جامعة المستقبل
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كلية العلوم
قسم الانظمة الطبية الذكية

المحاضرة العاشرة

Software engineering

المادة : Software engineering
المرحلة : الثالثة
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E- The Spiral Model :

- The **Spiral Model** was designed to include the best features from the **Waterfall** and **Prototyping Models**, and introduces a new component - ***Risk-assessment***.

- The term **'Spiral'** is used to describe the process that is followed as the development of the system takes place. Similar to the **Prototyping Model**, an initial version of the system is developed, and then repetitively modified based on input received from customer evaluations.

-With each iteration around the spiral (beginning at the centre and working outward).

Risk assessment is included as a step in the development process as a means of evaluating each version of the system to determine whether or not development should continue.

If the customer decides that any identified risks are too great, the project may be halted.

For example, if a substantial increase in cost or project completion time is identified during one phase of risk assessment, the customer or the developer may decide that it does not make sense to continue with the project, since the increased cost or lengthened timeframe may make continuation of the project impractical or unfeasible.

The lifecycle of Spiral Model is including the following steps (see **Figure 10.1**):

1. **Project Objectives:** Specific objectives for the phase are identified**.** Similar to the system conception phase of the **Waterfall Model**. Objectives are determined, possible obstacles are identified and alternative approaches are weighed.

2. **Risk Assessment:** Possible alternatives are examined by the developer, and associated risks /problems are identified. Resolutions of the risks are evaluated and weighed in the consideration of project continuation. Sometimes prototyping is used to clarify needs.

3. **Engineering & Production:** Detailed requirements are determined and the software piece is developed.

4. **Planning and Management:** The customer is given an opportunity to analyze the results of the version created in the Engineering step and to offer feedback to the developer.

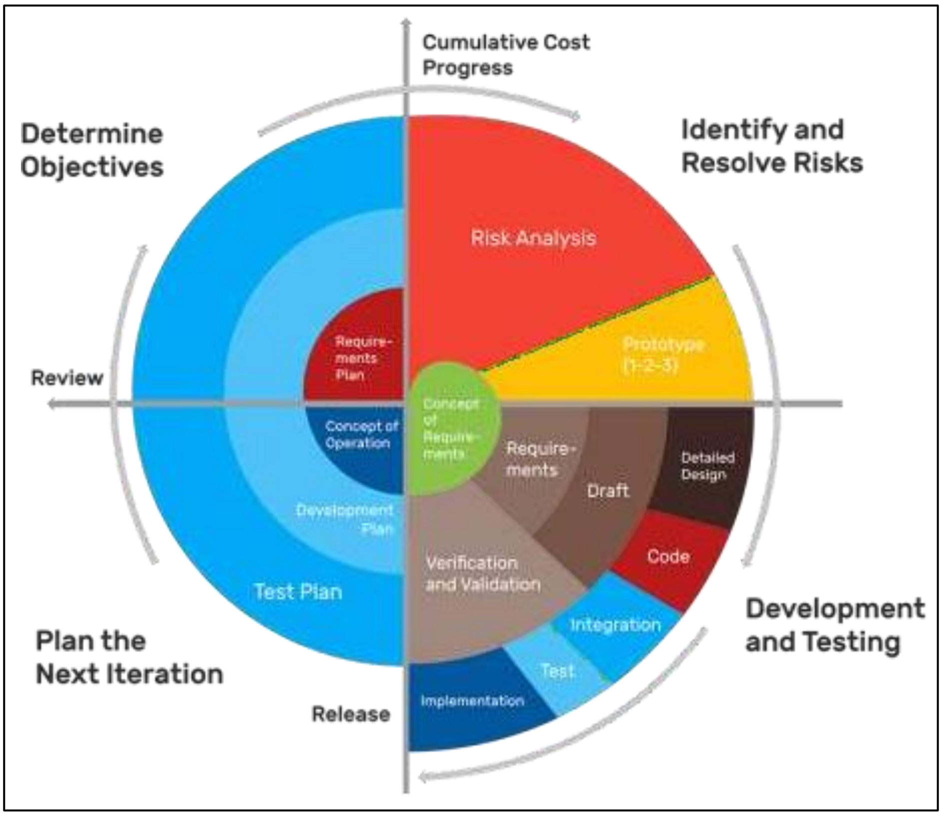

Figure 10.1: The Spiral model life-cycle

Each cycle contains the following tasks:

1. Determining objectives.
2. Specifying constraints.
3. Generating alternatives.
4. Identifying risks.
5. Resolving risks.
6. Developing next-level product.
7. Planning next cycle.

Spiral Model Advantages:

1. **Realism:** the model accurately reflects the iterative nature of software development on projects with unclear requirements.
2. **Flexible:** incorporates the advantages of the waterfal and rapid prototyping methods.
3. **Comprehensive** model decreases risk. Critical high-risk functions are developed first.

4. Users see the system early because of rapid prototyping tools.
5. Users can be closely tied to all lifecycle steps.
6. Early and frequent feedback from users.

7. Good project **visibility**.

Spiral Model Weaknesses

1. Time spent for evaluating risks too large for small or low-risk projects.
2. Time spent planning, resetting objectives, doing risk analysis and prototyping may be excessive.
3. The model is poorly understood by non-technical management, hence not so widely used.
4. Needs technical expertise in risk analysis to really work.
5. Spiral may continue indefinitely.
6. Developers must be reassigned during non-development phase activities.
7. Complicated model, needs professional management.
   High administrative overhead.
8. May be hard to define objective, verifiable milestones that indicate readiness to proceed through the next iteration.

When to use Spiral Model?

1. The project is large.
2. The requirements are unclear and complex.
3. When changes may require at any time.
4. Large and high budget projects.