Chapter 2
Process: A Generic View

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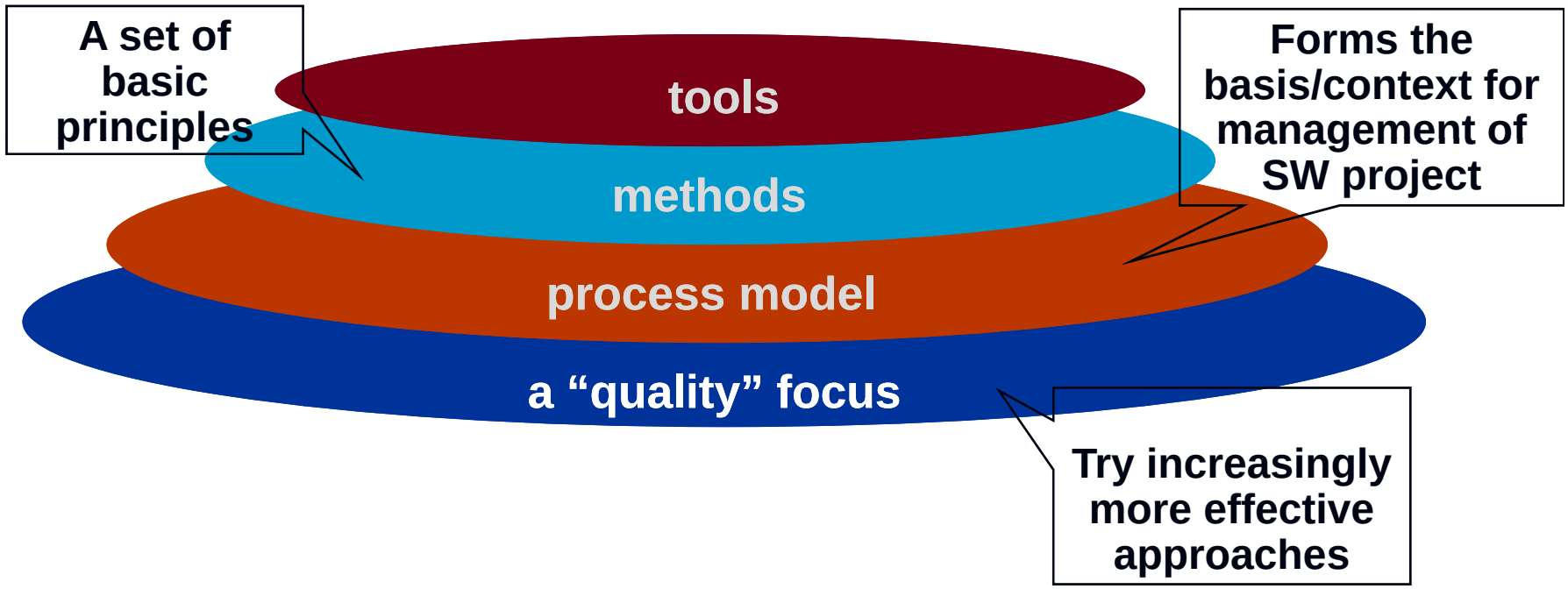
A Layered Technology



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.

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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

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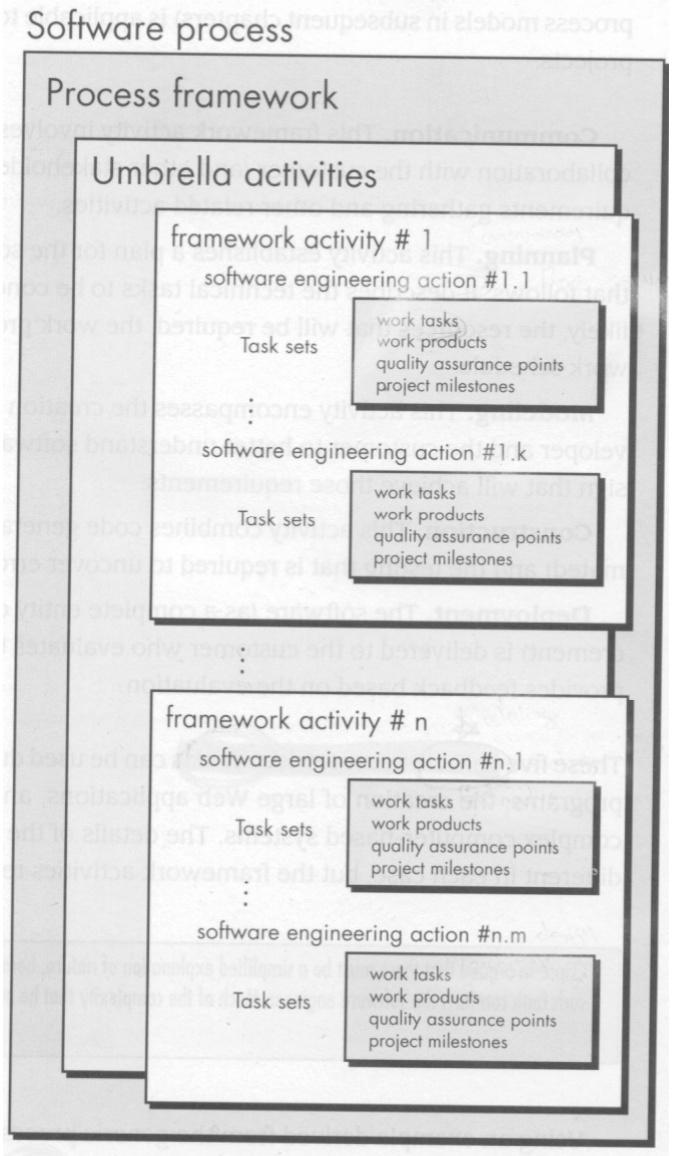
A Process Framework

Process framework

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



Framework Activities

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

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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 always be applied on every 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

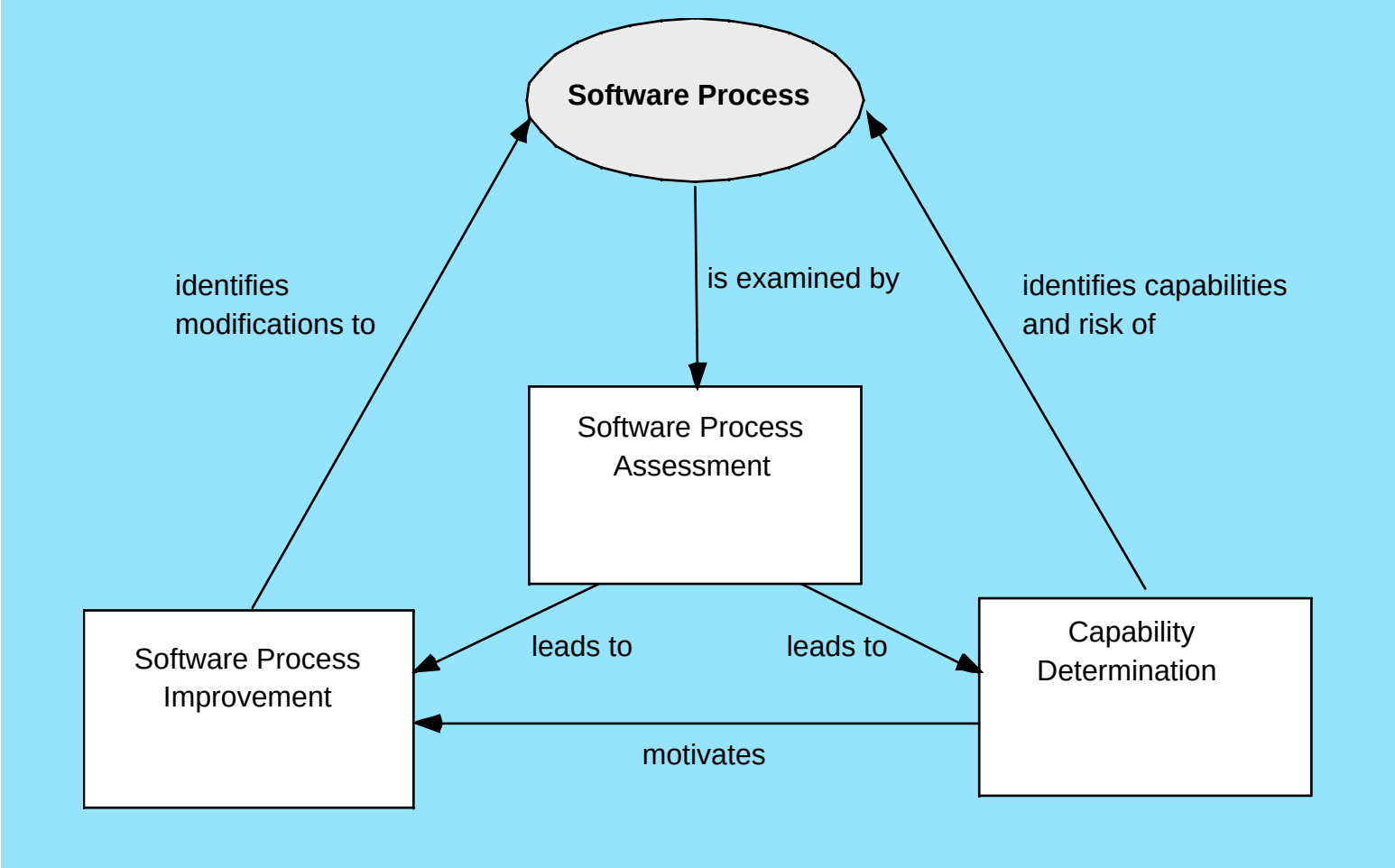
The CMMI (3/3)

- 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

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Similar International Standards

- **Evaluation Assurance Level (EAL)**
  - The **Evaluation Assurance Level** (EAL1 through EAL7) of an IT product or system is a numerical grade assigned following the completion of a Common Criteria (CC) security evaluation
  - The intent of the higher levels is to provide higher confidence that the system's principal security features are reliably implemented.
  - The EAL level does not measure the security of the system itself, it simply states at what level the system was tested to see if it meets all the requirements of its protection profile
  - To achieve a particular EAL, the computer system must meet specific *assurance requirements,* involving design documentation, design analysis, functional testing, or penetration testing.

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Quoted from Wikepedia

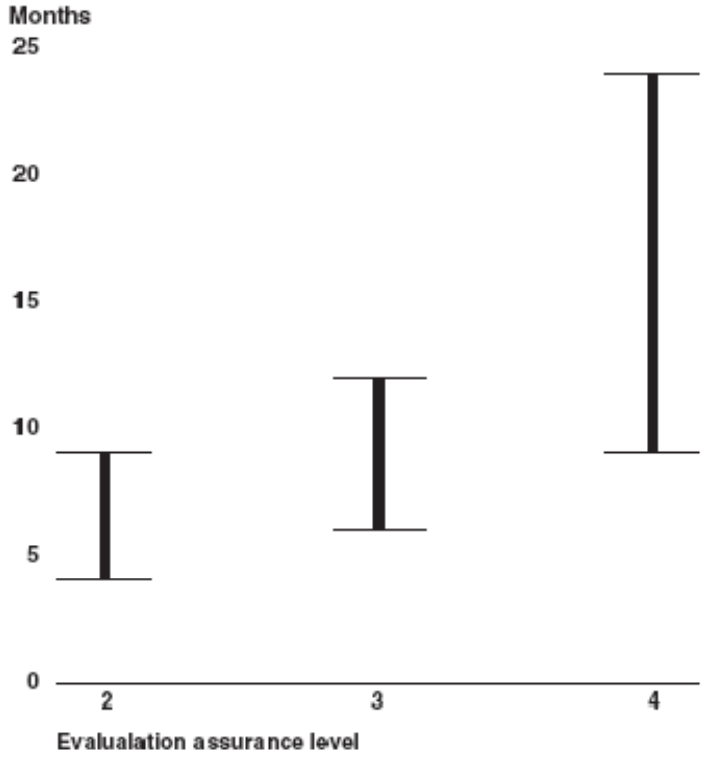
EAL 7 Levels

- **7 Levels**
  - **EAL1: Functionally Tested**
  - **EAL2: Structurally Tested**
  - **EAL3: Methodically Tested and Checked**
  - **EAL4: Methodically Designed, Tested, and Reviewed**
    - Commercial operating systems that provide conventional, user-based security features are typically evaluated at EAL4
      - AIX, HP-UX, FreeBSD, Solaris, Novell NetWare, SUSE Linux Enterprise Server 9, SUSE Linux Enterprise Server 10, Windows 2000 Service Pack 3, and Red Hat Enterprise Linux 5

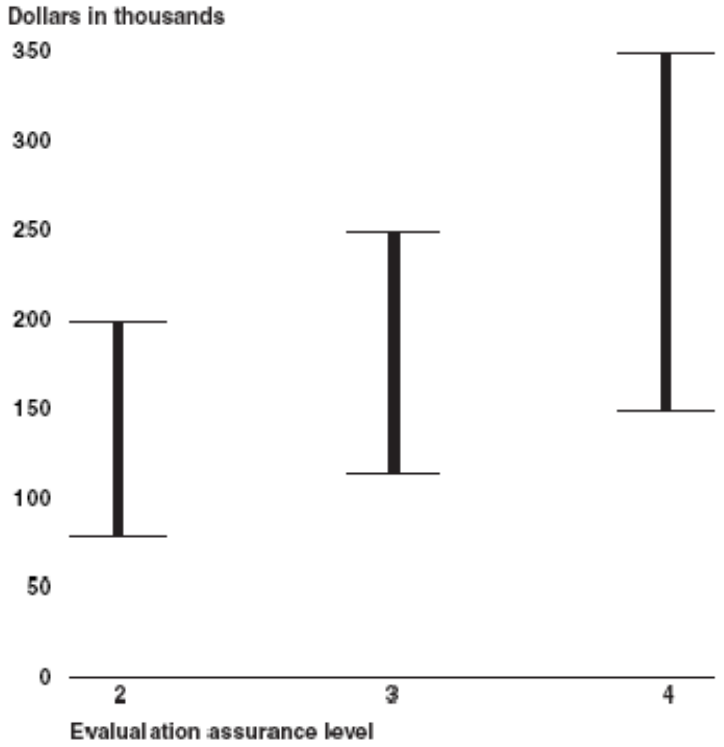
EAL 7 Levels (cont.)

- **7 Levels**
  - **EAL5: Semiformally Designed and Tested**
    - Numerous smart card devices have been evaluated at EAL5
    - XTS-400 (STOP 6) is a general-purpose operating system at EAL5 augmented.
    - LPAR on IBM System z is EAL5 Certified.
  - **EAL6: Semiformally Verified Design and Tested**
    - Ex> Green Hills Software INTEGRITY-178B OS
  - **EAL7: Formally Verified Design and Tested**
    - Ex> Tenix Interactive Link Data Diode Device

CC Evaluation Costs



Source: GAO analysis of data provided by laboratories.



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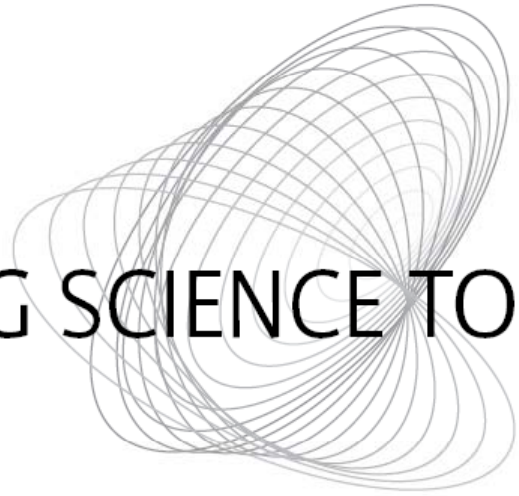

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