# Software Engineering Fundamental

# CHAPTER ONE

- Definition of software
- Software Engineering vs. Computer Science
- Failure curve of  Hardware and software
- Software Myths
- Software development life cycle (SDLC)
- Software Development  methods

- **Software** (set of instruction + design diagrams+ necessary databases)
- **Software Engineering** : Creation and design of the software .
- **Computer Science**: Broad approach to the study of the principles and use of computers that covers both theory and application

# Characteristics of Software

software has characteristics that are considerably different than those of hardware:

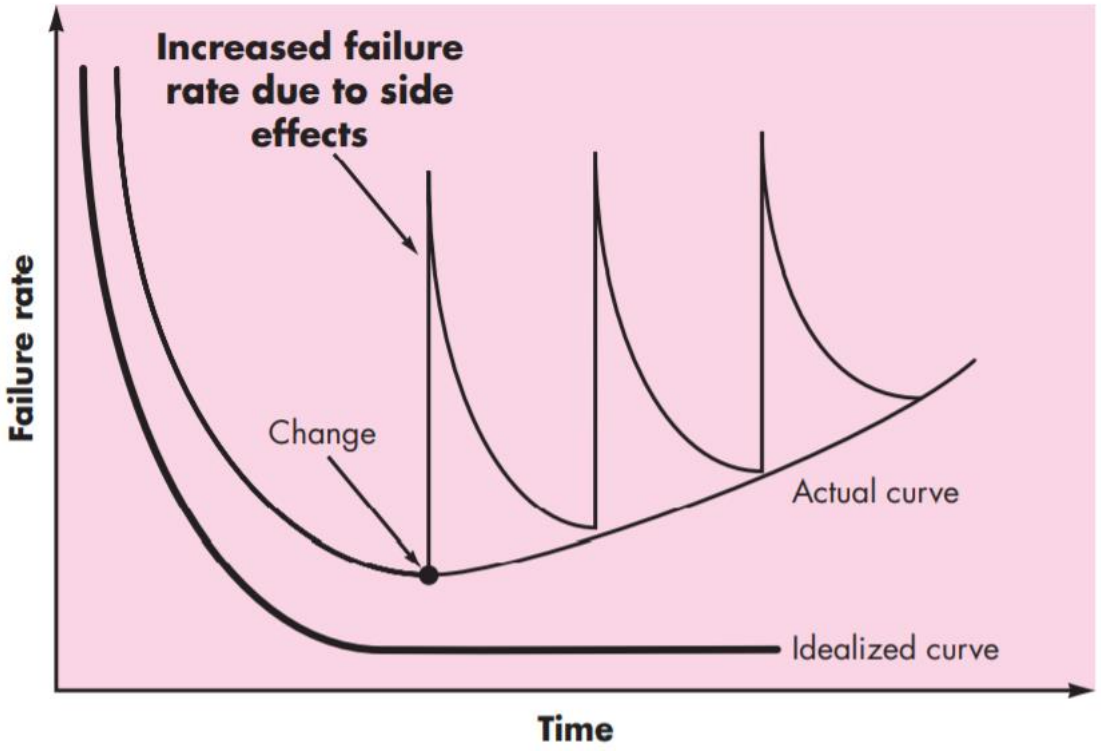
1. Software is developed ; it is not manufactured (*Both process focuses to achieve high quality, for hardware can introduce quality problems that are nonexistent for a software*)
2. Software doesn't "wear out."

3. Software is custom build

# Characteristics of software

**FIGURE 1.2**

Failure curves for software

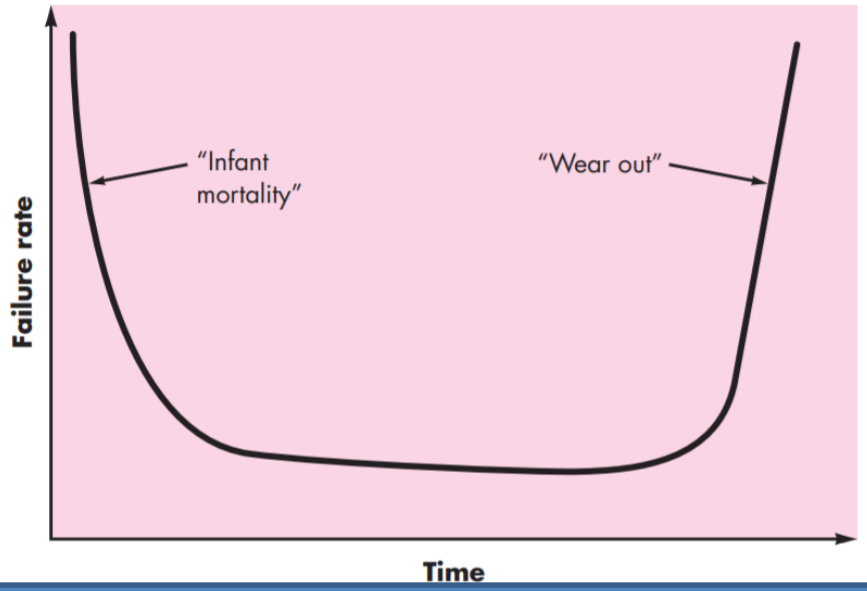



2. Software doesn't wear out but it does deteriorates

# Characteristics of Software



**FIGURE 1.1**
Failure curve for hardware




2. Software doesn't wear out but hardware does

# Software Myths

## Management myths

Myth: We already have a book that's full of standards and procedures for building software. Won't that provide my people with everything they need to know?

*Reality: Are software practitioners aware of its existence? Does it reflect modern software engineering practice? Is it complete? Is it adaptable*?

# Software Myths

## Management Myths

Myth :If we get behind schedule, we can add more programmers and catch up

*Reality :new people are added, people who were working must spend time educating the newcomers, thereby reducing the amount of time spent on productive development effort*

# Software Myths

## Management Myth

Myth: If I decide to outsource the software project to a third party, I can just relax and let that firm build it.

*Reality: If an organization does not understand how to manage and control software projects internally, it will invariably struggle when it outsources software projects.*

# Software Myths

**Customer myths**

Myth: A general statement of objectives is sufficient to begin writing programs—we can fill in the details later.

*Reality: an ambiguous "statement of objectives" is a recipe for disaster.*

# Software Myths

**Customer**

Myth: Software requirements continually change, but change can be easily accommodated because software is flexible.

*Reality :When requirements changes are requested early (before design or code has been started), the cost impact is relatively small. However, as time passes, the cost impact grows rapidly*

# Software Myths

Practitioner's myths.

Myth: Once we write the program and get it to work, our job is done

*Reality: Industry data indicate that between 60 and 80 percent of all effort expended on software will be expended after it is delivered to the customer for the first time*

# Software Myths

Practitioner's myths

Myth: Until I get the program "running" I have no way of assessing its quality

Reality: Quality focuses from at the time of requirement analysis

# Software Myths

Myth: The only deliverable work product for a successful project is the working program

*Reality: A variety of work products (e.g., models, documents, plans) provide a foundation for successful engineering and, more important, guidance for software support*.

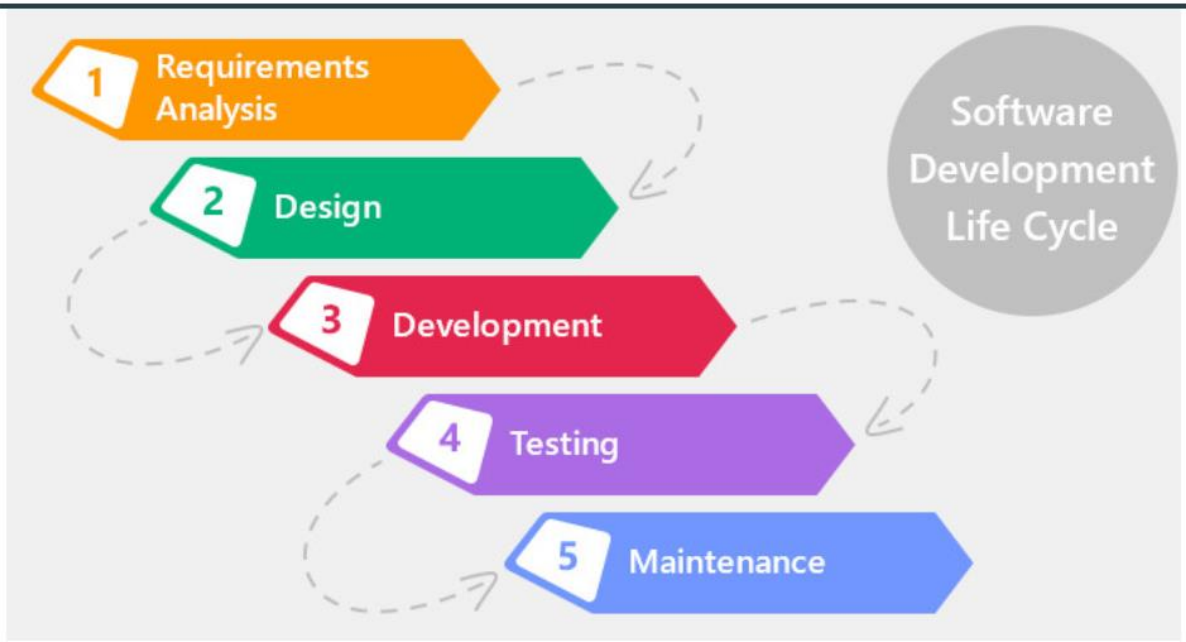
# Software Myths

## Practitioners Myths

Myth: Software engineering will make us create voluminous and unnecessary documentation and will invariably slow us down.

- Reality: Software engineering is not about creating documents. It is about creating a quality product. Better quality leads to reduced rework. And reduced rework results in faster delivery times.

# Software Development Life Cycle (SDLC)




## What are the Software Development Life Cycle (SDLC) phases?

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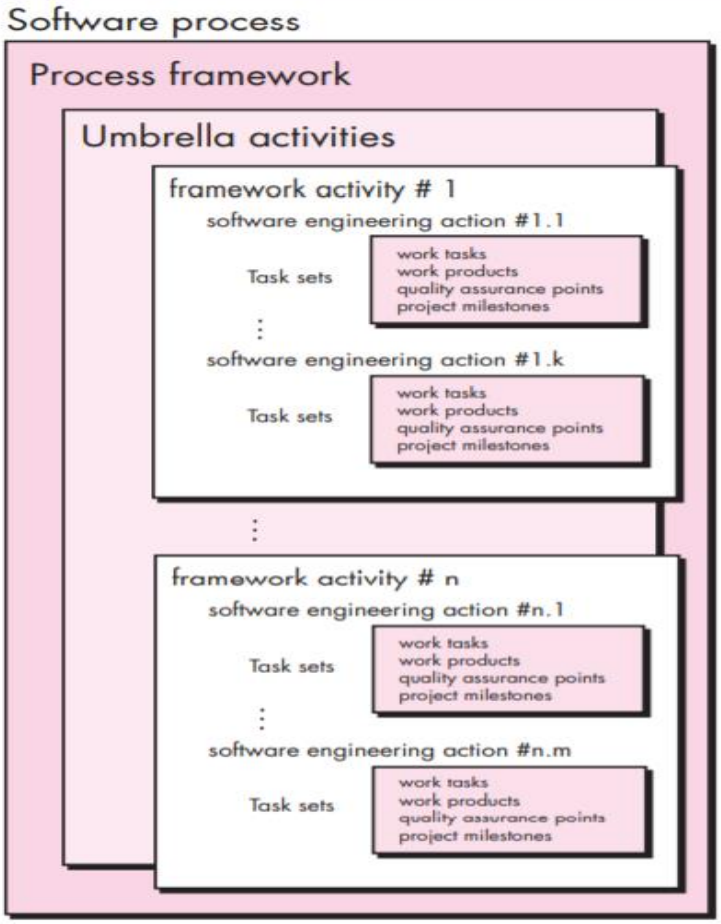
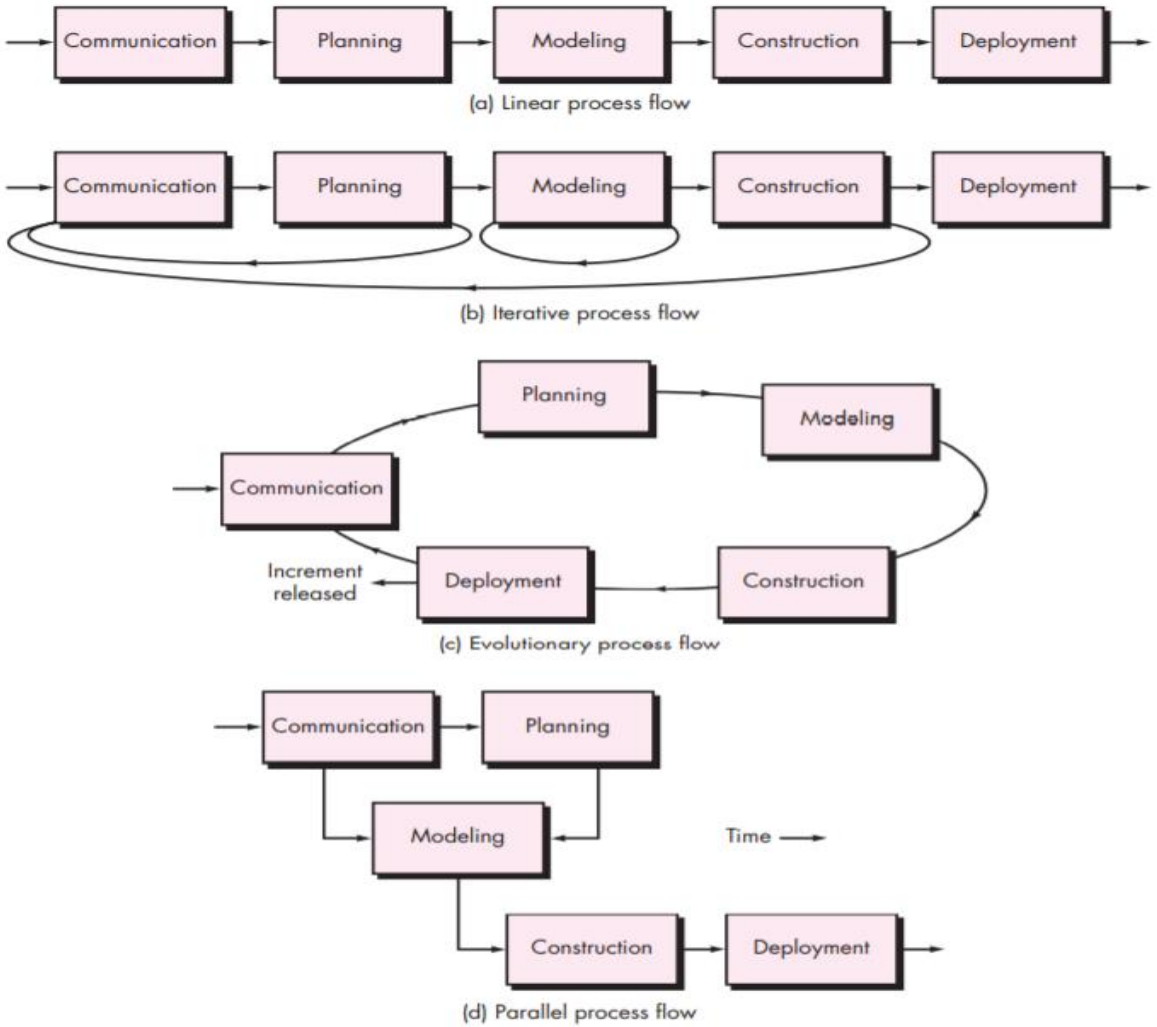
# Process Framework



# Umbrella Activities

1. Software Project Management
2. Formal Technical Review
3. Software Quality Assurance
4. Software Configuration Management
5. Documentation
6. Reusability Management
7. Measurement
8. Risk Management

# Process Flow



# Generic Process Model

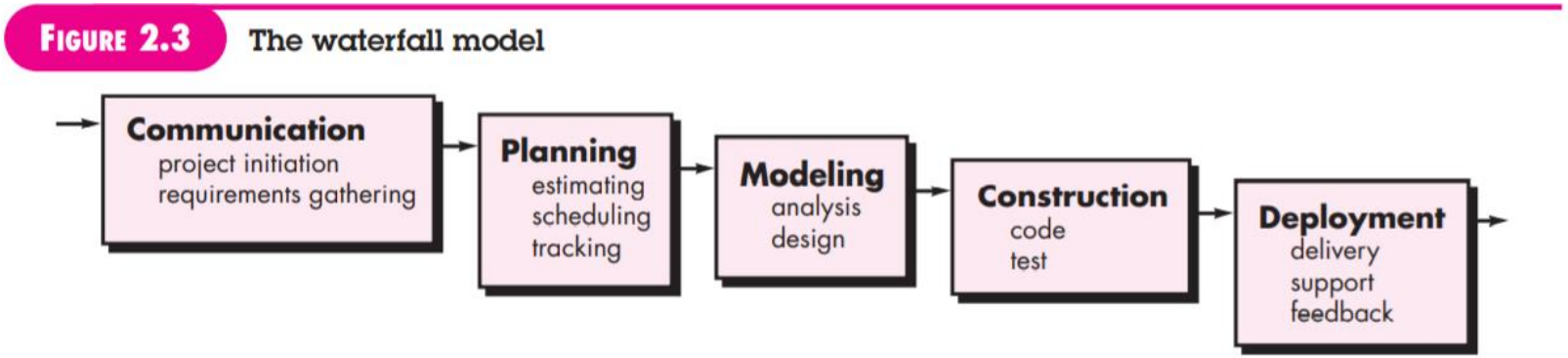
- Communication
- Planning
- Modeling
- Construction
- Deployment

# Process Model of Software Engineering

1. Waterfall model
2. Incremental model
3. Prototype model
4. Spiral  model
5. RAD model
6. Agile (Framework->Scrum)

# Software Process model

Waterfall model



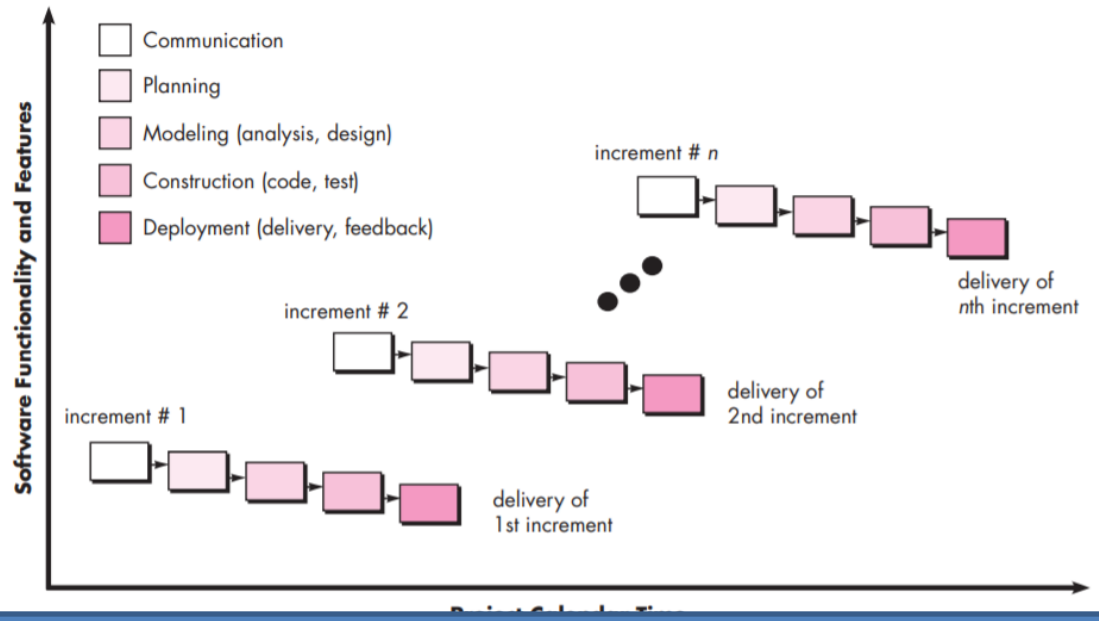

Requirement are well understood

# Software process model

Incremental model

**FIGURE 2.5**

**The incremental model**




When an incremental model is used, the first increment is often a core product

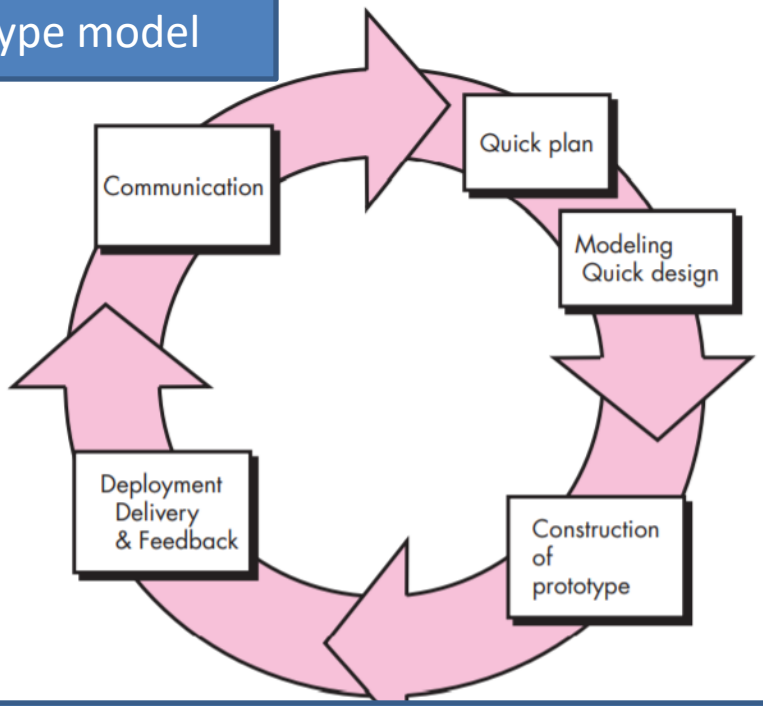
IF there may be a compelling need to provide a limited set of software functionality to users quickly and then refine and expand on that functionality in later software releases.

# Software Process model

**FIGURE 2.6**

The prototyping paradigm

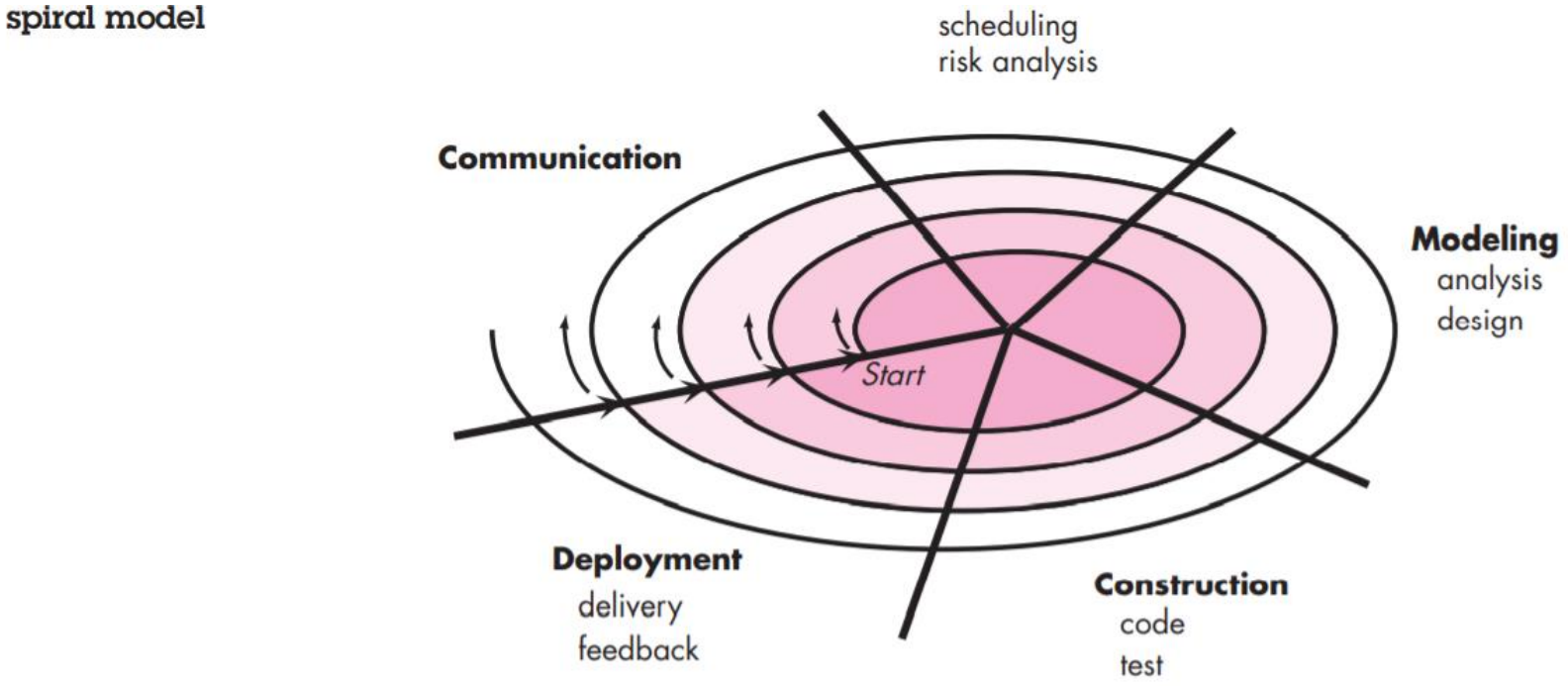
Prototype model




Often, a customer defines a set of general objectives for software, but does not identify detailed requirements for functions and features. In other cases, the developer may be unsure of the efficiency of an algorithm

# Software Process Model

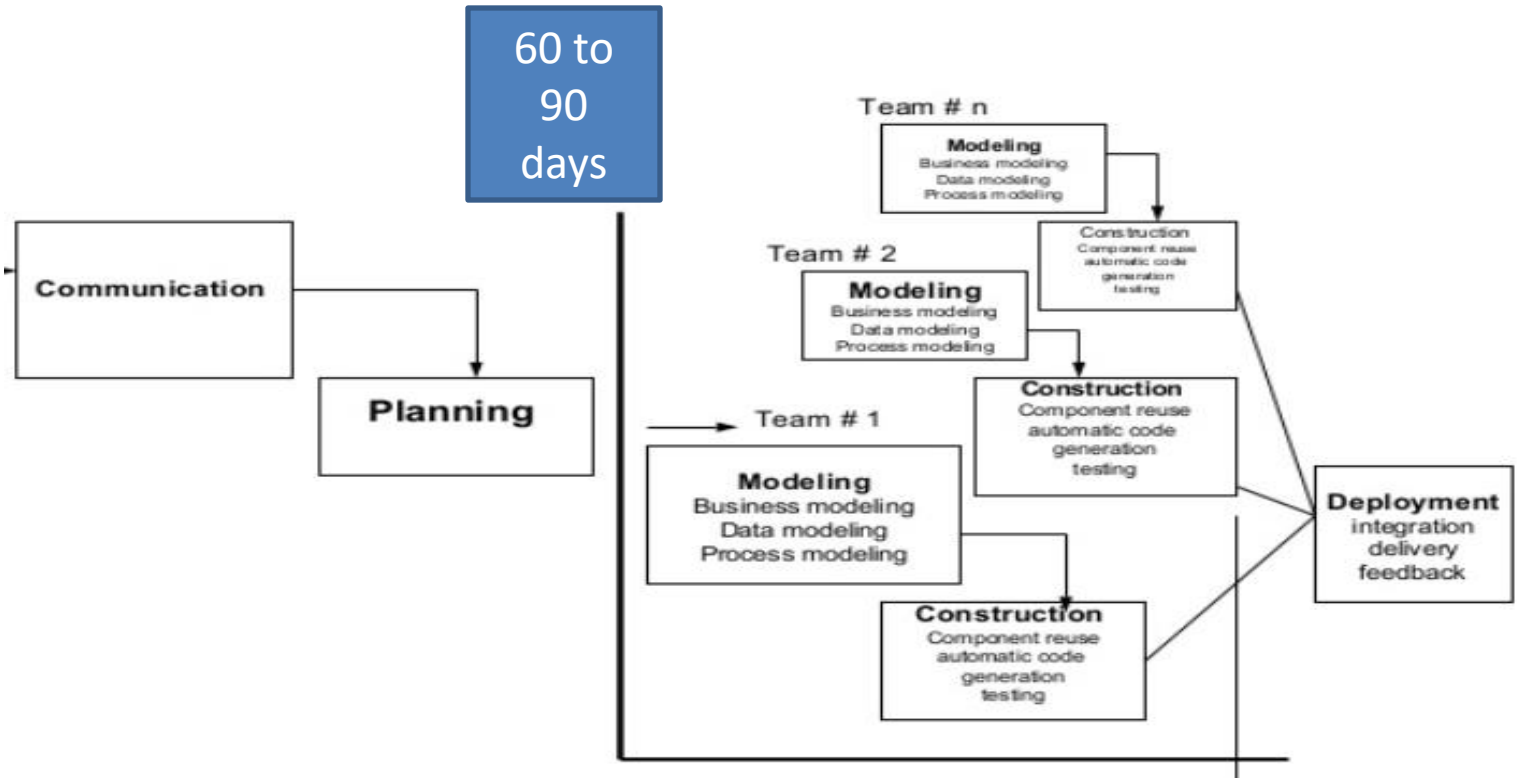
Spiral Model




The spiral development model is a risk-driven process model generator that is used to guide multi-stakeholder concurrent engineering of software intensive systems

# Software process model

Rapid Application Development



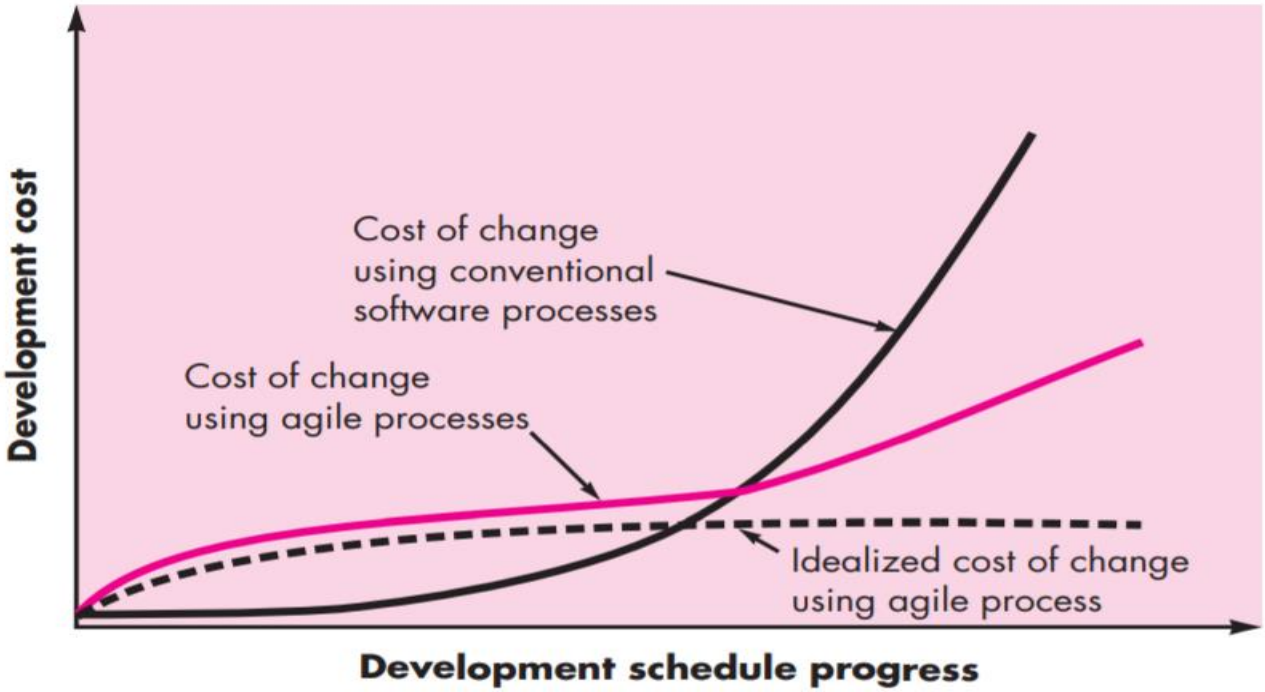
# Software process model

## Agile

- Agility has become today's buzzword when describing a modern software process.
- An agile team quickly respond to changes.
- Change is what software development is very much about.
- Agility has **12 principles** and four guidelines

# Software process model

Agile Process

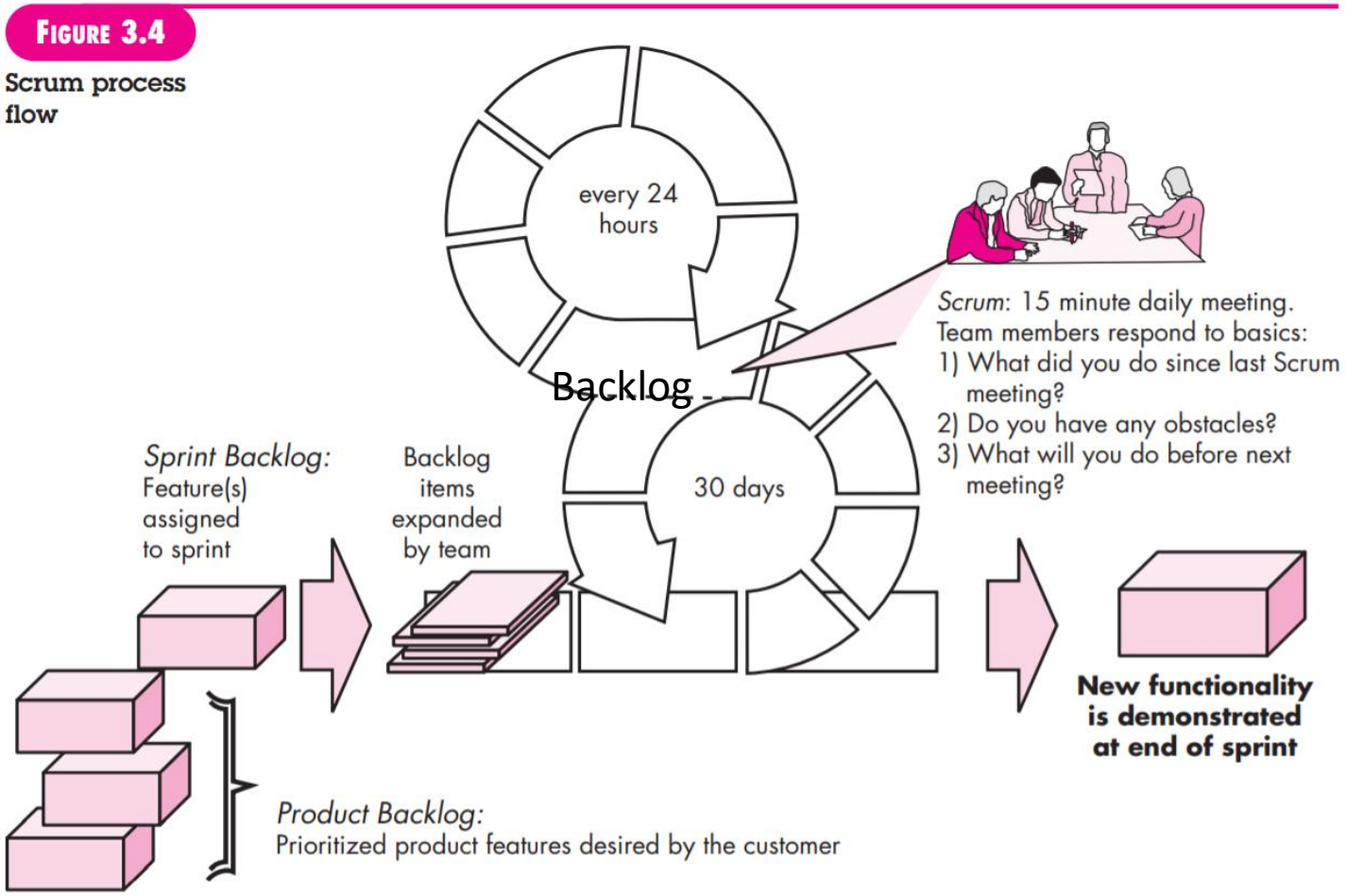


# Software process model

**Scrum**

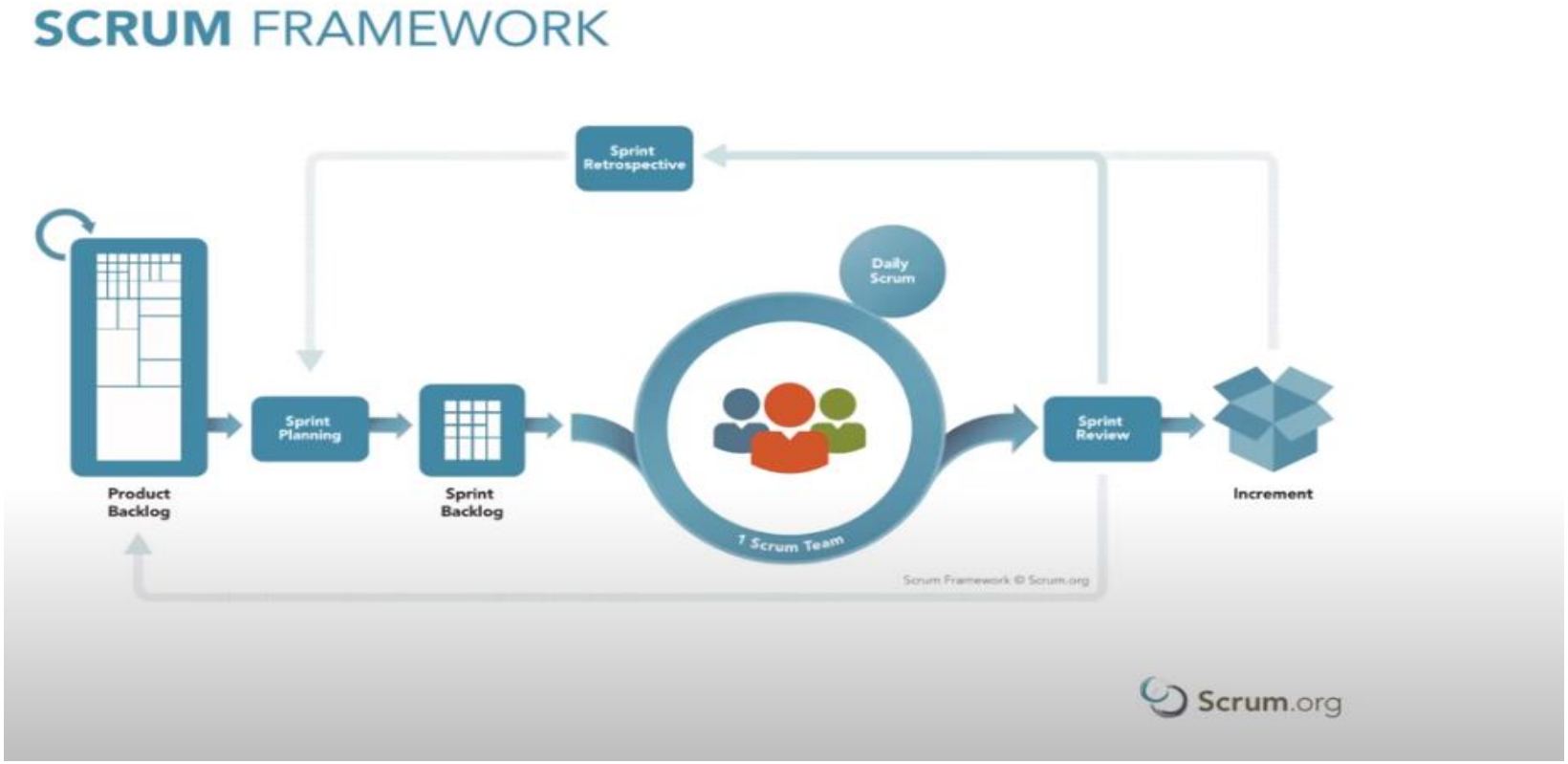
- It is one of the popular framework for the agile software development
- If you go to scrum.org it defines its **Better way Of Building Product.**
- Other popular frameworks are Kanban, Extreme Programming (XP)

# Software process model



# Software process model

Scrum process



# Scrum

## Backlog :

- Items can be added to the backlog at any time (this is how changes are introduced).
- The **product owner** assesses the backlog and updates priorities as required.

## Sprint:

- consist of work units that are required to achieve a requirement defined in the backlog that must be fit into a predefined time-box(typically 30 days).

# Scrum

**Scrum Meeting**

Scrum meetings are short (typically 15 minutes) meetings held daily by the Scrum team.

Three key questions are asked and answered by all team members

- What did you do since the last team meeting?
- What obstacles are you encountering?
- What do you plan to accomplish by the next team meeting?

# SCRUM

- A team leader, **Scrum master**, leads the meeting and assesses the responses from each person.
- The Scrum meeting helps the team to uncover potential problems as early as possible.

**Demos:**

- Deliver the software increment to the customer so that functionality that has been implemented can be demonstrated and evaluated by the customer.
- Demo may not contain all planned functionality, but rather those functions that can be delivered within the time-box that was established

# Process model

Unified process

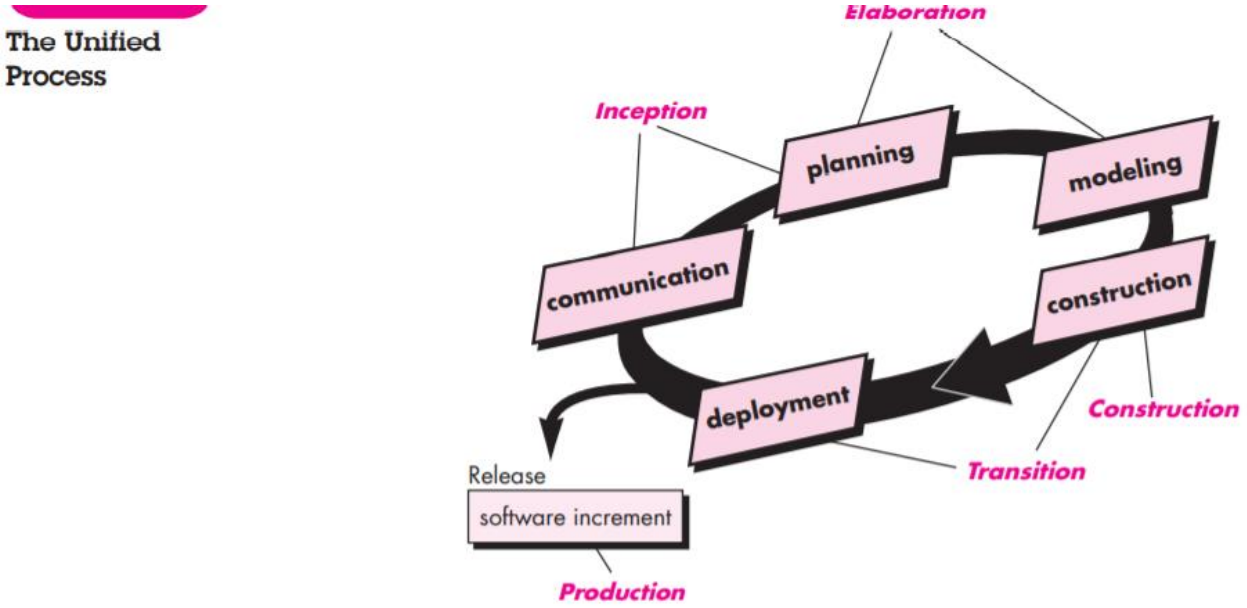
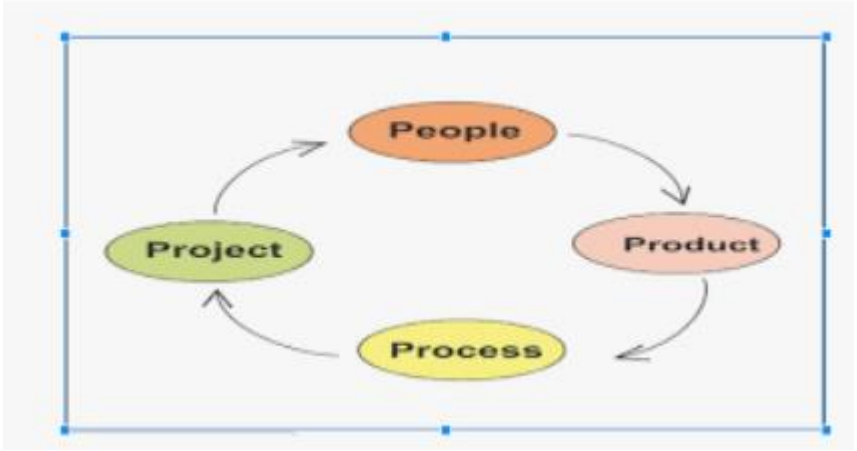



Fig : The  Unified process

# Four Ps in software Engineering



# People

- People are the key factor in the software development
- The following categories of people are involved in the software process.
    - Senior Managers
    - Project Managers
    - Practitioners--Developers
    - Customers
    - End Users

# Product

- Before a project can be planned, product objectives and scope should be established.
- Without product information it is impossible to define reasonable estimates of the cost.

# Process

- A  method provides the framework from that a comprehensive arrange for development is established

# Project

- We conduct planned and controlled software projects to manage complexity of project.
- To avoid project failure a software project manager and software engineers who built the project must :
- Develop a common sense approach for planning, monitoring, and controlling the project