

Project Management Concepts

Adapted from Pressman

Project Management

- Project management involves the planning, monitoring, and control of the people, process, and events that occur as software evolves from a preliminary concept to full operational deployment.

The Four P's

- **People** — the most important element of a successful project
- **Product** — the software to be built
- **Process** — the set of framework activities and software engineering tasks to get the job done
- **Project** — all work required to make the product a reality

People - Stakeholders

- *Senior managers*
 - define business issues that significantly influence the project.
- *Project (technical) managers*
 - plan, motivate, organize, and control the software practitioners
- *Practitioners*
 - deliver the technical skills that are necessary to engineer a product or application.
- *Customers*
 - specify the requirements for the software to be engineered and other stakeholders who have interest in the outcome.
- *End-users*
 - interact with the software once it is released for production use.

Software Teams

How to lead?

How to organize?

How to collaborate?



How to motivate?

How to create good ideas?

Team Leader

- The MOI Model
 - **Motivation.** The ability to encourage (by “push or pull”) technical people to produce to their best ability.
 - **Organization.** The ability to mold existing processes (or invent new ones) that will enable the initial concept to be translated into a final product.
 - **Ideas or innovation.** The ability to encourage people to create and feel creative even when they must work within bounds established for a particular software product or application.

Software Teams

The following factors must be considered when selecting a software project team structure ...

- the difficulty of the problem to be solved
- the size of the resultant program(s) in lines of code or function points
- the time that the team will stay together (team lifetime)
- the degree to which the problem can be modularized
- the required quality and reliability of the system to be built
- the rigidity of the delivery date
- the degree of sociability (communication) required for the project

Organizational Paradigms

- **closed paradigm**—structures a team along a traditional hierarchy of authority
- **random paradigm**—structures a team loosely and depends on individual initiative of the team members
- **open paradigm**—attempts to structure a team in a manner that achieves some of the controls associated with the closed paradigm but also much of the innovation that occurs when using the random paradigm
- **synchronous paradigm**—relies on the natural compartmentalization of a problem and organizes team members to work on pieces of the problem with little active communication among themselves

suggested by Constantine [Con93]

Agile Teams

- Team members must have trust in one another.
- The distribution of skills must be appropriate to the problem.
- Mavericks may have to be excluded from the team, if team cohesiveness is to be maintained.
- Team is “self-organizing”
 - An adaptive team structure
 - Uses elements of Constantine’s random, open, and synchronous paradigms
 - Significant autonomy

Team Coordination & Communication

- *Formal, impersonal approaches* include software engineering documents and work products (including source code), technical memos, project milestones, schedules, and project control tools, change requests and related documentation, error tracking reports, and repository data
- *Formal, interpersonal procedures* focus on quality assurance activities applied to software engineering work products. These include status review meetings and design and code inspections.
- *Informal, interpersonal procedures* include group meetings for information dissemination and problem solving and “collocation of requirements and development staff.”
- *Electronic communication* encompasses electronic mail, electronic bulletin boards, and by extension, video-based conferencing systems.
- *Interpersonal networking* includes informal discussions with team members and those outside the project who may have experience or insight that can assist team members.

The Product Scope

- Scope
 - **Context.** How does the software to be built fit into a larger system, product, or business context and what constraints are imposed as a result of the context?
 - **Information objectives.** What customer-visible data objects are produced as output from the software? What data objects are required for input?
 - **Function and performance.** What function does the software perform to transform input data into output? Are any special performance characteristics to be addressed?
- Software project scope must be unambiguous and understandable at the management and technical levels.

Problem Decomposition

- Sometimes called *partitioning* or *problem elaboration*
- Once scope is defined ...
 - It is decomposed into constituent functions
 - It is decomposed into user-visible data objects
 - or*
 - It is decomposed into a set of problem classes
- Decomposition process continues until all functions or problem classes have been defined

The Process

- Once a process framework has been established
 - Consider project characteristics
 - Determine the degree of rigor required
 - Define a task set for each software engineering activity
 - Task set =
 - Software engineering tasks
 - Work products
 - Quality assurance points
 - Milestones

Melding the Problem and the Process

COMMON PROBLEMS FRAMEWORK ACTIVITIES																
	Specification				Analysis				Modeling				Construction			
Software Engineering Tools																
Product Functions																
Text Input																
Editing and formatting																
Automatic copy edit																
Page layout capability																
Automatic indexing and TOC																
File management																
Document production																

Figure 21.2 Melding the Problem and the Process

The Project

- *Projects get into trouble when ...*
 - Software people don't understand their customer's needs.
 - The product scope is poorly defined.
 - Changes are managed poorly.
 - The chosen technology changes.
 - Business needs change [or are ill-defined].
 - Deadlines are unrealistic.
 - Users are resistant.
 - Sponsorship is lost [or was never properly obtained].
 - The project team lacks people with appropriate skills.
 - Managers [and practitioners] avoid best practices and lessons learned.

Common-Sense Approach to Projects

- *Start on the right foot.* This is accomplished by working hard (very hard) to understand the problem that is to be solved and then setting realistic objectives and expectations.
- *Maintain momentum.* The project manager must provide incentives to keep turnover of personnel to an absolute minimum, the team should emphasize quality in every task it performs, and senior management should do everything possible to stay out of the team's way.
- *Track progress.* For a software project, progress is tracked as work products (e.g., models, source code, sets of test cases) are produced and approved (using formal technical reviews) as part of a quality assurance activity.
- *Make smart decisions.* In essence, the decisions of the project manager and the software team should be to “keep it simple.”
- *Conduct a postmortem analysis.* Establish a consistent mechanism for extracting lessons learned for each project.

To Get to the Essence of a Project

- Why is the system being developed?
- What will be done?
- When will it be accomplished?
- Who is responsible?
- Where are they organizationally located?
- How will the job be done technically and managerially?
- How much of each resource (e.g., people, software, tools, database) will be needed?

Barry Boehm [Boe96]

Critical Practices

- Formal risk management
- Empirical cost and schedule estimation
- Metrics-based project management
- Earned value tracking
- Defect tracking against quality targets
- People aware project management