Process Models: Perspective Process Models (Continue)

LECTURE # 8

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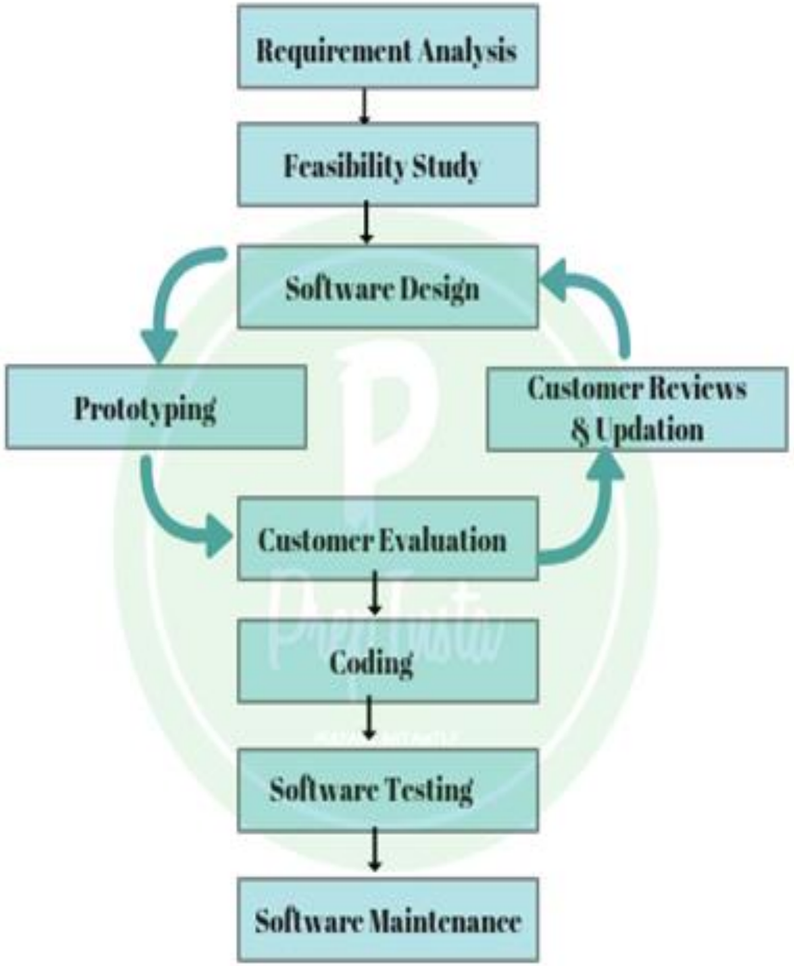
Prototype Model

- Prototype is a working model of software with some limited functionality.
- The basic idea in **Prototype model** is that instead of freezing the requirements before a design or coding can proceed, a throwaway prototype is built to understand the requirements.
- Prototype is developed based on the currently known requirements.
- By using prototype, the client can get an "actual feel" of the system, since the interactions with prototype can enable the client to better understand the requirements of the desired system.
- It does not always hold the exact logic used in the actual software application and is an extra effort to be considered under effort estimation
- Prototyping is an attractive idea for complicated and large systems for which there is no manual process or existing system to help determining the requirements.

Prototype Model

- Software prototyping is becoming very popular as a software development model, as it enables to understand customer requirements at an early stage of development.
- It helps get valuable feedback from the customer and helps software designers and developers understand about what exactly is expected from the product under development
- Stepwise approach to design prototype
  - Basic Requirement Identification
  - Developing the initial Prototype
  - Review of the Prototype
  - Revise and Enhance the Prototype



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Prototype Model

- **A Horizontal prototype** displays the user interface for the product and gives a broader view of the entire system, without concentrating on internal functions.
- **Horizontal prototypes** are used to get more information on the user interface level and the business requirements. It can even be presented in the sales demos to get business in the market
- A **Vertical prototype** on the other side is a detailed elaboration of a specific function or a sub system in the product.
- **Vertical prototypes** are technical in nature and are used to get details of the exact functioning of the sub systems. For example, database requirements, interaction and data processing loads in a given sub system.

Prototyping - Application

- Prototype model should be used when the desired system needs to have a lot of interaction with the end users.
- Prototyping ensures that the end users constantly work with the system and provide a feedback which is incorporated in the prototype to result in a useable system.
- When detailed information related to input and output requirements of the system is not available
- They are excellent for designing good human computer interface systems.

Advantages of Prototype model:

- Users are actively involved in the development
- Since in this methodology a working model of the system is provided, the users get a better understanding of the system being developed.
- Errors can be detected much earlier.
- Quicker user feedback is available leading to better solutions.
- Missing functionality can be identified easily
- Confusing or difficult functions can be identified
- Reduces time and cost.

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Disadvantages of Prototype model

- Leads to implementing and then repairing way of building systems.
- Practically, this methodology may increase the complexity of the system as scope of the system may expand beyond original plans.
- Risk of insufficient requirement analysis owing to too much dependency on the prototype.
- Users may get confused in the prototypes and actual systems.
- Developers may try to reuse the existing prototypes to build the actual system, even when it is not technically feasible.
- The effort invested in building prototypes may be too much if it is not monitored properly.

Summary

- A generic process model for software engineering encompasses a set of framework and umbrella activities, actions, and work tasks.
- Each of a variety of process models can be described by a different process flow
- Process patterns can be used to solve common problems that are encountered as part of the software process.
- Prescriptive process models have been applied for many years for software development. Each of these models suggests a some- what different process flow, but all perform the same set of generic framework activities: communication, planning, modeling, construction, and deployment.

Summary

- Sequential process models, such as the waterfall and V models, are the oldest software engineering paradigms. They suggest a linear process flow that is often in- consistent with modern, however, have applicability in situations where requirements are well defined and stable.
- Incremental process models are iterative in nature and produce working versions of software quite rapidly and are designed to accommodate change.
- Evolutionary models, such as prototyping and the spiral model, produce incremental work products quickly. These models can be adopted to apply across all software engineering activities—from concept development to long-term system maintenance.

Process Models: Specialized Process Models

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Objectives

- The objectives of this lecture is to
  - Understand the Specialized Process Models
  - Their strengths and weaknesses

Specialized Process model

- Special process models take many features from one or more conventional models.
- However these special models tend to be applied when a narrowly defined software engineering approach is chosen.
- Types in Specialized process models:
  - 1. Component based development (Promotes reusable components)
  - 2. The formal methods model (Mathematical formal methods are backbone here)
  - 3. Aspect oriented software development (Uses crosscutting technology)
  - Unified Process (use-case driven, architecture centric)

Component Based Development

- Software Reuse:
  - In most engineering disciplines, systems are designed by composition (building system out of components that have been used in other systems)
  - Software engineering has focused on custom development of components
  - To achieve better software quality, more quickly, at lower costs, software engineers are beginning to adopt systematic reuse as a design process

Component Based Development

- **Benefits of Reuse**
  - Increased Reliability
  - Reduced Process Risk
  - Effective Use of Specialists
  - Standards Compliance
  - Accelerated Development

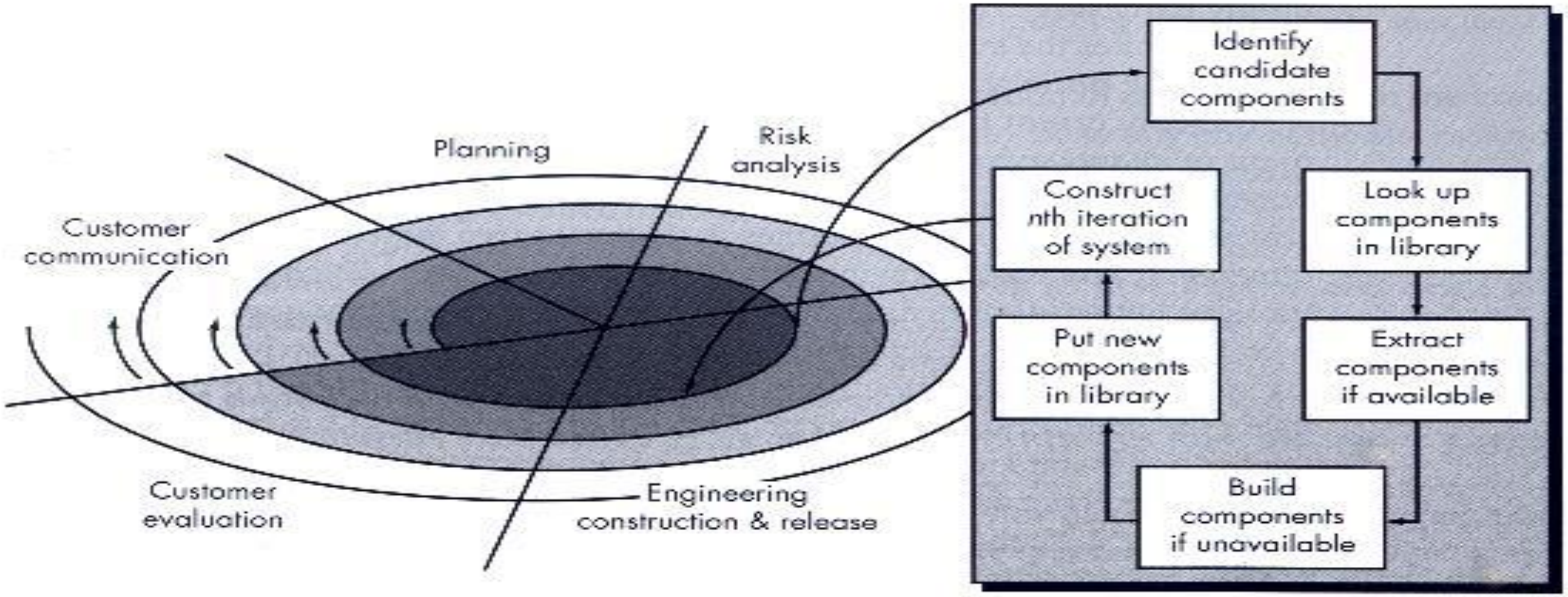
Component Based Development (CBD)

- Component-based software engineering is the idea of building software from established software components, as opposed to building the software from the scratch.
- Commercial off-the-shelf (COTS) software components, developed by vendors who offer them as products, provide targeted functionality with well-defined interfaces that enable the component to be integrated into the software that is to be built.
- Components interact through well-defined interfaces.

Component Based Development (CBD)

- The component based development model incorporates many of the characteristics of the spiral model.
- It is evolutionary in nature, demanding an iterative approach to the creation of software.
- However, the model focuses on prepackaged software components. It promotes software reusability.
- Component integration is relatively easy, the main focus is on maintenance.

Component Based Development (CBD)


Planning
Risk analysis
Customer communication
Customer evaluation
Engineering construction & release
Identify candidate components
Look up components in library
Extract components if available
Build components if unavailable
Put new components in library
Construct nth iteration of system

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Component Based Development (CBD)

- Modeling and construction activities begin with the identification of candidate components. Candidate components can be designed as either conventional software modules or object oriented packages.
- Component based development has the following steps:
  - 1. Available component based products are researched and evaluated for the application domain.
  - 2. Component integration issues are considered.
  - 3. A software architecture is designed to accommodate the components.
  - 4. Components are integrated into the architecture.
  - 5. Comprehensive testing is conducted to ensure proper functionality.