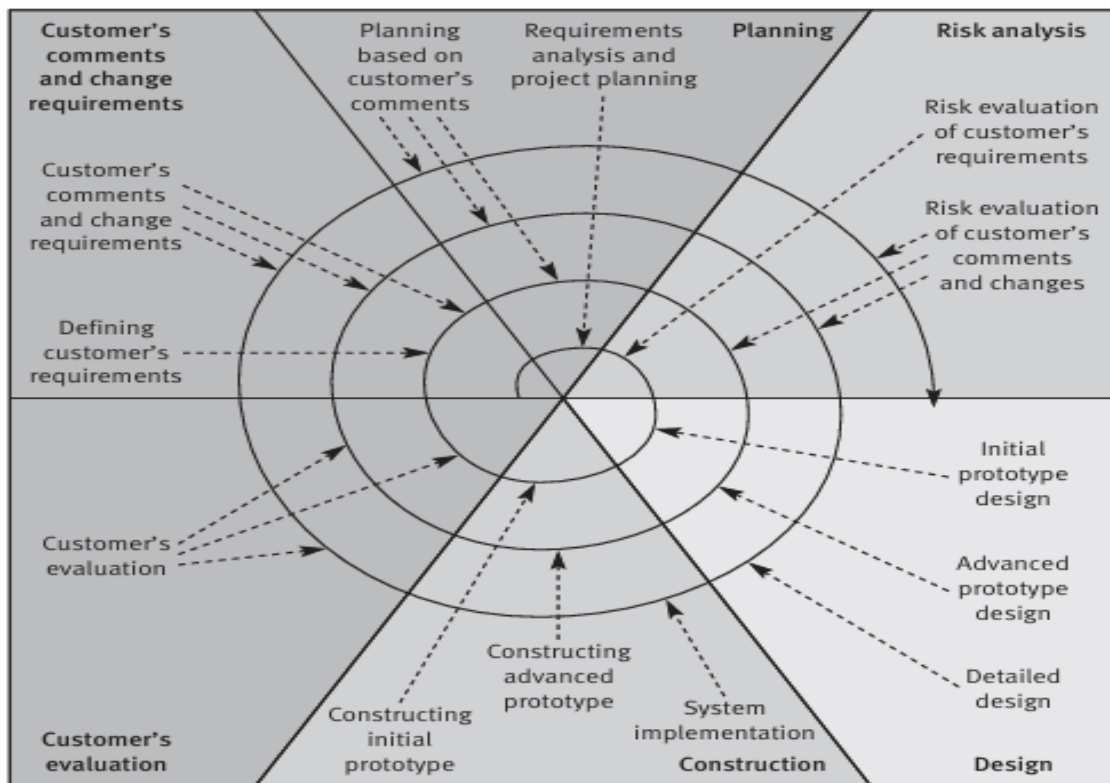Figure 7.4: The advanced spiral model (Boehm, 1998)

📘 **Advanced Spiral Model (Boehm, 1998) – Full Explanation**

🔍 **Overview**

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.

🔁 The process then loops again with new feedback.

🔁 **How the Spiral Works**

Each cycle of the spiral includes:

1. Understanding customer needs

2. Planning the next steps

3. Evaluating and mitigating risks

4. Designing and building prototypes

5. Getting customer feedback

This loop repeats with increasing refinement until the system is complete.