Software Process Introduction

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Objectives

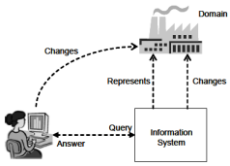
- To present what is *software*
- To present general software development *life cycle* model
- To present *software process* concepts
- To *define a process* for a project

References

1. Antoni Olive. Conceptual Modeling of Information Systems. 2007.
2. Roger S. Pressman. *Software Engineering -- A Practitioner's Approach*. 5th Edition. McGraw-Hill. 2001.
3. Silvia T. Acuna et al.. A process model applicable to software engineering and knowledge engineering. 1999.
4. NASA , *Recommended Approach to Software Development*. 1992.
5. Bill Curtis et al.. Process Modeling. 1992.
6. R. M. Hillyer. Models of Software Evolution - Life Cycle and Process. 1990.
7. Silvia T. Acuna and Xavier Ferre. Software Process Modelling. 1998.

Information System [1]

- An *information system* is a designed system that collects, stores, processes, and distributes information about the state of a domain.
- A system is therefore considered to have three main functions:
  - *Memory*: to maintain a representation of the state of a domain.
  - *Informative*: to provide information about the state of a domain.
  - *Active*: to perform actions that change the state of a domain.

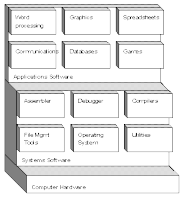


What is Software [2]

- Software is (1) *instructions* (computer programs) that when executed provide desired function and performance, (2) *data structures* that enable the programs to adequately manipulate information, and (3) *documents* that describe the operation and use of the programs.

Software Applications

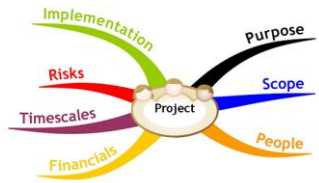
- System software
- Application software
- Engineering/scientific software
- Embedded software
- Product-line software
- Web applications
- AI software



How To Develop Software?

- Which step should we do **next**?
- How **long** will it take?
- **How** to perform the step?
- Which **artifacts** will it produce?
- **Who** is responsible for doing the step?

Software Project Planning [4], [6]



Project Manager
Business Analyst
Technical Architect

System and Operations
Concept Document
Project Plan

Clients, Users

Software Requirements [2]

The *elicitation*, *analysis*, *specification*, and *validation* of requirements for software.

1. Requirements *elicitation*
2. Requirements *analysis* and negotiation
3. Requirements *specification*
4. System *modeling*
5. Requirements *validation*
6. Requirements *management*

Roles and Products

- Business Analyst
- Users
- Project Manager

- Project vision
- Functional requirement specification
- Supplementary specification
- Glossary
- Business rules
- Domain model

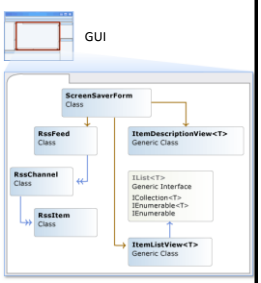
Software Design

- *The process of problem-solving* and planning for a software solution.
- After the purpose and specifications of software are determined, software developers *plan for a solution*.
- *It includes* low-level component and algorithm implementation issues as well as the architectural view.

Roles and Products

Architectural design specification

Technical Architect, Designer, Developer



Detailed design specification

Software Construction (Implementation)

The *construction of software* through the use of programming languages.

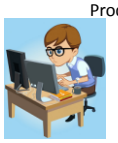
Roles and Products

Code File, Unit Tests

Module

Product

Development Plan
Integration Plan

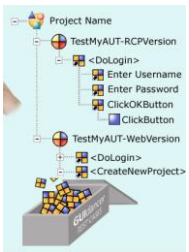


Developer
Technical Architect

Software Testing

The empirical investigations conducted to provide stakeholders with information about the quality of the product or service under test, with respect to the context in which it is intended to operate.

Roles and Products



- ❑ Test Plan
- ❑ Test Data
- ❑ User Guide
- ❑ Test Result

QA/QC and Tester

Acceptance Testing Roles and Products

System Delivery

- ❑ Acceptance Test Plan
- ❑ Test Result

Clients, Users

Supporter and Development Team

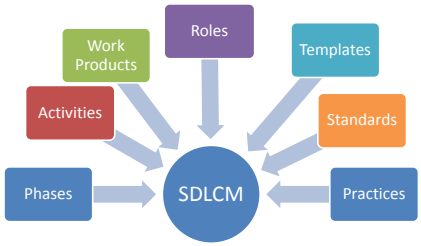
Software Maintenance

- *Software maintenance is* the process of enhancing and optimizing deployed software (software release), as well as remedying defects.
- *Software systems often have problems and need enhancements* for a long time after they are first completed. This subfield deals with those problems.

Clients, Users, Supporters and Development Team

Software Development Life Cycle Model [3]

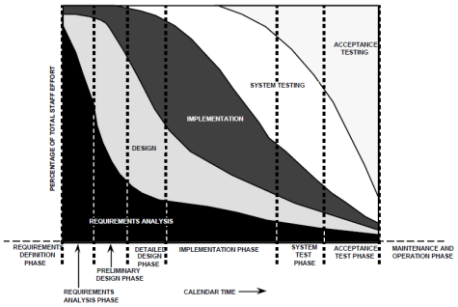
Life cycle: all the states through which the software evolves.
A software life cycle model is either a descriptive or prescriptive characterization of how software is or should be developed.



Why SDLC Model?

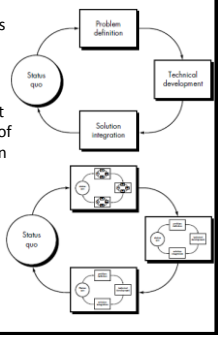
- *To organize, plan, staff, budget, schedule and manage software project work* over organizational time, space, and computing environments.
- *As prescriptive outlines for what products* to produce for delivery to client.
- *As a basis for determining what software engineering tools and methodologies* will be most appropriate to support different life cycle activities.
- *As frameworks for analyzing or estimating patterns of resource allocation* and consumption during the software life cycle.
- *As comparative descriptive or prescriptive* accounts for how software systems come to be the way they are.
- *As a basis for conducting empirical studies* to determine what affects software productivity, cost, and overall quality.

NASA/SEL SDLC Model [4]



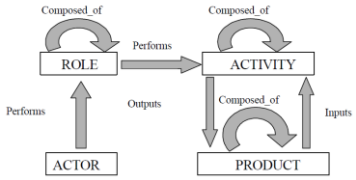
Process and Process Model [5], [2]

- *A process is* a set of partially ordered steps intended to reach a goal.
- *A process model is* an abstract description of an actual or proposed process that represents selected process elements that are considered important to the purpose of the model and can be enacted by a human or machine.
- *Software process is* a partially ordered set of activities undertaken to manage, develop and maintain software systems.
- *A software process model is* an abstract representation of the software process.



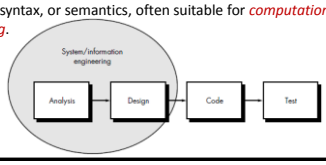
Elements of Process Model [7]

- *Agent* or Actor is an entity that executes a process.
- *Artifact* or Product is the (sub)product and the "raw material" of a process.
- *Activity* is the stage of a process that produces externally visible changes of state in the software product.
- *Role* describes a set of agent or group responsibilities, rights and skills required to perform a specific software process activity.



Software Process vs. SDLC

- The life cycle centers on the *product*, defining the states through which the product passes from the start of construction (the initial state is the user need) until the software is in operation (this product state is the deployed system) and finally retired (the state is the retired system).
- The software process centers on the *construction process* rather than on the product(s) outputted.
- Software process can be used to develop more *precise and formalized* descriptions of software life cycle activities.
- Software process power emerges from their utilization of a sufficiently rich notation, syntax, or semantics, often suitable for *computational processing*.



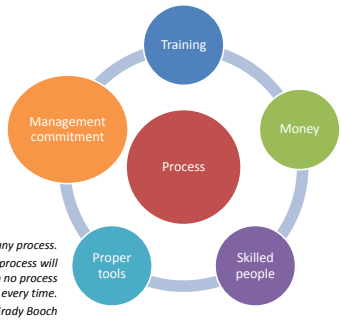
Software Process Objective

- The software process has a common objective: to *build* and maintain a software product that satisfies a need detected by a user.
- The integral software process model seeks to do just this: define a *series of activities* to be performed to produce software.

Why Software Process?

- Bringing *discipline* to various tasks in software development.
  - This discipline leads to *consistency* and uniformity in products delivered at the end of these tasks.
  - Project *predictability* (framework for software development plan)
  - Better *communication* and learning
  - Preventing *wasted effort* and repeated errors
- Having good processes to follow vs. Hiring only *brilliant* people
- Having people work smarter vs. Having people work *harder*
- *Guarantee* for Customers (schedule, budget and quality)

How To Use Software Process?



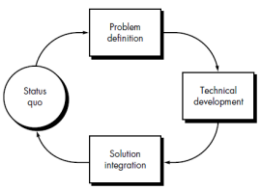
- *People are more important than any process.*
  - *Good people with a good process will outperform good people with no process every time.*

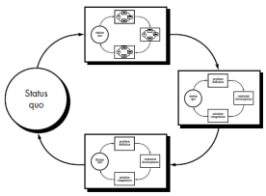
– Grady Booch

Process Definition Template

- *Life cycle* (hierarchical/overlapped phases)
- Phase
  - Purpose
  - *Entry criteria*
  - Inputs
  - Roles
    - Tasks
    - Process flow
    - Deliverables
  - Checkpoints
  - Outputs
  - *Exit criteria*

Problem Solving Loop [2]





Regardless of the process model that is chosen for a software project, all of the stages—status quo, problem definition, technical development, and solution integration—*coexist simultaneously at some level of detail.*

Thank You For Your Time