CH02: Modeling the process and life cycle

• Process of developing software (organization and discipline in the activities) contribute to the quality of the software and the speed with which it is developed
• The Meaning of Process
• Software Process Models
• Tools and Techniques for Process Modeling
• Practical Process Modeling

The Meaning of Process

• We can think of a set of ordered tasks as a process: a series of steps involving activities, constraints and resources that produce an intended output of some kind.
• When the process involves the building of some product, we sometimes refer to the process as a life cycle.

Following a Process

• A process is a collection of procedures (a recipe), organized so that we build products to satisfy a set of goals or standards.
• Processes are important because they impose consistency and structure on a set of activities.
• When we know how to do something well and we want to ensure that others do it the same way.

Writing a Process

(Writing a “program” for others to follow)

• Prescribe all major activities
• Uses resources, subject to a set of constraints
• May composed of sub-processes
• Each activities has entry and exit criteria
• Activities are organized in a sequence.
• State the goals of each activity.

Software Process Models

• are prescriptions for the way software development should progress.
• are descriptions of the way software development is done in actuality.
• Every software development process model includes system requirements as input and delivered product as output.

Waterfall Model

- REQUIREMENTS ANALYSIS
- SYSTEM DESIGN
- PROGRAM DESIGN
- CODING
- UNIT & INTEGRATION TESTING
- SYSTEM TESTING
- ACCEPTANCE TESTING
- OPERATION & MAINTENANCE
(Development process in reality)

REQUIREMENTS ANALYSIS
SYSTEM DESIGN
PROGRAM DESIGN
IMPLEMENTATION
UNIT TESTING
INTEGRATION TESTING
SYSTEM TESTING
DELIVERY
MAINTENANCE

V Model

REQUIREMENTS ANALYSIS
SYSTEM DESIGN
PROGRAM DESIGN
UNIT & INTEGRATION TESTING
CODING

ACCENTEC TESTING
SYSTEM TESTING

OPERATION & MAINTENANCE

Prototyping Model

LIST OF REVISIONS

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PROTOTYPE REQUIREMENTS

REVISE PROTOTYPE

USER/CUSTOMER REVIEW

PROTOTYPE DESIGN

PROTOTYPE SYSTEM

TEST

DEVELOPED SYSTEM

SYSTEM REQUIREMENTS
(sometimes informal or incomplete)

Operational Specification: requirements enacted (automated) using a software package

Execute and Revise

OPERATIONAL SPECIFICATION

TRANSFORMED SPECIFICATION

TEST

DEVELOPED SYSTEM

SYSTEM REQUIREMENTS
(sometimes informal or incomplete)

Transformational Model

Compare with requirements; update as needed

FORMAL DEVELOPMENT RECORD

Sequence of transformations plus rationale for them

FORMAL SPECIFICATION

TRANSFORM N -

TRANSFORM 2

TRANSFORM 1

TEST

DEVELOPED SYSTEM

SYSTEM REQUIREMENTS
(sometimes informal or incomplete)

Phases Development

Development systems

Build Release 1
Build Release 2
Build Release 3

Time

Users

Use Release 1
Use Release 2
Use Release 3

Production systems
(Increments and Interactions)

**INCREMENTAL DEVELOPMENT**

**ITERATIVE DEVELOPMENT**

**Tools and Techniques for Process Modeling**
- Choose Language or Notation
- A *static* model depicts the process, showing that the inputs are transformed to outputs.
- A *dynamic* model can enact the process, so that the user can see how intermediate and final products are transformed over time.

**Static Modeling: Lai Notation**
- State tables show information about the completeness of each artifact at a given time.
- Transition diagrams show how the states are related to one another.

**State table and Transition diagram**

Parked:

\[ ((\text{state	ext{off}})(\text{car.engine}) = \text{off}) \land ((\text{state	ext{off}})(\text{car.gear}) = \text{park}) \land ((\text{state	ext{off}})(\text{car.speed}) = \text{stand})) \]

**Dynamic Modeling: System Dynamics**
- Simulate the process and make changes before the resources are actually expended.
- Factors affecting overall productivity.
- (Quantified) Relationships (links) between the factors.
- System dynamics models are supported by software that simulates the overall process.
Practical Process Modeling

- used properly, process modeling offers great benefits for understanding processes and revealing inconsistencies.
- Develop special language to help defining and enacting processes, e.g. Marvel specification language.
- A process model is useful for guiding your behavior when you are working with a group.