CTIS359
Principles of Software Engineering

Software Project Management (PM)

"The "P" in PM is as much about 'people' management as it is about 'project' management."

Cornelius Fichtner

Today

- Introduction
  - Why (software) PM is important?
- Formal definitions
  - Project
  - Project management
    - Project management plan
  - Effort
    - Effort =? Time/Duration
  - SWE Management
    - SWEBOK
- What does SW PM involve?

Introduction

- In most organizations that develop software, programmers, analysts and other professionals work together in **a team**.
- An **adequate team structure** depends on many factors, such as
  - the # of people involved
  - their experience and involvement in the project
  - the kind of project
  - individual differences and style
- These factors also influence the way projects are to be managed.

Source: Software Engineering Principles and Practice Hans van Vliet 2007

Introduction

- The work to be done within the framework of a project, be it a software development project, building a house, or the design of a new car, involves a number of tasks.
- A critical part of management responsibility is to **coordinate the tasks of all participants**.
- This coordination can be carried out in a number of ways.

Source: Software Engineering Principles and Practice Hans van Vliet 2007

Introduction

- There are both **external** and **internal** influences on the coordination mechanism.
  - Internal influences originate from **characteristics of the project**.
  - External influences originate from the **project's organizational environment**.
- If these influences ask for conflicting coordination mechanisms, conflicts between the project and the environment are lurking around the corner.

Source: Software Engineering Principles and Practice Hans van Vliet 2007

Is SWE Technical? Social? branch?

- Software projects also have diverse stakeholders with competing agendas, which adds to the complexity of managing people.
- SWE is thus as much a branch of the social sciences as it is of engineering.

Formal definitions …

project - Definition

- **project**
- ***1.*** endeavor (çaba, gayret, uğraş) with defined start and finish criteria undertaken to create a product or service in accordance with specified resources and requirements
  - *[ISO/IEC/IEEE 15939:2017 Systems and software engineering —Measurement process, 3.33; ISO/IEC TS 24748-1:2016 Systems and software engineering — Life cycle management — Part 1: Guide for life cycle management, 2.35; ISO/IEC/IEEE 15288:2015 Systems and software engineering —System life cycle processes, 4.1.33]*
- ***2.*** undertaking with pre-specified objectives, magnitude and duration
  - *[ISO/IEC 2382:2015, Information technology — Vocabulary]*
- ***3.*** a temporary endeavor undertaken to create a unique product, service, or result
  - *[A Guide to the Project Management Body of Knowledge (**PMBOK® Guide**) — Fifth Edition]*
- ***4.*** set of activities for developing a new product or enhancing an existing product
  - *[ISO/IEC 26514:2008 Systems and software engineering — requirements for designers and developers of user documentation, 4.38]*

Source: ISO/IEC/ IEEE 24765 ISO/IEC/IEEE 24765:2017(E) 2nd Edition 2017-09 Systems and software engineering — Vocabulary

project management- Definition

- **project management (PM)**
- ***1.*** the application of knowledge, skills, tools, and techniques to **project activities** to meet the project requirements
  - *[A Guide to the Project Management Body of Knowledge (**PMBOK® Guide**) — Fifth Edition]*
- ***2.*** activities concerned with **project planning** and **project control**
  - *[ISO/IEC 2382:2015, Information technology — Vocabulary]*

Source: ISO/IEC/ IEEE 24765 ISO/IEC/IEEE 24765:2017(E) 2nd Edition 2017-09 Systems and software engineering — Vocabulary

project management plan - Definition

- **project management plan**
- ***1.*** the **document** that describes how the project will be executed, monitored, and controlled
  - [A *Guide to the Project Management Body of Knowledge (PMBOK® Guide) — Fifth Edition*]

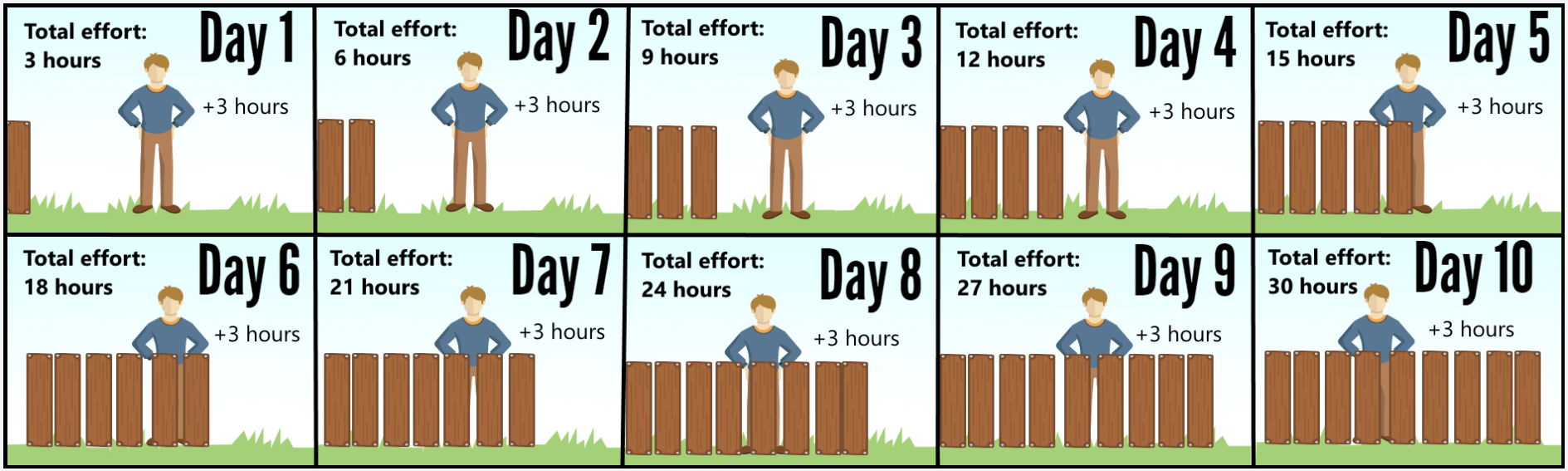
Source: ISO/IEC/ IEEE 24765 ISO/IEC/IEEE 24765:2017(E) 2nd Edition 2017-09 Systems and software engineering — Vocabulary

effort - Definition

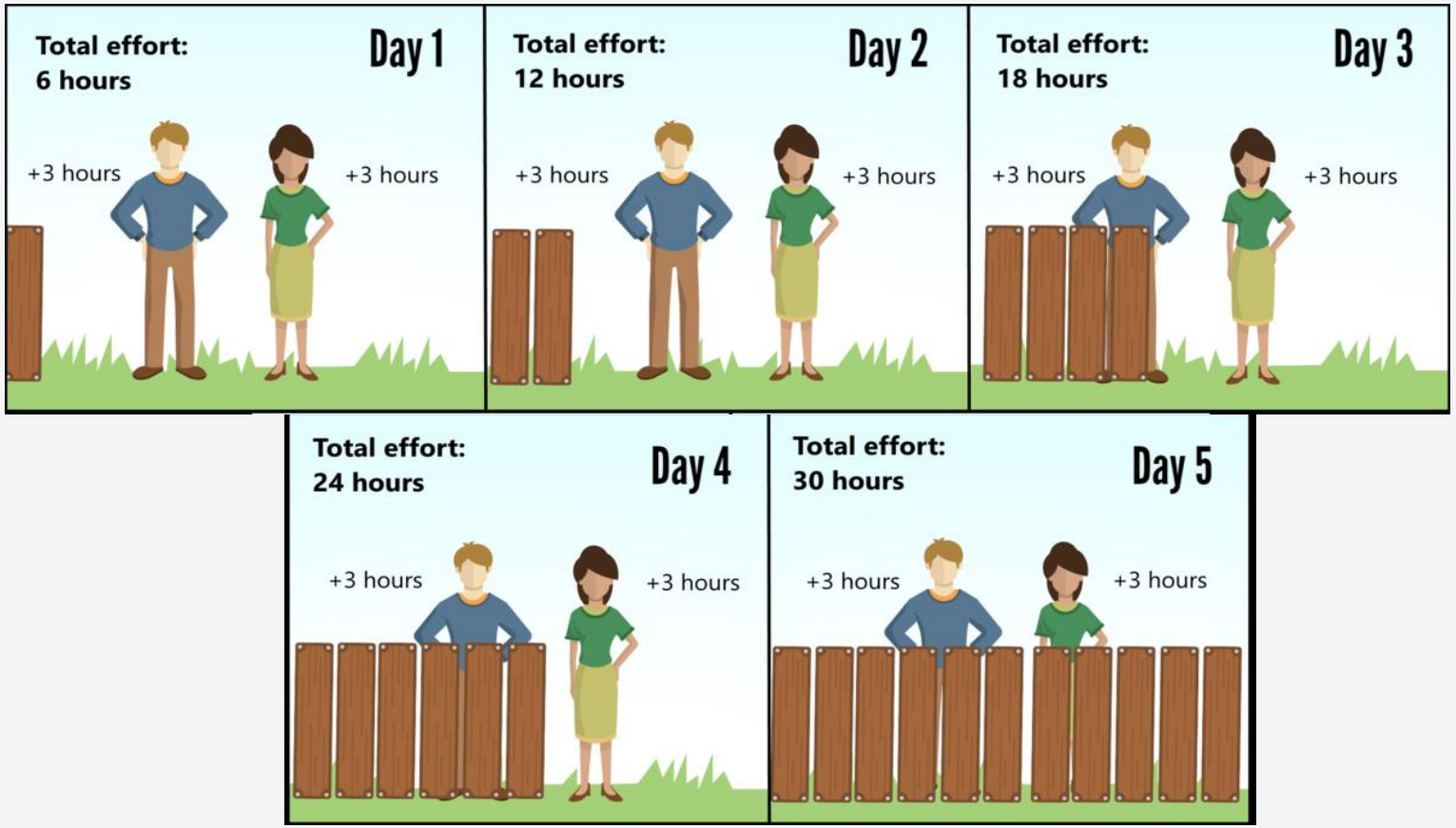
- **effort**
- 1. the number of labor units required to complete a schedule activity or work breakdown structure component, often expressed in hours, days or weeks
  - [A Guide to the Project Management Body of Knowledge (PMBOK® Guide) — Fifth Edition]

Source: ISO/IEC/ IEEE 24765 ISO/IEC/IEEE 24765:2017(E) 2nd Edition 2017-09 Systems and software engineering — Vocabulary

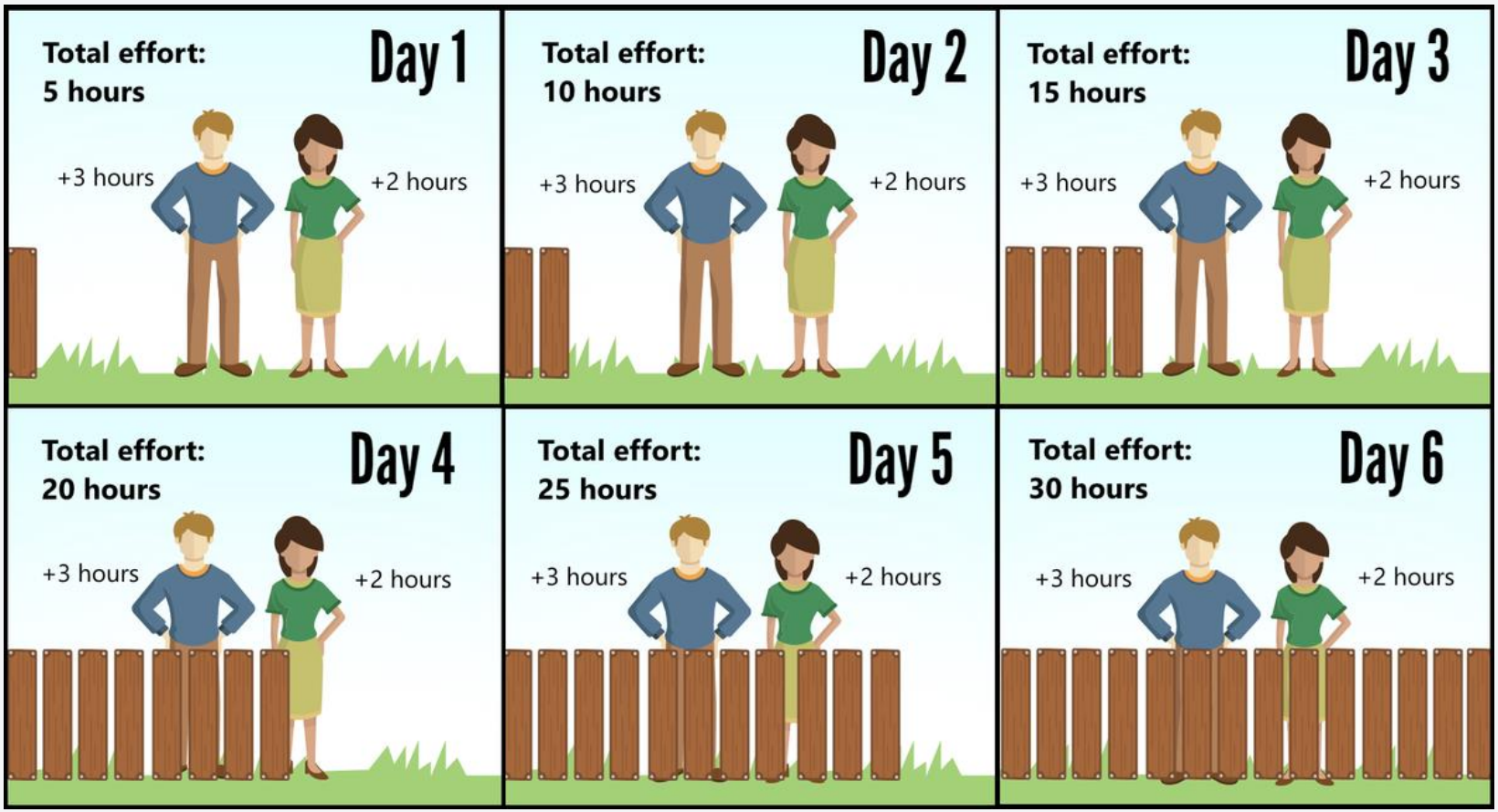
effort ≠ duration



effort ≠ duration



effort ≠ duration



Introduction

- Software projects have **a history** of being delivered late or/and over-budget or/and delivering low-quality products.
- Software project management (PM) is concerned with **the effective management of software projects** to ensure the successful delivery of a high-quality product, on time and on budget, to the customer.
- A project is **a temporary group activity** designed to accomplish a specific goal such as the delivery of a product to a customer.
  - A project has a clearly defined beginning and end in time.

Source: Concise Guide to Software Engineering From Fundamentals to Application Methods, O'Regan Gerard, 2017

Introduction

- PM involves **good**
  - project planning and estimation
  - the management of resources
  - the management of issues and change requests that arise during the project
  - managing quality
  - managing risks
  - managing the budget
  - monitoring progress
  - taking appropriate action when progress deviates from expectations
  - communicating progress to the various stakeholders
  - delivering a high-quality product to the customer

Source: Concise Guide to Software Engineering From Fundamentals to Application Methods, O'Regan Gerard, 2017

What does PM involve?

PM involves…

- Defining the business case for the project
- Defining the scope of the project and what it is to achieve
- Estimation of the cost, effort and schedule
- Determining the start and end dates for the project
- Determining the resources required
- Assigning resources to the various tasks and activities
- Determining the project lifecycle and phases of the project
- Staffing the project
- Preparing the project plan

Source: Concise Guide to Software Engineering From Fundamentals to Application Methods, O'Regan Gerard, 2017

PM involves…

- Scheduling the various tasks and activities in the schedule
- Preparing the initial project schedule and key milestones
- Obtaining approval for the project plan and schedule
- Identifying and managing risks
- Monitoring progress, budget, schedule, effort, risks, issues, change requests and quality
- Taking corrective action
- Replanning and rescheduling
- Communicating progress to affected stakeholders
- Preparing status reports and presentations

Source: Concise Guide to Software Engineering From Fundamentals to Application Methods, O'Regan Gerard, 2017

Software Engineering Management

- Software engineering management can be defined as the application of management activities—planning, coordinating, measuring, monitoring, controlling, and reporting—to ensure that software products and software engineering services are delivered efficiently, effectively, and to the benefit of stakeholders.

SWEBOK®

Software Engineering Management

- Software engineering management can be defined as the application of management activities—planning, coordinating, measuring, monitoring, controlling, and reporting—to ensure that software products and software engineering services are delivered efficiently, effectively, and to the benefit of stakeholders.

Source: Guide to the Software Engineering Body of Knowledge Version 3.0 (SWEBOK Guide V3.0) 2014

Software Engineering Management

- In one sense, it should be possible to manage a SWE project in the same way **other complex endeavors** are managed.
- However, there are aspects **specific to software projects** and **software life cycle processes** that complicate effective management, including these:
  - Clients often don't know what is **needed** or what is feasible.
  - Clients often lack appreciation for the **complexities** inherent in SWE, particularly regarding the impact of **changing** requirements.
  - It is likely that increased understanding and **changing** conditions will generate new or changed software requirements.
  - As a result of **changing** requirements, software is often built using an iterative process rather than as a sequence of closed tasks.
  - SWE necessarily incorporates **creativity** and **discipline**. Maintaining an appropriate balance between the two is sometimes difficult.
  - The degree of novelty and **complexity** is often high.
  - There is often a rapid rate of **change** in the underlying technology.

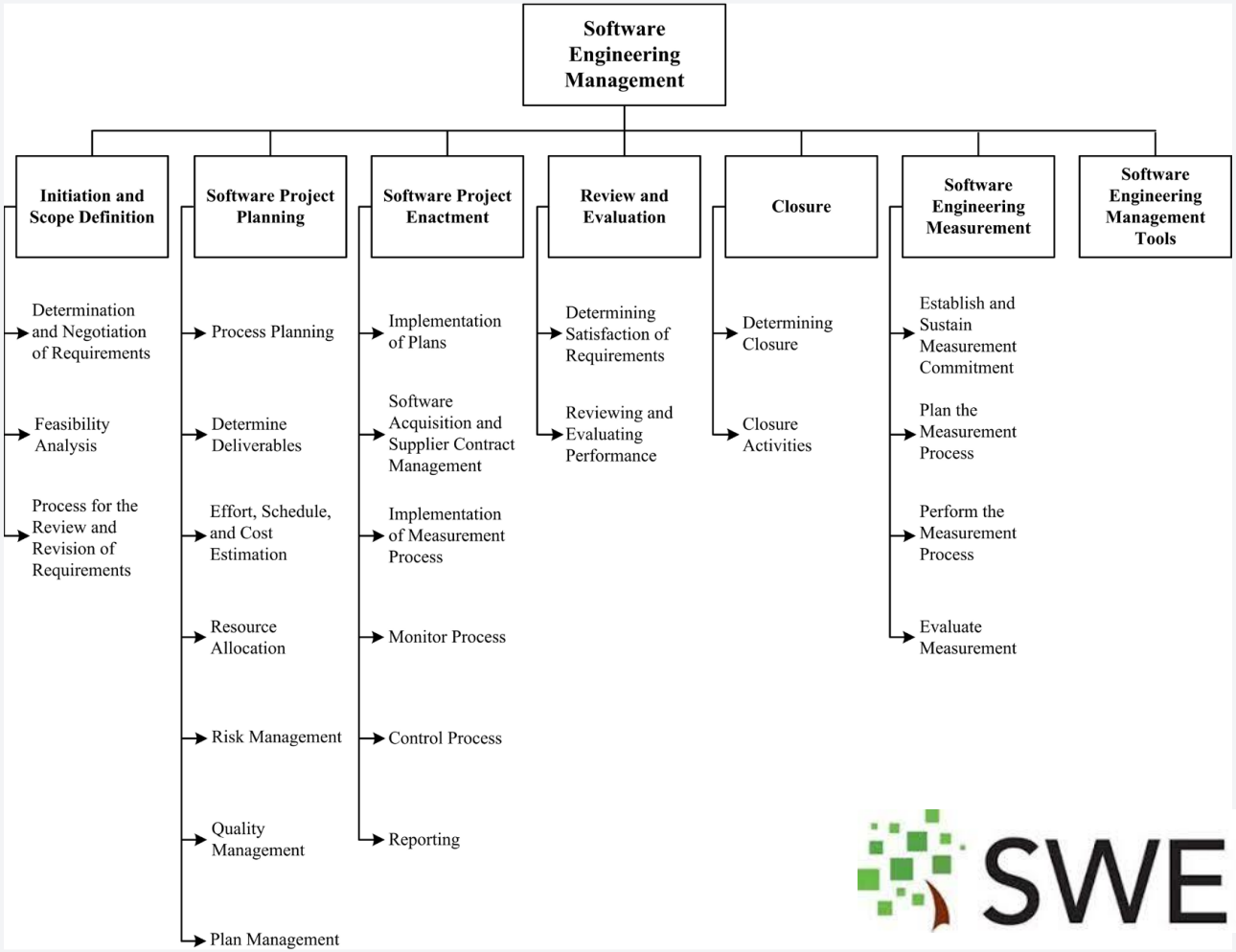
Source: Guide to the Software Engineering Body of Knowledge Version 3.0 (SWEBOK Guide V3.0) 2014

Software Engineering Management

- Software engineering management **activities** occur at **three levels**:
  - organizational and infrastructure management
  - project management
  - management of the measurement program

Source: Guide to the Software Engineering Body of Knowledge Version 3.0 (SWEBOK Guide V3.0) 2014

Breakdown of Topics for the SWE Management KA



Source: Guide to the Software Engineering Body of Knowledge Version 3.0 (SWEBOK Guide V3.0) 2014

Breakdown of Topics for the SWE Management KA

- The seven (7) **topics** are:

1. **Initiation and Scope Definition**, which deal with the decision to embark on a software engineering project
2. **Software Project Planning**, which addresses the activities undertaken to prepare for a successful software engineering project from the management perspective
3. **Software Project Enactment**, which deals with generally accepted software engineering management activities that occur during the execution of a software engineering project
4. **Review and Evaluation**, which deal with ensuring that technical, schedule, cost, and quality engineering activities are satisfactory
5. **Closure**, which addresses the activities accomplished to complete a project;
6. **Software Engineering Measurement**, which deals with the effective development and implementation of measurement programs in software engineering organizations
7. **Software Engineering Management Tools**, which describes the selection and use of tools for managing a software engineering project

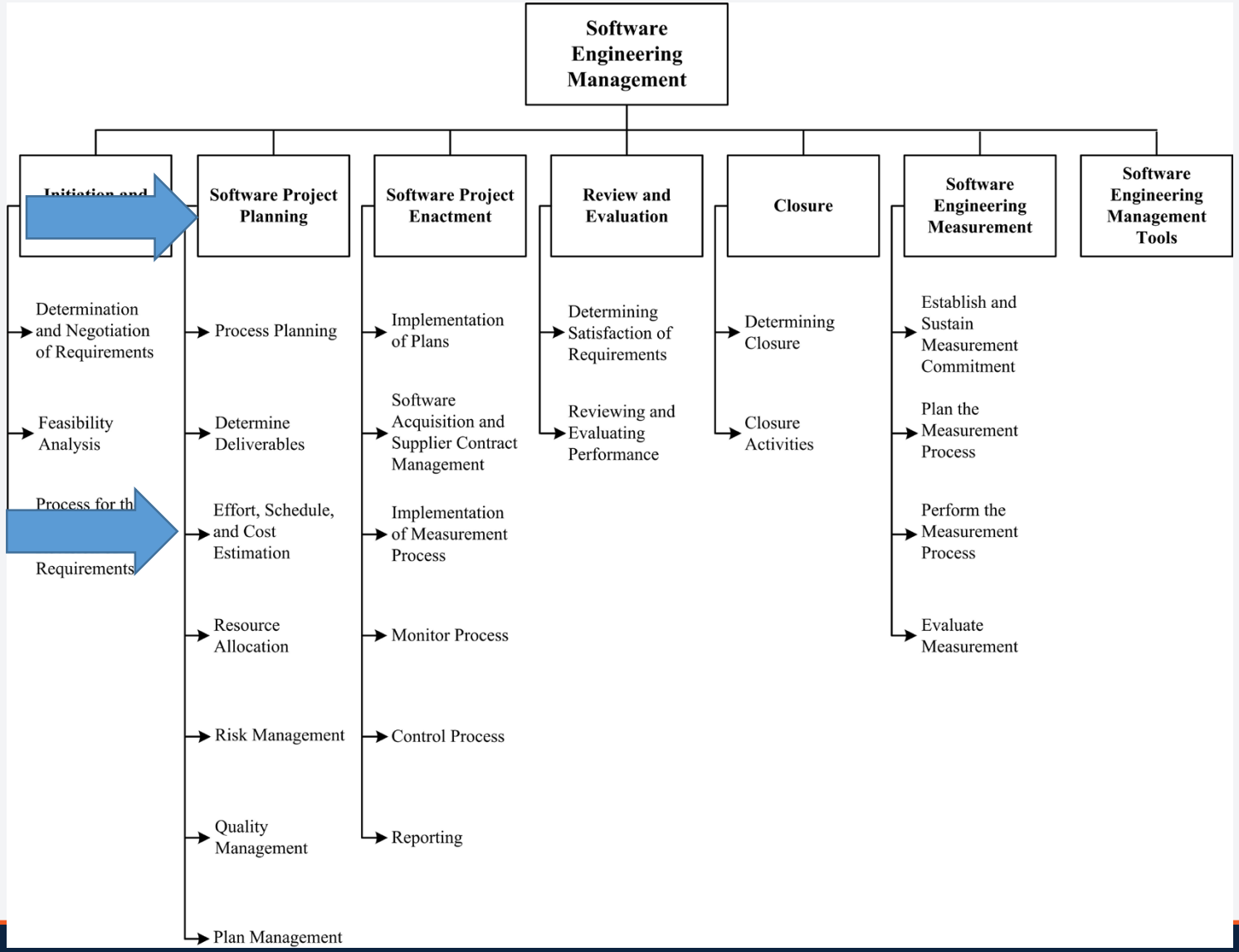
Source: Guide to the Software Engineering Body of Knowledge Version 3.0 (SWEBOK Guide V3.0) 2014

Breakdown of Topics for the SWE Management KA

- Because most SDLC models require **similar activities** that may be executed in different ways, the breakdown of topics (shown in the previous figure) is **activity-based**.
- The elements of the **top-level breakdown are the activities** that are **usually** performed **when a software development project is being managed**, independent of the SDLC model that has been chosen for a specific project.
  - There is no intent in this breakdown to recommend a specific life cycle model.
  - The breakdown implies only what happens and does not imply when, how, or how many times each activity occurs.

Source: Guide to the Software Engineering Body of Knowledge Version 3.0 (SWEBOK Guide V3.0) 2014

Breakdown of Topics for the SWE Management KA



Source: Guide to the Software Engineering Body of Knowledge Version 3.0 (SWEBOK Guide V3.0) 2014