The Software Process - Part One

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Table of Contents

What is Engineering?

Engineering is the application of mathematics, science, economics, and social and practical knowledge to invent, innovate, design, build, maintain, research, and improve structures, machines, tools, systems, components, materials, processes, solutions, and organizations.

What is Engineering?

Engineering is the application of scientific knowledge to solving problems in the real world.

Frit Bauer

[Software Engineering] is the establishing and use of sound engineering principles in order to obtain economically software that is reliable and works efficiently on real machines.

IEEE

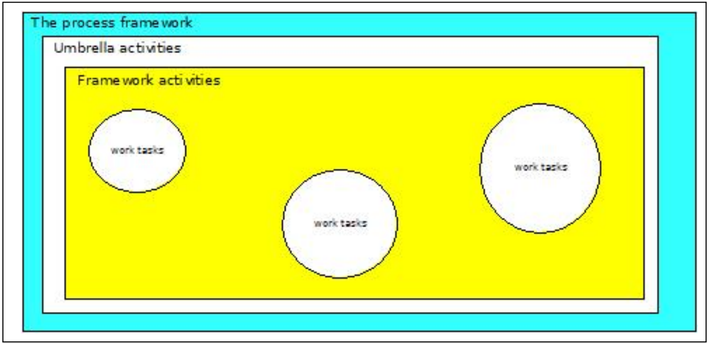
Software Engineering: (1) The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software: that is, the application of engineering to software. (2) The study of approaches as in (1).

The foundation for software engineering is the *process* layer. The software process forms the basis for management control of software projects and established the context in whih technical methods are applied, work products (models, documents, data, reports, forms, etc.) are produced, milestones are established, quality is insured, and change is properly managed.

Jacobson, Booch, and Rambaugh

A process defines *who* is doing *what, when, and how* to reach a certain goal.

Process


The process framework
Umbrella activities
Framework activities
work tasks
work tasks
work tasks

Process Framework

- Communication
- Planning
- Modeling
- Construction
- Deployment

Communication

Heavy communication with the customer, users, other stakeholders, and includes requirements engineering and other activities.

Planning

Established a plan for the software engineering work that follows. It describes the technical tasks to be performed, the risks that are likely, the resources that will be required, the work products that will be produced, and the work schedule.

Modeling

Encompasses the creations of models that allow the developer and the customer to better understand the requirements and the design that will achieve those requirements.

Construction

Combines code generation and the testing that verifies and validates the implementation artifacts. This especially includes the detection and rectification of errors.

Deployment

The software product is delivered to the customer, who evaluates it ad provides feedback based on that evaluation.

Umbrella activities

- Project tracking and control
- Risk management
- Software quality assurance
- Formal technical reviews
- Measurement
- Configuration management
- Reusability management
- Work product preparation and production

Project tracking and control

This allows the software team to assess progress against the project plan and take necessary action to maintain the schedule.

Risk management

This assesses the risks that may affect the outcome of the projecty or the quality of the project.

Formal technical reviews

This assesses the software engineering work products in order to uncover and remove errors and defects before they are propogated to the next activity.

Measurement

This defines and collects data concerning the process, process, and production metrics that assist in the performance of the other umbrella activities.

Configuration management

This manages the the effects of change throughout the process.

Reusability management

This defies criteria for work reuse and established mechanisms for building anbd maintaining reusable components.

Work product preparation and production

This encompasses all the activities necessary to required to prepare and product the engineering work products.

Capability Maturity Model integrated

- Level 0: Incomplete
- Level 1: Performed
- Level 2: Managed
- Level 3: Defined
- Level 4: Quantitatively managed
- Level 5: Optimized

CMMI — Incomplete

The process area either does not perform or does not achieve all goals and objectives required.

CMMI — Performed

Meets Level 0, and in addition can perform all the work tasks required.

CMMI — Managed

Meeets Level 1, and in addition all process areas conform to an organizationally defined policy, all people doing the work have access to all the resources they need, and all procedures and processes are monitored, reviewed, and evaluated as to adherence with organizational policy.

CMMI — Defined

Meets Level 2, and in addition, all processes are tailored according to the organization's guidelines, metrics, and other process improvement standards.

CMMI — Quantitatively managed

Meets Level 3, and in addition, processes and procedures are controlled using measurements and quantitatively assessment.

CMMI — Optimized

Meets Level 4, and in addition, process areas are adapted and optimized using statistical metrics in order to institutionalize process improvement.

Performed

No standards The organization has no processes, procedures, or standards, and all work is not repeatable.

Performed

Basic Project Management

- requirements management
- project planning
- monitoring and control
- supplier management
- measurement and analysis
- quality assurance
- configuration management

Defined

Process Standrdization

- requirements developmenbt
- technical solutionproduct integration
- verification and validation
- process focus, definition, and training
- integrated project management
- risk and supplier management
- decision analysis and resolution
- integration envorinment
- integrated teaming

Quantitatively Managed

quantitative management

- organizational process performance
- quantitative process managment

Optimized

dontinuous process improvement

- organizational innovation and deployment
- causal analysis and resolution