Chapter 22 Notes

Projects need to be managed because professional software engineering is always subject to organizational budget and schedule constraints. The project managers job is to ensure that the software project meets and overcomes these constraints as well as delivering high-quality software.

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Deliver software that meets the customers’

Success Criteria for project management are:

1. Deliver the software to the customer at the agreed time
2. Keep overall costs within budget
3. Deliver software that meets the customer’s expectations
4. Maintain a happy and well-functioning development team

How does SWE differ from other types of Engineering

1. The product is intangible
   1. Software cannot be seen or touched. SW project managers cannot see progress by simply looking at the artifact that is being constructed (unlike civil and mechanical engineers). They rely on others to produce evidence that they can use to review the progress of the work
2. Large SW projects are often “one-off” projects
   1. Large software projects are usually different in some ways from previous projects -> managers who have large previous experience may find it difficult to anticipate problems.
   2. Lessons learned in the past may not be transferrable to new projects
3. SW process are variable and organization-specific
   1. Unlike other engineering (like civil) where bridges and building have a fixed process

Manager Activities

1. Project Planning
   1. Planning, estimating, and scheduling project development, and assigning people to tasks.
   2. They supervise work to ensure that it is carried out to the required standards and monitor progress
2. Reporting
   1. Project managers are usually responsible for reporting on the progress of a project to customers and to the managers of the company developing the software.
3. Risk management
   1. Project managers have to assess the risks that may affect a project, monitor these risks, and take action when problems arise.
4. People Management
   1. Responsible for managing a team of people. They have to choose people for their team and establish ways of working that lead to effective team performance
5. Proposal Writing
   1. 1st stage in SW project may involve writing a proposal to win a contract to carry out an item of work.
      1. The proposal describes the objectives of the project and how it will be carried out. Usually includes cost and schedule estimates and justifies why the project contract should be awarded to a particular organization or team.

Risk Management (Section 22.1)

* This involves anticipating risks that might affect the projects schedule or the quality of the software being developed, and then taking action to avoid these risks.
* 3 Categories of Risk
  + Project Risks
    - Risks that affect the project schedule or resources. (Ex. Loss of an experience designer)
  + Product Risks
    - Risks that affect the quality or performance of the software being developed. (Ex. The failure of a purchases component to perform as expected)
  + Business Risks
    - Risks that affect the organization developing or procuring the software (Ex. A competitor introducing a new product is a business risk)
* The results of risk analysis should be recorded in the project plan along with a consequence analysis (Which sets out the consequences of the risk for the project, product, and business)
* Common Risks
  + Project Risks
    - Staff Turnover
    - Management Change
    - Hardware Unavailability
  + Project and Product Risks
    - Requirements Change
    - Specification Delays
    - Size underestimate
  + Product Risks
    - CASE Tool (tools that support the project) underperformance
  + Business Risks
    - Technology change
    - Product competition
* Process of Risk Management
  + Risk Identification
    - Identify possible project, product, and business risks
  + Risk Analysis
    - Assess the likelihood and consequences of these risks
  + Risk Planning
    - Make plans to address the risk, either by avoiding it or minimizing its effects on the project
  + Risk Monitoring
    - Regularly assess the risk and your plans for risk mitigation and revise these when you learn more about the risk
    - After this you loop back to Risk Analysis
* You should document the outcomes of the risk management process in a Risk management Plan
  + This should include a discussion of the risks faced by the project, an analysis of these risks, and information on how you propose to manage the risk if it seems likely to be a problem
* **Risk Identification (Section 22.1.1)**
  + Concerned with identifying risks that could pose a major threat to the process, the SW being developed, or the development organization.
  + 6 Types of Risk that may be included in a risk checklist
    - Technology Risks
      * Derive from SW or HW technologies that are used to develop the system
    - People Risks
      * Risks that are associate with the people in the development team
    - Organizational Risks
      * Risks that derive from the organizational environment where the SW is being deployed
    - Tools Risks
      * Risks that derive from the SW tools and other support SW used to develop the system
    - Requirements Risks
      * Risks that derive from changes to the customer requirements and the process of managing the requirements change
    - Estimation Risks
      * Risks that derive from the management estimates of the resources required to build the system
  + After creating the checklist you should prune it to keep it manageable in size
* **Risk Analysis (Section 22.1.2)**
  + You have to consider each identified risk and make a judgment about the probability and seriousness of that risk. It is not possible to make precise, numeric assessment of the probability and seriousness of each risk. Rather, you should assign the risk to one of a number of bands:
    - The probability of the risk might be assess as very low (<10%), low (10-25%), moderate (25-50%), high (50-75%), or very high ( >75%)
    - The effects of the risk might be assessed as catastrophic (threaten the survival of the project), serious (would cause major delays), tolerable (delays are within allowed contingency), or insignificant
  + Once risks have been analyzed and ranked, you should asses which of these risks are most significant.
* **Risk Planning (Section 22.1.3)**
  + Considers each of the key risks that have been identified, and develops strategies to manage these risks.
  + For each of the risks, you have to think of actions that you might take to minimize the disruption to the project of the problem identified in the risk occurs.
  + 3 Strategies
    - Avoidance Strategies
      * Following these strategies means that the probability that the risk will arise will be reduced.
    - Minimization Strategies
      * Following these strategies means that the impact of the risk will be reduced
    - Contingency Plans
      * Following these strategies means that you are prepared for the worst and have a strategy in place to deal with it.
* **Risk Monitoring (Section 22.1.4)**
  + Is the process of checking that your assumptions about the product, process, and business risks have not changed.
  + You should regularly assess each of the identified risks to decide whether or not that risk is becoming more or less probable. You should also think about whether or not the effects of the risk have changed.

**Managing People (Section 22.2)**

* It costs a lot to recruit and retain good people and it is up to SW managers to ensure that the organization gets the best possible return on its investment.
* 4 Critical Factors in People Management
  + Consistency
    - People in a project team should all be treated in a comparable way. No one expects all rewards to be identical but people should not feel that their contribution to the organization is undervalued.
  + Respect
    - Different people have different skills and managers should respect these differences. All members of the team should be given an opportunity to make a contribution. In some cases, of course, you will find that people simply don’t fit into a team and they cannot continue, but it is important not to jump to conclusions about this at an early stage in the project
  + Inclusion
    - People contribute effectively when they fel that others listen to them and take account of their proposals. It is important to develop a working environment where all views, even those of the most junior staff, are considered.
  + Honesty
    - As a manager, you should always be honest about what is going well and what is going badly in the team. You should also be honest about your level of technical knowledge and willing to defer to staff with more knowledge when necessary. If you try to cover up ignorance or problems you will eventually be found out and will lose the respect of the group.
* **Motivating People (Section 22.2.1)**
  + Means organizing the work and the working environment to encourage people to work as effectively as possible. If people are not working, they will not be interested in work and they will work more slowly and will make more mistakes
  + People are motivated by satisfying their needs
    - Self-realization needs (Higher)
      * Needs concerned with personal development
    - Esteem Needs
      * Need to feel respected by others
    - Social Needs
      * Need to feel part of a social grouping
    - Safety Needs
      * Need to feel secure in an environment
    - Physiological Needs (Lower…must be satisfied before moving to higher needs)
      * Needs for food, sleep, and so on
  + It is most important to satisfy the Social, Esteem, and Self-Realization needs of people
    - To satisfy Social Needs
      * Need to give people time to meet their co-workers and provide places for them to meet
    - To satisfy Esteem Needs
      * Need to show people that they are valued by the organization
      * Public recognition of achievements is a simple and effective way to do this
      * People must be paid at a level that reflects their skills and knowledge
    - To satisfy Self-Realization Needs
      * Need to give people responsibility for their work, assigning them demanding tasks, and provide a training program where people can develop their skills.
      * Training is important also
  + Being a member of a cohesive group is highly motivating for most people. People with fulfilling jobs often like to go to work because they are motivated by the people they work with and the work that they do. Therefore, as well as thinking about individual motivation you also have to think about how a group as a while can be motivated to achieve the organization’s goals.
  + 3 Types of Professionals
    - Task-Oriented People
      * Motivated by the work they do.
      * These people are motivated by the intellectual challenge of SW development
      * Usually like to work as individuals
    - Self-Oriented People
      * Motivated by personal success and recognition
      * Interest in software development as a means of achieving their own goals. They have longer-term goals, such as career progression, that motivate them and they wish to be successful in their work to help realize goals
      * Usually like to work as individuals
    - Interaction-Oriented People
      * Motivated by the presence and actions of co-workers.
      * As SW development becomes more user-centered, interaction-oriented people are becoming more involved in SWE
      * Usually like to work in a group

**Teamwork (Section 22.3)**

* It is better to use small groups (10 people) because communication problems are reduced. Everyone knows everyone else and the whole group can get around a table for a meeting to discuss the project and the software that they are developing
* In a cohesive group, members think of the group as more important than the individuals who are group members. Member of a well-led, cohesive-group are loyal to the group.
  + Benefits of a cohesive group
    - The group can establish its own quality standards
      * Because these are developed by consensus, they are more likely to be observed than external standards imposed on the group
    - Individuals learn from and support each other
      * People in the group learn from each other. Inhibitions caused by ignorance are minimized as mutual learning is encouraged
    - Knowledge is shared
      * Continuity can be maintained if a group member leaves.
      * Others can take over critical tasks and ensure that the project is not unduly disrupted
    - Refactoring and continual improvement is encouraged
      * Group members work collectively to deliver high-quality results and fix problems, irrespective of the individuals who originally created the design or program.
    - \*\*\*An effective way of promoting cohesion is to be inclusive. This mean you should treat group members as responsible and trustworthy,, and make information freely available.
* 3 Factors that affect Team working
  + The people in the group
    - You need a mix of people in a project group as SW development involves diverse activities such as negotiating with clients, programing, testing, and documentation
  + The group organization
    - A group should be organized so that individuals can contribute to the best of their abilities and tasks can be completed as expected
  + Technical and Managerial Communications
    - Good communications between group members, and between SWE team and other project stakeholders, is essential
* **Selecting Group Members (Section 22.3.1)**
  + Creating a group with the right balance of technical skills and personalities, and organizing that group so that the members work together effectively.
  + A group that has complementary personalities may work better than a group that is selected solely on technical ability. People who are motivated by work are likely to be the strongest technically, people who are interaction-oriented help facilitate communications within the group, and people who are self-oriented will probably be best at pushing the work forward to finish the job.
* **Group Organization (Section 22.3.2)**
  + The way the group is organized affects the decision that are made by that group, the ways that information is exchanged, and the interactions between the development group and external project stakeholders.
  + Important organizational questions for project managers include:
    - Should the project manager be the technical leader of the group? The technical leader or system architect is responsible for the critical techincial decisions made during SW development.
    - Who will be involved in making critica technical decisions, and how will these be made? Will decisions be made by the system architect, the project manager, or by reaching consensus amongst a wider range of team members?
    - How will interactions with external stakeholders and senior company management be handled? In many cases, the project manager will be responsible for these interactions, assisted by the system architect if there is one.
    - How can groups integrate people who are not collocated? It is now common for groups to include members from different organization and people to work from home as well as in a shared office.
    - How can knowledge be shared across the group?
  + Extreme Programming (XP) groups claim that formal structure inhibits information exchange. In XP, many decision that are usually seen as management decisions are devolved to group members.
  + Informal Groups
    - Can be successful when most group members are experienced and competent but not when the group is composed mostly of inexperienced or incompetent members.
  + Hierarchal Groups
    - Decision are made at the top and implementation is done at the bottom
    - Works when a well-understood problem can be easily broken into sub-problems with sub-problem solutions developed in different parts of the hierarchy. In these cases, there is relatively little communication across the hierarchy. This situation is relative rare in SWE because:
      * Changes to SW often require changes to several parts of the system and this requires discussion and negotiations at all levels in the hierarchy
      * SW technologies change so fast that more junior staff often know more about the technology than experience staff. Top-down communications may mean that the project manager does not find out about the opportunities of using new technologies. More junior staff may become frustrated because of what they see as old-fashioned technologies being used for development.
* **Group Communications (Section 22.2.3)**
  + It is essential that group members communicate effectively and efficiently with each other and with other project stakeholders. Group members must exchange information on the status of their work, the design decisions that have been made, and changes to previous design decisions.
  + The effective and efficiency of communications is influenced by:
    - Group Size
      * Larger groups = more difficult to communicate
    - Group Structure
      * People in informally structured groups communicate more effectively than people in groups with a formal, hierarchal structure.
      * In hierarchal structures, communication tends to go up and down the structure and not through the same level.
    - Group Composition
      * People with the same personality types may clash and, as a result, communications can be inhibited. Communication is also usually better in mixed-sex groups than in single-sex groups. Women are often more interaction-oriented.
    - The Physical Work Environment
      * The organization of the workplace is a major factor in facilitating or inhibiting communications
    - The Available Communication Channels
      * You need to make use of a range of technologies to facilitate communications (face-to-face, email, formal documents, telephone, etc.)
  + Effective communication is achieved when communications are 2-way and the people involved can discuss issues and information and establish a common understanding or proposals and problems.