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SE ZG501

Software Quality Assurance and Testing

Lecture No. 15

Spiral Model

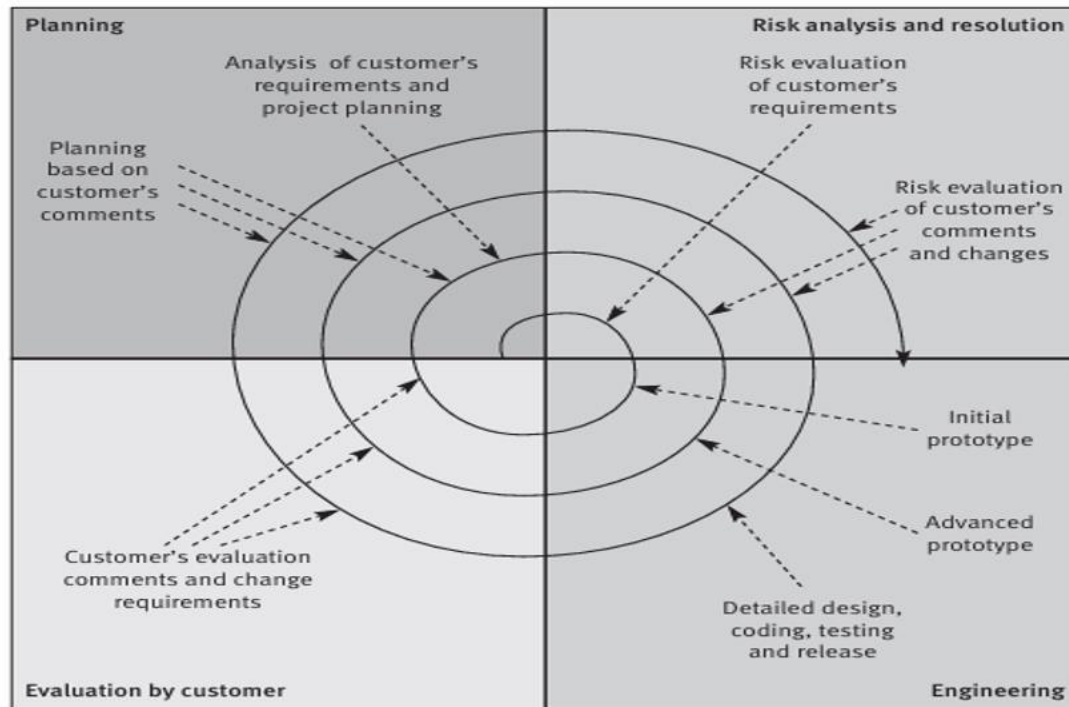


Figure 7.3: The spiral model (Boehm, 1988)

Source: After Boehm (1988) (© 1988 IEEE)

The image illustrates the **Spiral Model** of software development proposed by Barry Boehm in 1988. It is a risk-driven process model that combines elements of both design and prototyping in stages. Each loop in the spiral represents a phase in the software development lifecycle, emphasizing risk assessment and customer feedback.

Key Quadrants and Activities:

1. Top-Left: Planning

- **"Analysis of customer's requirements and project planning"**
This step involves understanding what the customer wants and planning the project accordingly.
- **"Planning based on customer's comments"**
Customer feedback is integrated into future planning.

2. Top-Right: Risk Analysis and Resolution

- **"Risk evaluation of customer's requirements"**
Risks related to the initial requirements are assessed.
- **"Risk evaluation of customer's comments and changes"**
As feedback and new changes come in, associated risks are re-evaluated.

1. Bottom-Right: Engineering

- **"Initial prototype"**
A basic version of the software is developed to demonstrate the concept.
- **"Advanced prototype"**
A more complete version is developed based on feedback.
- **"Detailed design, coding, testing and release"**
The final product is built, tested, and deployed.

2. Bottom-Left: Evaluation by Customer

- **"Customer's evaluation, comments, and change requirements"**
After each phase, the customer reviews the output and provides feedback.
- This input feeds into the next loop of the spiral, improving the product iteratively.

How the Spiral Model Works:

- Each cycle (loop) in the spiral goes through **4 main stages**: Planning → Risk Analysis → Engineering → Evaluation.
- After each cycle, the product evolves with more features and improvements.
- This model supports **incremental development, prototyping, and continuous customer feedback**.

Advantages:

- Strong focus on **risk analysis**.
- Ideal for **large, complex, and high-risk projects**.
- Promotes **early detection of problems** and **continuous customer involvement**.

Win Win Spiral Model

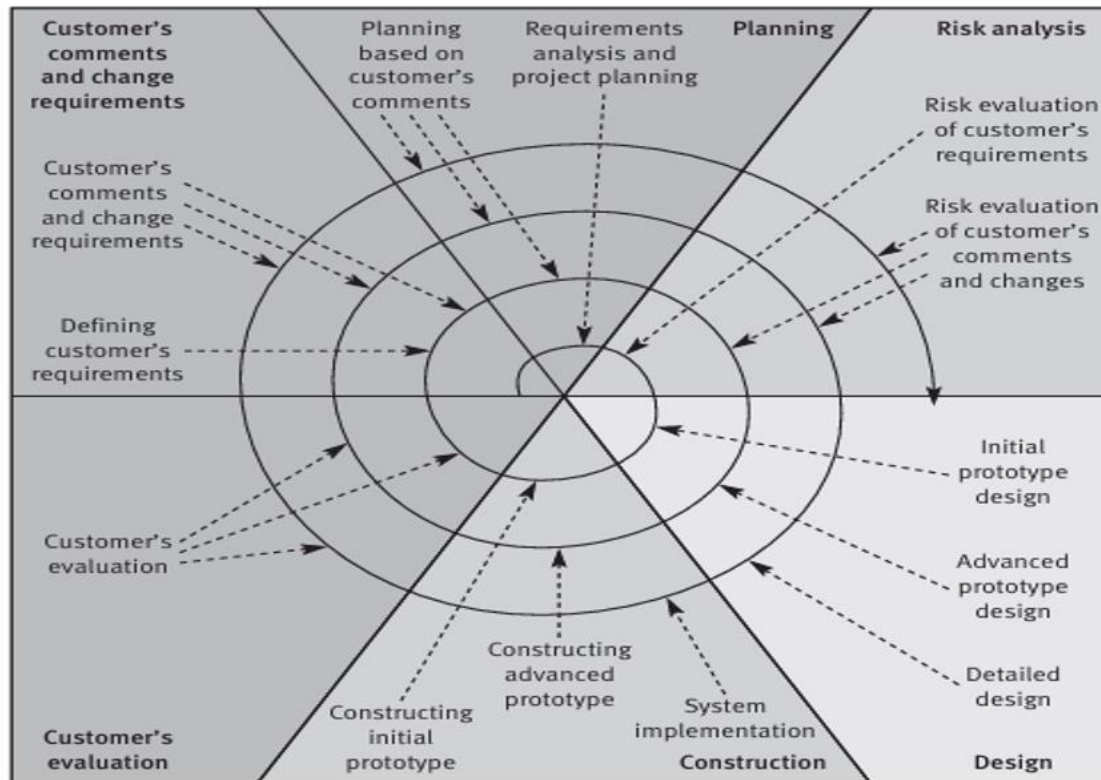


Figure 7.4: The advanced spiral model (Boehm, 1998)

The **Advanced Spiral Model** is an iterative and risk-driven software development model that expands on Boehm's original 1988 spiral model. It emphasizes **continuous customer involvement, prototyping, risk analysis, and incremental delivery** through iterative cycles.

Each loop of the spiral represents one phase of development, and the loops expand outward as the project progresses.

Structure of the Spiral

The model is divided into **four main quadrants**, each representing a key activity phase within one development cycle:

1. Customer's Comments and Change Requirements (Top-Left Quadrant)

This quadrant deals with **gathering and analyzing customer feedback**, which drives the next iteration.

Key Activities:

- **Defining Customer's Requirements**
Initial gathering of what the customer wants from the system.
- **Customer's Comments and Change Requirements**
Customer feedback after seeing a prototype or release. May include new features, modifications, or clarifications.
- **Planning Based on Customer's Comments**
The project plan is updated in response to this feedback. Priorities may shift.

◆ 2. Planning (Top-Centre Quadrant)

This quadrant focuses on **organizing the work** and **setting goals** for the next cycle.

Key Activities:

- **Requirements Analysis**
Understand what the system must do, refine user needs.
- **Project Planning**
Define scope, tasks, responsibilities, schedule, and cost.

Planning Based on Feedback

Adapt timelines and features based on customer suggestions from the previous cycle.

3. Risk Analysis (Top-Right Quadrant)

This quadrant evaluates potential **risks** that might hinder development success.

Key Activities:

- **Risk Evaluation of Requirements**
Analyze technical, cost, and schedule risks of implementing features.
- **Risk Evaluation of Comments and Changes**
If customers suggest changes, assess risks before integrating them.

4. Design and Construction (Bottom-Right and Bottom-Left Quadrants)

These two quadrants are about **building and delivering** the product in iterations.

Design (Bottom-Right Quadrant)

This quadrant focuses on defining the system architecture and interface.

Key Activities:

- **Initial Prototype Design** – Design the first, rough version of the system.
- **Advanced Prototype Design** – Add more features and detail to the next version.
- **Detailed Design** – Technical design with implementation details, architecture, and interface specifications.

Construction (Bottom-Left Quadrant)

This quadrant focuses on **development, testing, and delivery.**

Key Activities:

- **Constructing Initial Prototype** – Basic implementation of the design.
- **Constructing Advanced Prototype** – Improved and expanded version.
- **System Implementation** – Final product is developed, tested, and deployed.
- **Customer Evaluation** – Customer uses and reviews the product.

THANK YOU