Chapter 2
Process: A Generic View

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A Layered Technology

A set of basic principles

tools

methods

process model

a "quality" focus

Forms the basis/context for management of SW project

Try increasingly more effective approaches
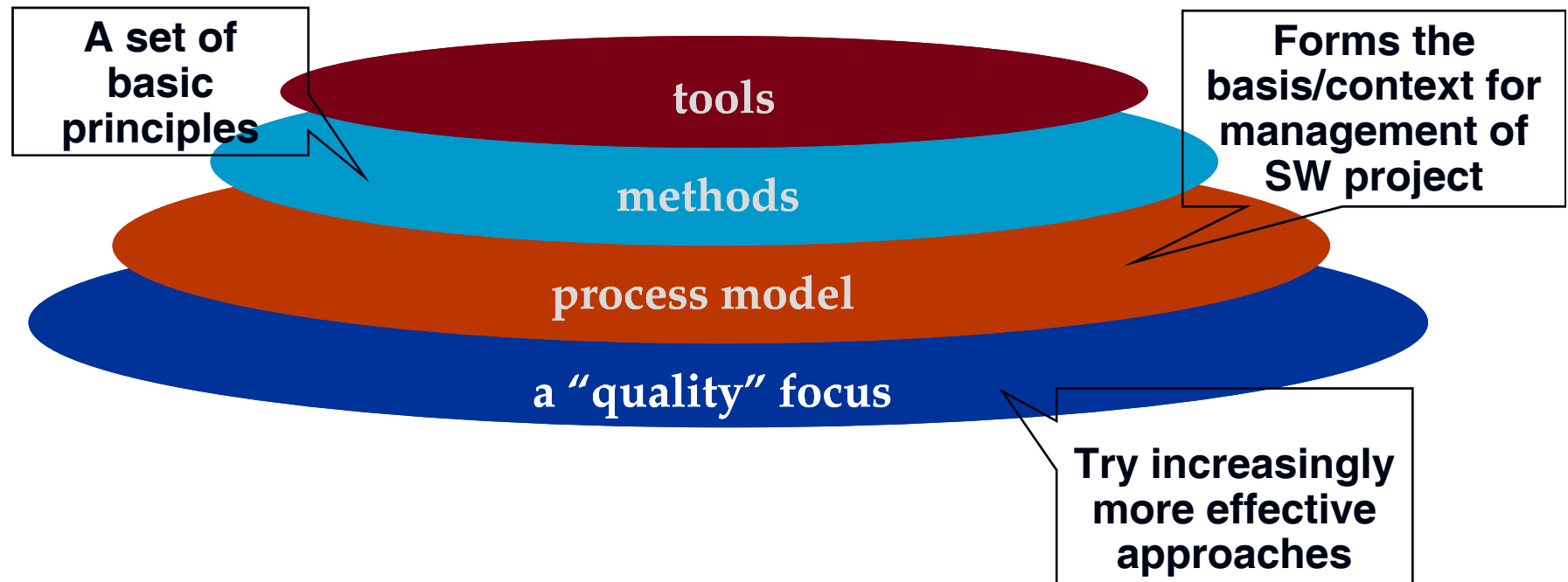
Why Is Process Important?

- Every organization tried to "get the fat" out of industrial processes for more than a century
  - Ex. Toyota's cost reduction for vehicle manufacturing
- Process helps us order our thinikng by defining common activities and artifacts
  - Process is a means to capture and transfer the knowledge we gain in developing a particular product
  - Process improvement identify and deploy knowledge over large groups.

Why Process Improvement Helps

- A process is about incorporating discipline into routine activities to check everything that was supposed to be done was done
    - Making sure
        - There was sufficient repeatabilitity in the tasks to make future work predictable
        - This process repeatability and predictability are called "capability maturity"
- Informally speaking, process improvement is to incorporate individual wisdom/guidance into the way the organization works

A Process Framework
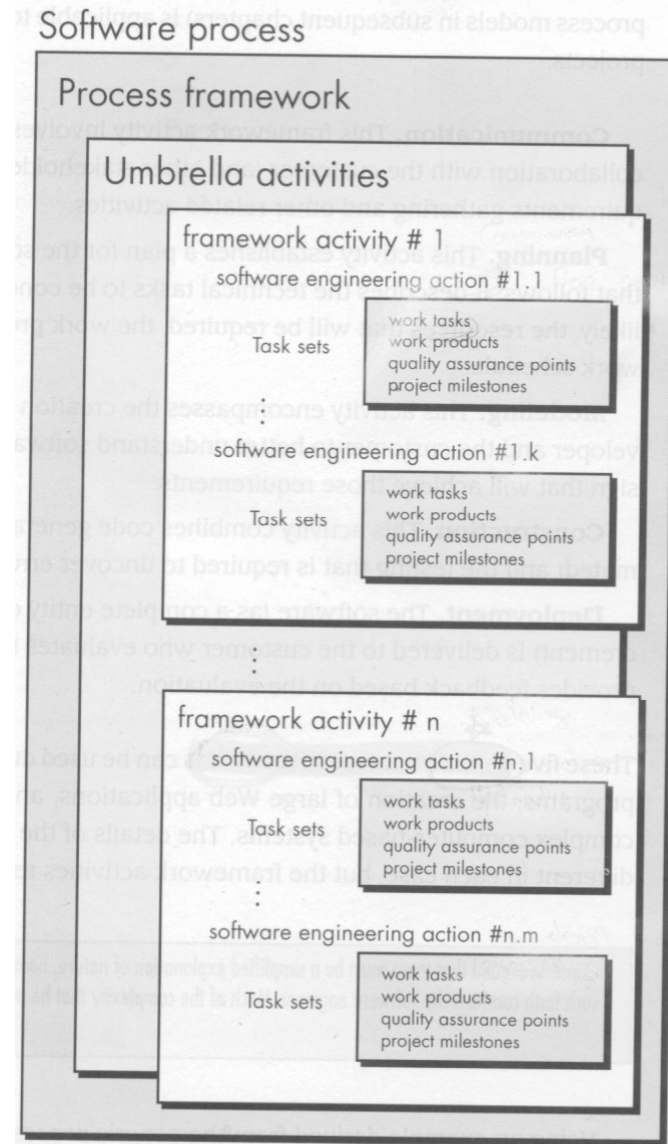
Process framework

> **Framework activities**
>   **work tasks**
>   **work products**
>   **milestones & deliverables**
>   **QA checkpoints**
> **Umbrella Activities**

Software process

Process framework

Umbrella activities

framework activity # 1
software engineering action #1.1

Task sets — work tasks / work products / quality assurance points / project milestones

software engineering action #1.k

Task sets — work tasks / work products / quality assurance points / project milestones

framework activity # n
software engineering action #n.1

Task sets — work tasks / work products / quality assurance points / project milestones

software engineering action #n.m

Task sets — work tasks / work products / quality assurance points / project milestones

Framework Activities

- Communication
- Planning
- Modeling
  - Analysis of requirements
  - Design
- Construction
  - Code generation
  - Testing
- Deployment

Umbrella Activities

- Software project management
- Risk management
- Software quality assurance
- Formal technical reviews
- Software configuration management
- Work product preparation and production
- Reusability management

The Process Model: Adaptability

- the framework activities will <u>always</u> be applied on <u>every</u> project ... BUT

- the tasks (and degree of rigor) for each activity will vary based on:
  - the type of project
  - characteristics of the project
  - common sense judgment; concurrence of the project team

The CMMI (1/3)

- CMMI stands for "Capability Maturity Model Integrated"
  - Remember that the process repeatability and predictability are called "capability maturity"

- By the mid-1990's, the five-level world view of Capability Maturity Model for Software became dominant and there appeared too many CMMs for [*]

- Therefore, U.S. Defense Department and Software Engineering Institute @ CMU developed a common and extensible framework, which is CMMI, a second generation of CMMs

Excerpted from "CMMI Survival Guide" by S.Garcia and R.Turner

The CMMI (2/3)

- Process improvement is to incorporate individual wisdom/guidance into the way the organization works

  1. Individual learning:

     Knowledge resides within individuals and may be informally shared

  2. Group learning:

     Knowledge is explicitly collected and shared within groups such as teams or projects, supporting better performance within the group

  3. Organizational learning:

     Group-based knowledge is collected and standardized, and mechanisms exist that encourage its use across related groups

  4. Quantitative learning:

     The organizational knowledge tranfer and use are measured, and decisions are made based on empirical information

  5. Strategic learning:

   Knowledge collection, transfer, and use are rapid across the organization

The CMMI (3/3)

- The CMMI defines each process area in terms of "specific goals" and the "specific practices" required to achieve these goals.
    - Level 0: Incomplete
    - Level 1: Performed
    - Level 2: Managed
    - Level 3: Defined
    - Level 4: Quantitatively managed
    - Level 5: Optimized
- *Specific goals* establish the characteristics that must exist if the activities implied by a process area are to be effective.
- *Specific practices* refine a goal into a set of process-related activities.

Process Assessment

- The process should be assessed to ensure that it meets a set of basic process criteria that have been shown to be essential for a successful software engineering.

- Many different assessment options are available:

  - SCAMPI (Standard CMMI Assessment Method for Process Improvement)

  - CBA IPI (CMM-Based Appraisal for Internal Process Improvement)

  - SPICE (ISO/IEC15504)

  - ISO 9001:2000

Assessment and Improvement
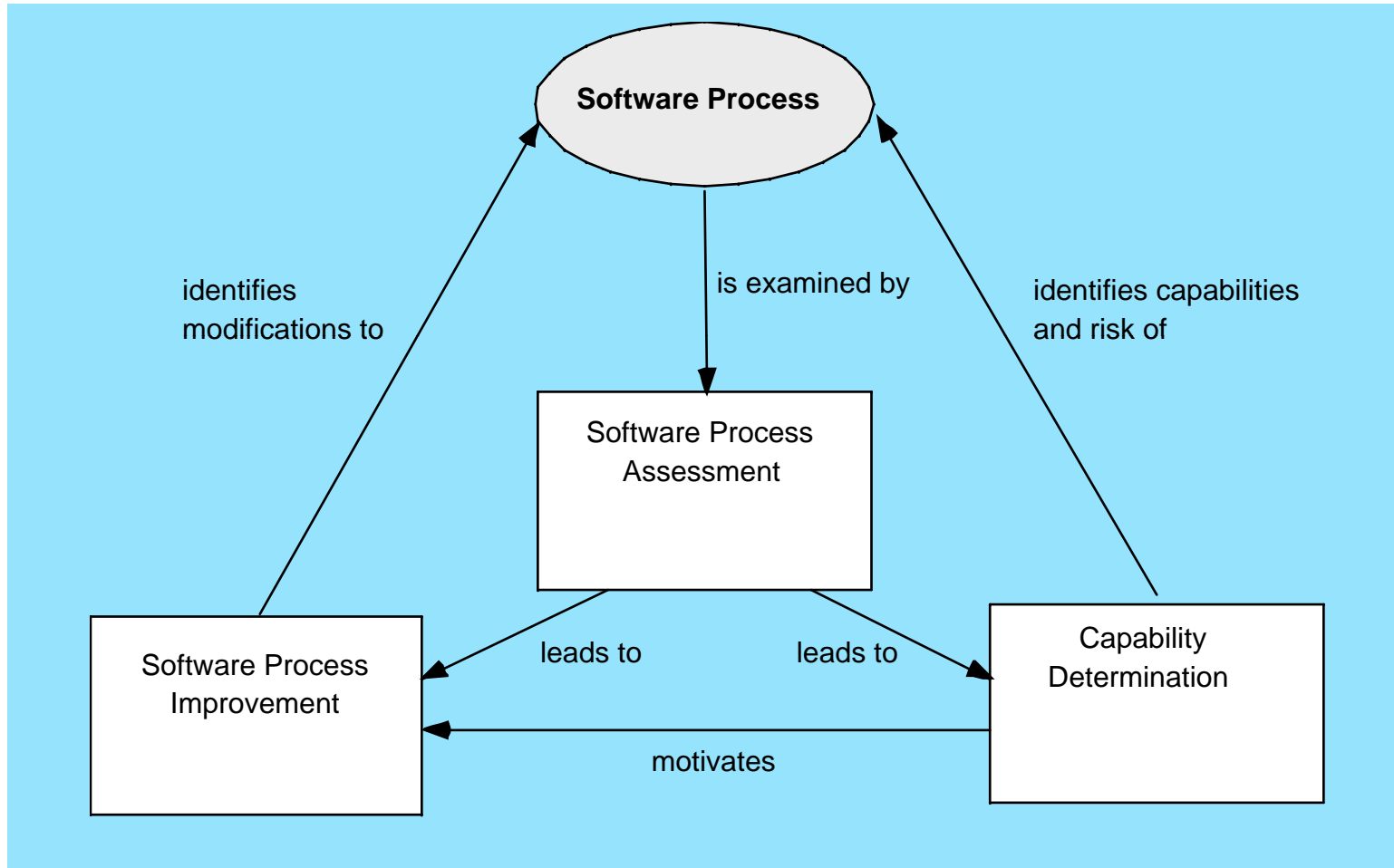
Personal Software Process (PSP)

- Recommends five framework activities:
  - Planning
  - High-level design
  - High-level design review
  - Development
  - Postmortem

- stresses the need for each software engineer to identify errors early and as important, to understand the types of errors

Team Software Process (TSP)

- Each project is "launched" using a "script" that defines the tasks to be accomplished

- Teams are self-directed

- Measurement is encouraged

- Measures are analyzed with the intent of improving the team process