Integrating quality activities in the project life cycle

- Software development methodologies:
  - The software development life cycle (SDLC) model
  - The prototyping model
  - The spiral model
  - The object-oriented model
- Factors affecting intensity of SQA activities
  - Verification, validation and qualification
  - Development and quality plans for small and for internal projects
- A model for SQA defect removal effectiveness and cost

The prototyping model

- Requirements determination by customer
- Prototype design
- Prototype implementation
- Prototype evaluation by customer
- Requirements fulfilled?
  - Yes
  - No
- Requirements for corrections, changes and additions
- System tests and acceptance tests
- System conversion
- System operation and maintenance

Prototyping vs SDLC

- Advantages of Prototyping
  - Shorter development process
  - Savings of development resources
  - Better fit to customer requirements
  - Reduced risk of failure
  - Easier & faster user comprehension
- Disadvantages of Prototyping
  - Diminished flexibility & adaptability to changes
  - Reduced preparation for instances of failure
  - More difficult to manage

The Spiral Model

The Advanced Spiral model - The Win-Win Model

Source: After Boehm 1988 (© 1988 IEEE)
**Object Oriented Development Model**

**Factors affecting the required intensity of SQA activities**

Project factors:
- Project's magnitude
- Project's technical complexity and difficulty
- Extent of reusable software components
- Severity of failure outcomes if the project fails

Team factors:
- The professional qualification of the team members
- Team acquaintance with the project and its experience in the area
- Availability of staff members that can professionally support the team
- Familiarity with the team members, in other words, the percentage of new staff members in the team

**Verification, validation and qualification**

**Verification** – The process of evaluating a system or component to determine whether the products of a given development phase satisfy the conditions imposed at the start of that phase

**Validation** - The process of evaluating a system or component during or at the end of the development process to determine whether it satisfies specified requirements

**Qualification** - The process used to determine whether a system or component is suitable for operational use


**Model for SQA defect removal effectiveness and cost**

The model’s quantitative results:

a. The SQA plan’s total effectiveness in removing project defects
b. The total costs of removal of project defects

**Data**

- Defect origin distribution
  - consistent
- Defect removal effectiveness
  - Each quality assurance activity filters a certain % of defects
- Cost of defect removal
  - Varies by development phase

**The model**

- Assumed linear & sequential (waterfall)
- New defects introduced at each phase
- Review & test SQA activities are filters
- Filtering efficiency is consistent
- Incoming defects are sum of earlier non-removed defects
- Average cost of defect removal is same for all phases
- Cost for each QA activity is (# defects removed) * (relative cost of removal)
- Remaining defects will be detected by customer