

**Khulna University**  
Computer Science & Engineering Discipline

Copyright © 2015, SK Alamgir Hossain

## SK Alamgir Hossain

Assistant Professor  
Computer Science & Engineering Discipline  
Khulna University, Khulna, Bangladesh  
<http://alamgirhossain.com>

CSE3203 - Software Engineering and Information System Design

---

---

---

---

---

---

---

---

## Chapter 3

### The Software Process

---

---

---

---


---

---

---

---

## Chapter Outline



**Khulna University**  
Computer Science & Engineering Discipline

- Layered Technology
- Software Process Framework
- Generic Process Framework Activities
- Umbrella Activities
- CMMI Level

Chapter 3 - The Software Process

<http://alamgirhossain.com> Slide: 3

---

---

---

---

---

---

---

---

## Lecture 4

### The Software Process

- Layered Technology
- Software Process Framework
- Generic Process Framework Activities
- Umbrella Activities
- CMMI Level

---

---

---

---

---

---

---

---

### THE SOFTWARE PROCESS



- A software process is a framework for the tasks that are required to build high quality software.

Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 5

---

---

---

---

---

---

---

---

### What is software engineering?



- **Definition** : The application of systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software;  
- that is, the application of engineering to software.
- Its a discipline that is concerned with all aspects of software production.
- Software engineers should adopt
  - Systematic and organized approach to their work
  - Use appropriate tools and techniques depending on the problem to be solved
  - The development constraints and the resources available
- Apply Engineering Concepts to developing Software
- Challenge for Software Engineers is to produce high quality software with finite amount of resources & within a predicted schedule

Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 6

---

---

---

---

---

---

---

---

## Software Engineering – Layered Technology

The diagram illustrates the layers of software engineering technology as a stack of four concentric ellipses. From top to bottom, the layers are: Tools: CASE preferred (grey), Methods: technical "how to's" (dark grey), Process model: the "framework" (red), and A quality focus: the "bedrock" (yellow). The layers are stacked such that each layer is wider than the one above it, creating a tiered effect.

Chapter 3 – The Software Process <http://alamgirhossain.com> Slide: 7

---

---

---

---

---

---

---

---

## Layered Technology

### A quality focus

- Every organization is rest on its commitment to quality.
- Total quality management continuous improvement culture and it is this culture ultimately leads to development of increasingly more effective approaches to software engineering.
- The bedrock that supports software engineering is a quality focus.

### Process

- It's a foundation layer for software engineering.
- It's define **framework** for a set of *key process areas* for effectively manage and deliver quality software in a cost effective manner
- The processes define the tasks to be performed and the order in which they are to be performed

Chapter 3 – The Software Process <http://alamgirhossain.com> Slide: 8

---

---

---

---

---

---

---

---

## Layered Technology

### Methods

- It provide the technical **how-to's** for building software.
- Methods encompass a broad array of tasks that include requirements analysis, design, program construction, testing, and support.
- There could be more than one technique to perform a task and different techniques could be used in different situations.

### Tools

- Provide automated or semi-automated support for the process, methods and quality control.
- When tools are integrated so that information created by one tool can be used by another, a system for the support of software development, called **computer-aided software engineering (CASE)**

Chapter 3 – The Software Process <http://alamgirhossain.com> Slide: 9

---

---

---

---

---

---

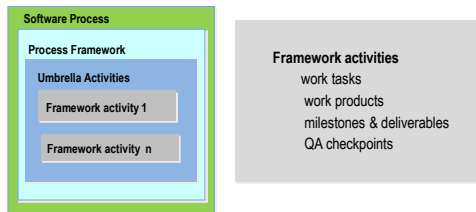
---

---

## Process Framework



- A process framework establishes the foundation for a complete software process by identifying a small number of framework activities that are applicable to all software projects regardless of their size and complexity.
- In addition the process framework encompasses a set of umbrella activities that are applicable across the entire software process



Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 10

---

---

---

---

---

---

---

---

## Process Framework - Why ?



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

- To build complete software process.
- Identified a small number of framework activities that are applicable to all software projects, regardless of their size or complexity.
- It encompasses a set of umbrella activities that are applicable across the entire software process.

Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 11

---

---

---

---

---

---

---

---

## Generic Process Framework Activities



- Communication
  - Heavy communication with customers, stakeholders, team
  - Encompasses requirements gathering and related activities
- Planning
  - Workflow that is to follow
  - Describe technical task, likely risk, resources will require, work products to be produced and a work schedule.
- Modeling
  - Help developer and customer to understand requirements (Analysis of requirements) & Design of software
- Construction
  - Code generation: either manual or automated or both
  - Testing – to uncover error in the code.
- Deployment
  - Delivery to the customer for evaluation
  - Customer provide feedback

Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 12

---

---

---

---

---

---

---

---

## Umbrella activities: Complementary Activities



- **Software project tracking and control**
  - Assessing progress against the project plan.
  - Take adequate action to maintain schedule.
- **Formal technical reviews**
  - Assessing software work products in an effort to uncover and remove errors before goes into next action or activity.
- **Software quality assurance**
  - Define and conducts the activities required to ensure software quality.
- **Software configuration management**
  - Manages the effects of change.
- **Document preparation and production**
  - Help to create work products such as models, documents, logs, form and list.
- **Reusability management**
  - Define criteria for work product reuse
  - Mechanisms to achieve reusable components.
- **Measurement**
  - Define and collects process, project, and product measures
  - Assist the team in delivering software that meets customer's needs.
- **Risk management**
  - Assesses risks that may effect that outcome of project or quality of product (i.e. software)

Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 13

## The Capability Maturity Model Integration: CMMI



- The **Software Engineering Institute (SEI)** has developed process meta-model to measure organization different level of process capability and maturity.
- CMMI – developed by SEI
- The CMMI defines each process area in terms of "specific goals" and the "specific practices" required to achieve these goals.
- **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.

Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 14

## SEI Software Maturity Model (Continuous)



- **Level 0 (Incomplete)** – Process are not perform or not achieve all the goals and objectives defined by the CMMI for Level 1 capability.
- **Level 1 (Performed)** – All specific goals are performed as per defined by CMMI
- **Level 2 (Managed)** – All level 1 criteria have been satisfied
  - In addition to Level 1;
    - People doing work have access to adequate resources to get job done,
    - Stakeholders are actively involved,
    - Work tasks and products are monitored, controlled, reviewed, and evaluated for conformance to process description.
- **Level 3 (Defined)** – All level 2 criteria have been achieved.
  - In addition;
    - management and engineering processes documented
    - standardized and integrated into organization-wide software process
- **Level 4 (Quantitatively Managed)** – All level 3 criteria have been satisfied.
  - Software process and products are quantitatively understood
  - Controlled using detailed measures and assessment.
- **Level 5 (Optimized)** – Continuous process improvement is enabled by quantitative feedback from the process and testing innovative ideas.

Chapter 3 - The Software Process

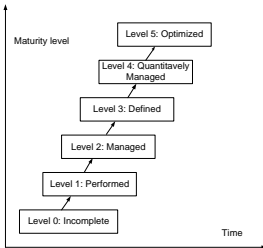
<http://alamgirhossain.com>

Slide: 15

## CMMI – Maturity Levels



Defines five maturity levels. To achieve a maturity level the specific goals and practices associated with a set of process areas must be achieved.



Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 16

## Process areas required to achieve a maturity level



Level	Focus	Process areas
Optimizing	Continuous process improvement	Organizational Innovation and Deployment Causal Analysis and resolution
Quantitatively managed	Quantitative management	Organizational Process performance, Quantitative project management, etc
Defined	Process standardization	Requirements Development, Technical solution Product integration, Verification, Validation
Managed	Basic project management	Requirements managements, project planning, Project monitoring and control, Supplier agreement management, Measurement and analysis, etc
Performed		

Chapter 3 - The Software Process

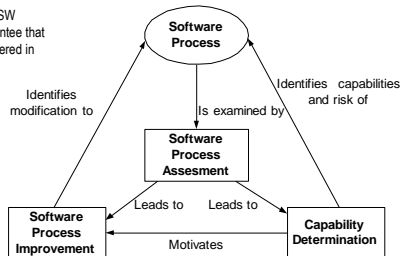
<http://alamgirhossain.com>

Slide: 17

## Process Assessment



The existence of a SW process is no guarantee that the SW will be delivered in time



Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 18

## Process Technology



- Process technology tools have been developed to help software organizations analyze their current process, organize work tasks, control and monitor progress and manage technical quality.

Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 19

---

---

---

---

---

---

---

---

## Product and Process



- If the process is weak, the end product will undoubtedly suffer.

Chapter 3 - The Software Process

<http://alamgirhossain.com>

Slide: 20

---

---

---

---

---

---

---

---

**THANK YOU**

---

---

---

---

---

---

---

---