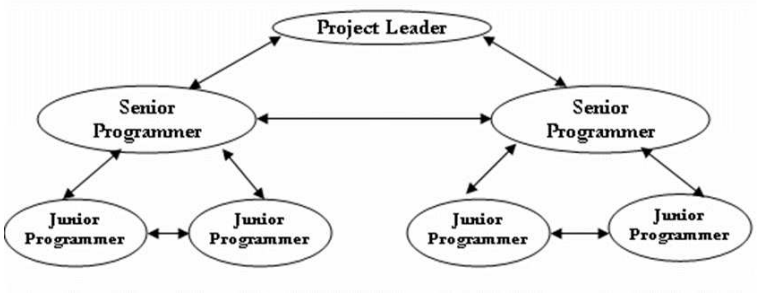

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- Disadvantages
  - The most technically efficient programmers tend to be promoted, so the best programmers are lost.
  - The best programmers may not be good managers hence promoted to a management post might result in reduction in productivity.

Risk Management

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- A risk is a potential problem: it might happen, it might not.
- Steps of Risk Analysis and Management
  - Recognizing what can go wrong is the first step, called risk identification.
  - Each risk is analyzed to determine the likelihood that it will occur and the damage that it will do if it does occur.
  - Risks are ranked, by probability and impact.
  - Finally, a plan is developed to manage those risks with high probability and high impact.
- Steps: risk identification, risk projection, risk assessment, and risk management.

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  - Unpredictable risk: joker in the deck. They can and do occur, but they are extremely difficult to identify in advance and handle.

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- Reactive risk strategy
  - Reactive risk strategies follows that the risks have to be tackled at the time of their occurrence.
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  - Systematic attempt to specify threats to the project plan.
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- Risk Identification
  - Systematic attempt to specify threats to the project plan.
  - Identification of predictable and known risks–avoid and control the risks.
  - One way is to create the checklist.
    - focuses on known and predictable risks in the generic categories.

Risk Management

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- Product size: overall size of the software.

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- Staff size and experience: overall technical and project experience of the software engineers.

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- Risk Projection
  - Also known as risk estimation.
  - Attempts to rate the risk in two ways:
    - likelihood or probability that the risk is real; and
    - consequences of the problems associated with the risk.
  - Project planner along with other managers and technical staff, performs four risk projection activities:
    - Establish a scale that reflects the perceived likelihood of a risk,
    - Delineate the consequences of the risk,
    - Estimate the impact of the risk on the project and the product, and
    - Note the overall accuracy of the risk projection so that there will be no misunderstandings.

Risk Management

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- Risk Assessment
  - Risk analysis establishes a set of triplets of the form $\{r_i, l_i, x_i\}$, where
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  - Risk assessment activities:
    - Define the risk referent levels for the project.
    - Attempt to develop a relationship between each $\{r_i, l_i, x_i\}$ and each of the referent levels.
    - Predict the set of referent points that define a region of termination, bounded by a curve or areas of uncertainty.
    - Try to predict how compound combinations of risks will affect a referent level.

Risk Management

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- Risk Mitigation, Monitoring, and Management
  - An effective strategy must consider three issues: risk avoidance, risk monitoring, and risk management and contingency planning.
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    - Define documentation standards and establish mechanisms to assure that documents are developed in a timely manner.
    - Conduct peer reviews of all work.
    - Assign a backup staff member for every critical technologist.