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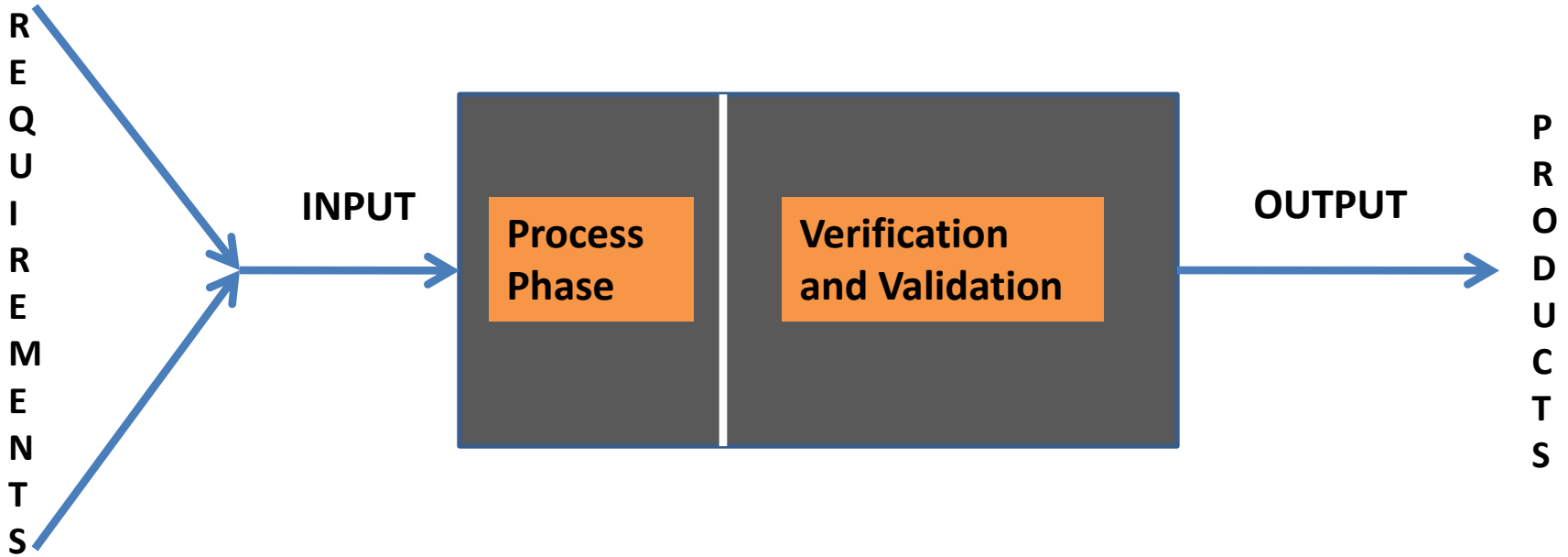
Introduction to Software Process Models

Reference Book : Managing IT Projects by Kathy S., Ceneage learning.

IEEE defines…

" A process Model as Framework containing the processes, activities and tasks involved in the development, operation, and maintenance of a software product, spanning the life of the system from definition of its requirements to the termination of its use."



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A software Process

- A software process is a framework for the activities, actions, and tasks that are required to build high-quality software
- A software process defines the approach that is taken as software is engineered
- A generic process framework for software engineering defines five framework activities—communication, planning, modeling, construction, and deployment

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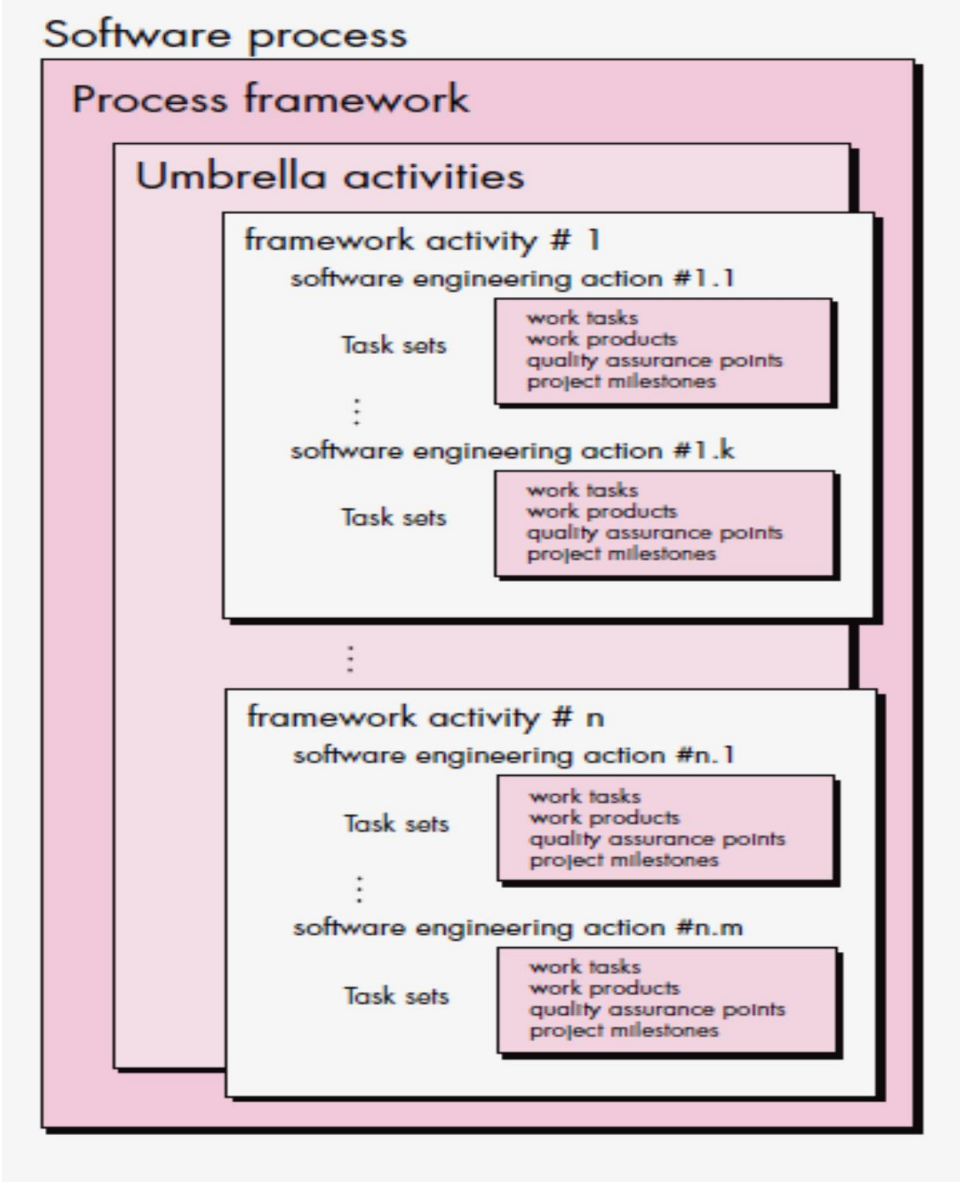
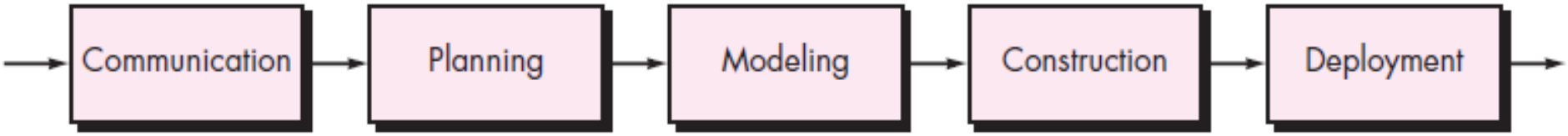
A software Process Framework



Linear Process Flow

Generic

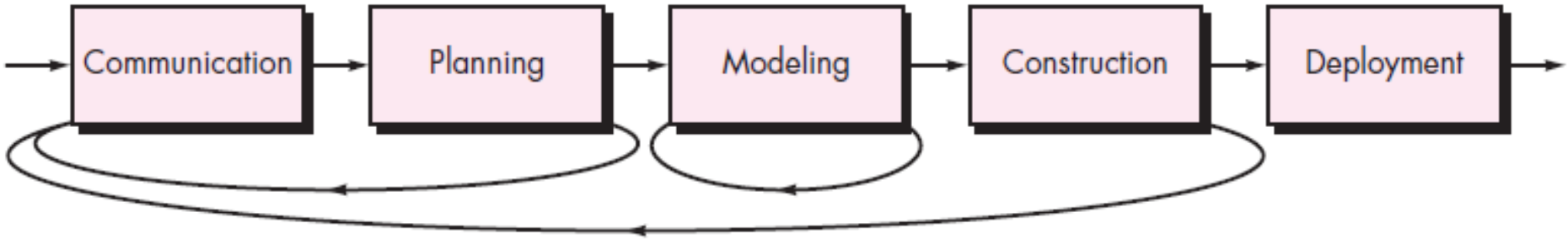
PRESSMAN



A linear process flow executes each of the five framework activities in sequence, beginning with communication and ending with deployment.

Iterative Process Flow

PRESSMEN LINEAR POINTS



An Iterative process flow repeats one or more activities before proceeding to the next activity.

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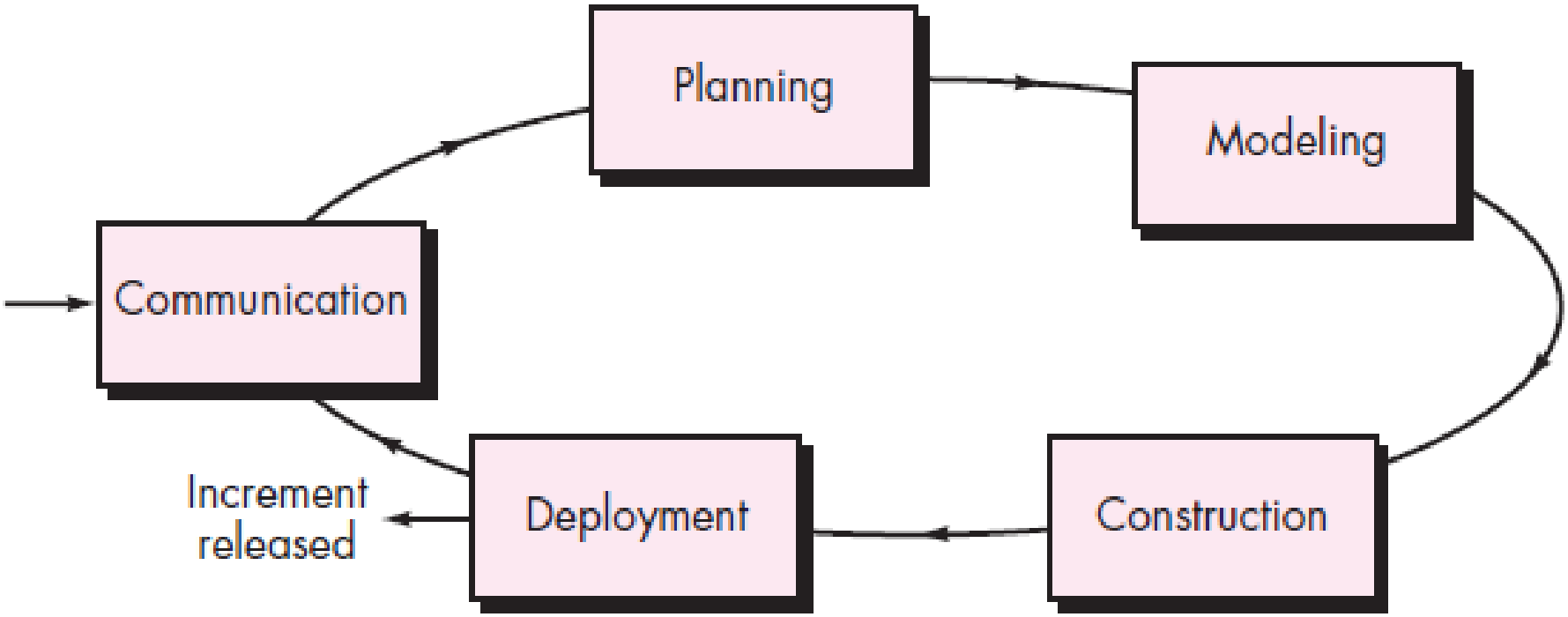
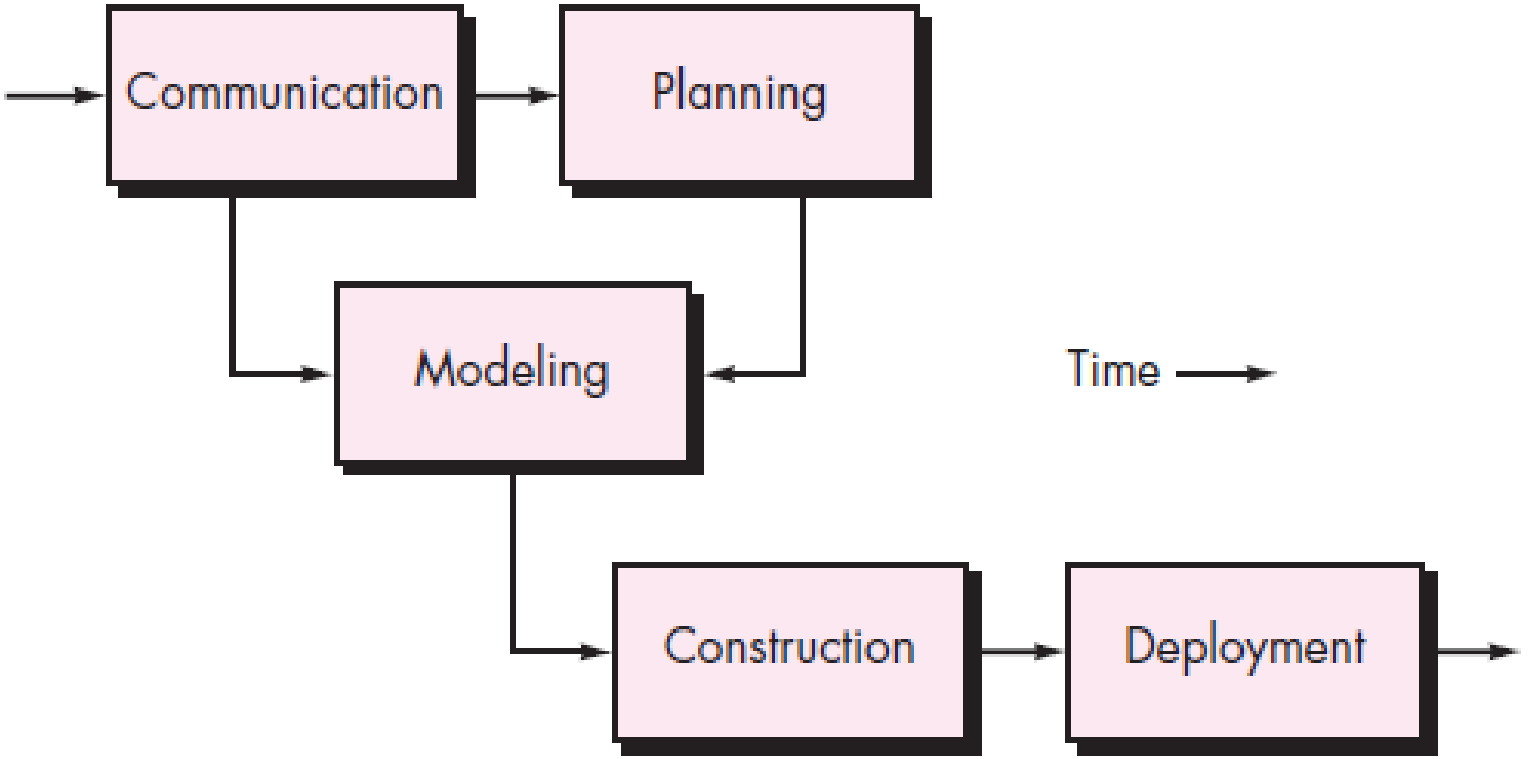
Evolutionary Process Flow

An evolutionary process flow executes the activities in a circular manner. Each time circuit through the five activities leads to a more complete version of the software.



Parallel Process Flow

A parallel process flow executes one or more activities in parallel with other activities (e.g. Modeling for one aspect of the software might executed in parallel with construction of another aspect of the software)



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Umbrella Activities

- Software project tracking and control
- Risk management
- Software quality assurance
- Technical reviews
- Measurement
- Software configuration management
- Reusability management
- Work product preparation and production

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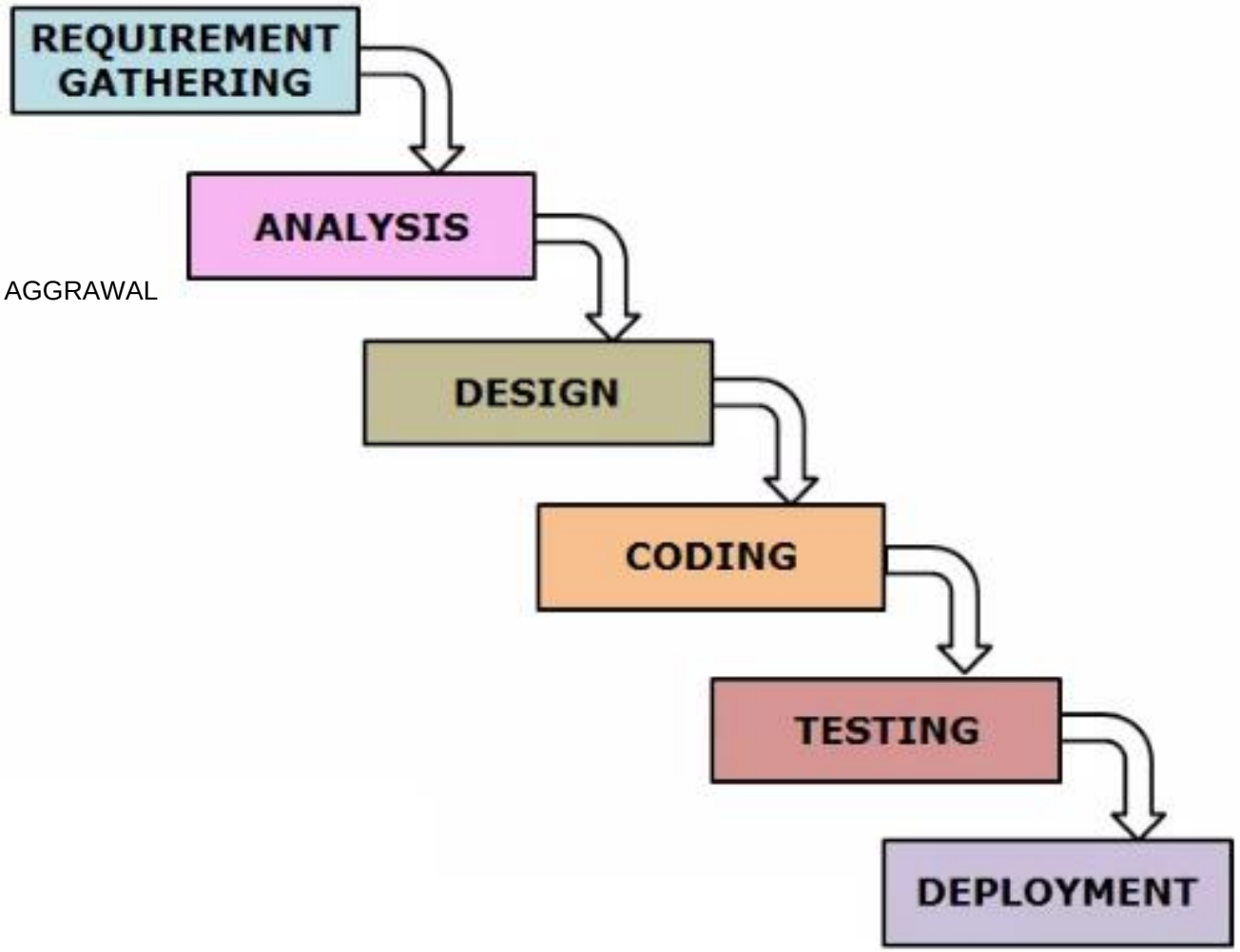
Water Fall Model



AGGRAWAL

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Water Fall Model

- Simplest Process Model
- Linear ordering of activities
- Sequential development strategy
- Development in Structured phases
- Output of one phase is Input to other
- Output is a work product
- Fully known and fixed requirements
- Customer patience

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Water Fall Model (2)

- Planning in early stage
- No return to previous phase
- No overlapping phases
- Not appropriate to handle large projects
- Requires detailed documentation
- Change flexibility level is difficult
- User Involvement is only at beginning
- High Risk involvement

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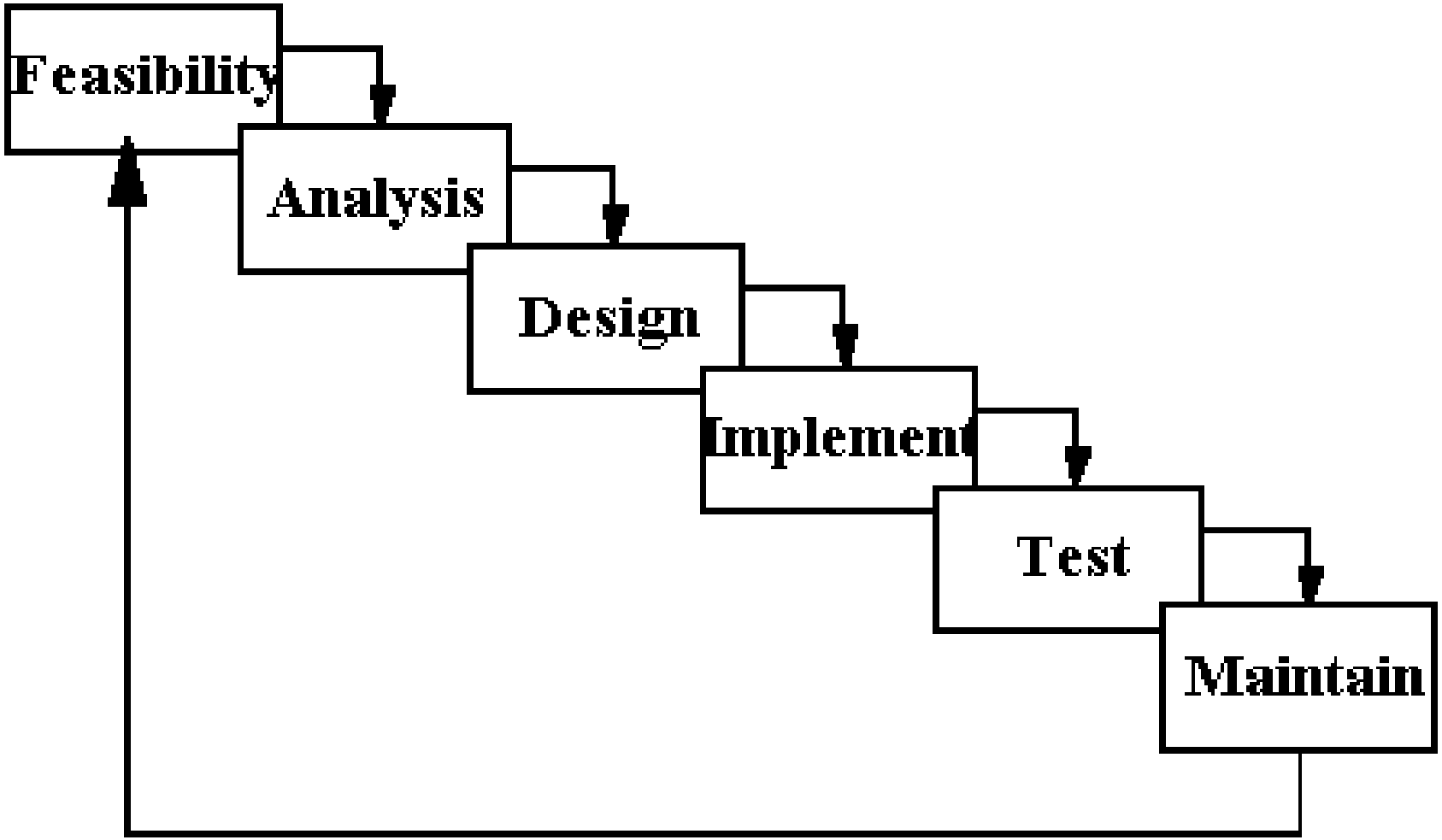
Water Fall Model



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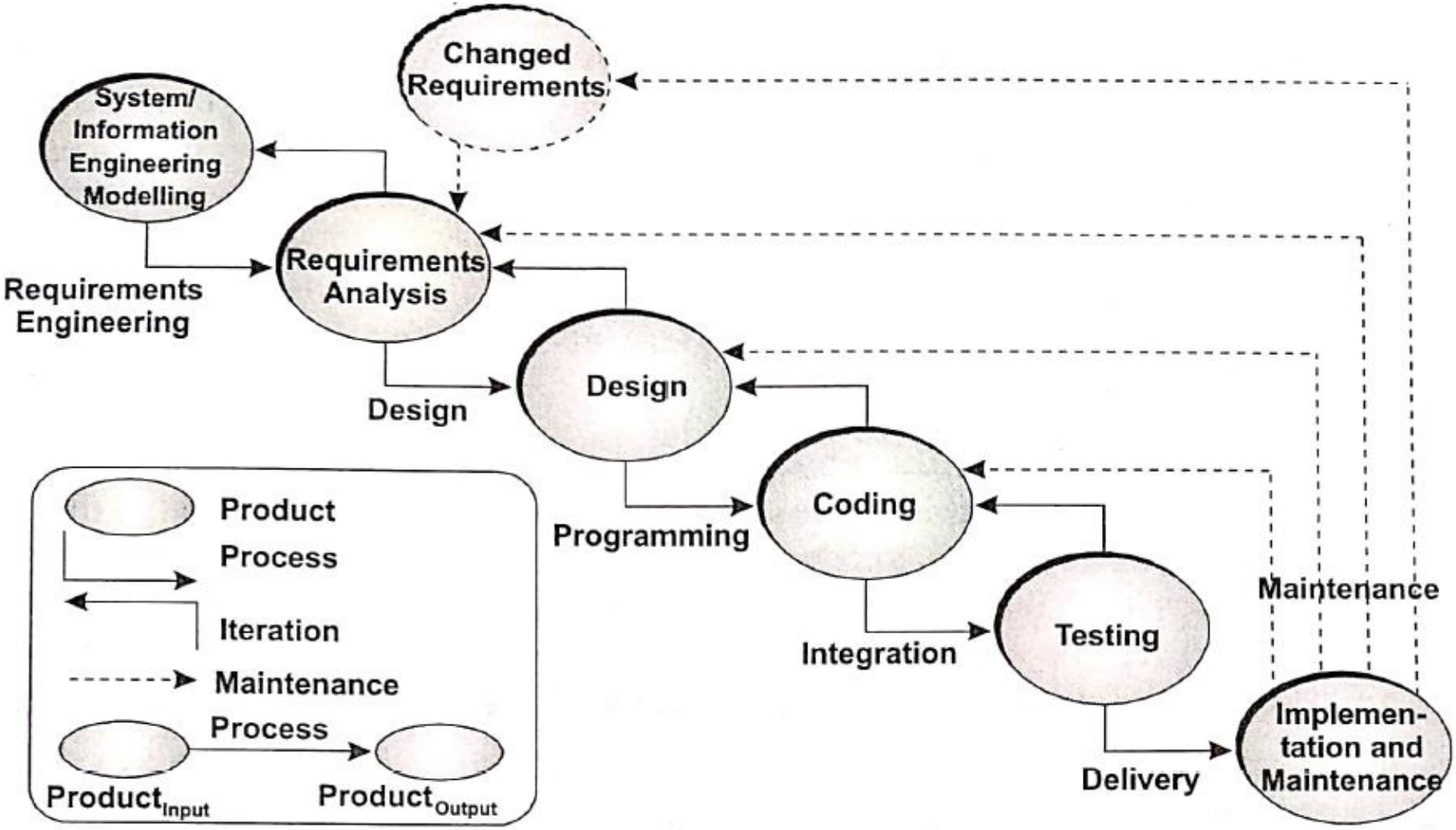
Water Fall Model



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ITERATIVE ENHANCEMENT MODEL

Incremental Model

PRESSMAN

- To produce software in increments
- A combination of linear + Iterative flow
- Deliverables are increments
- Delivery of operational product
- Useful when staffing is unavailable
- Provides a platform for Evaluation by Customer
- Freezing of requirements for an increment

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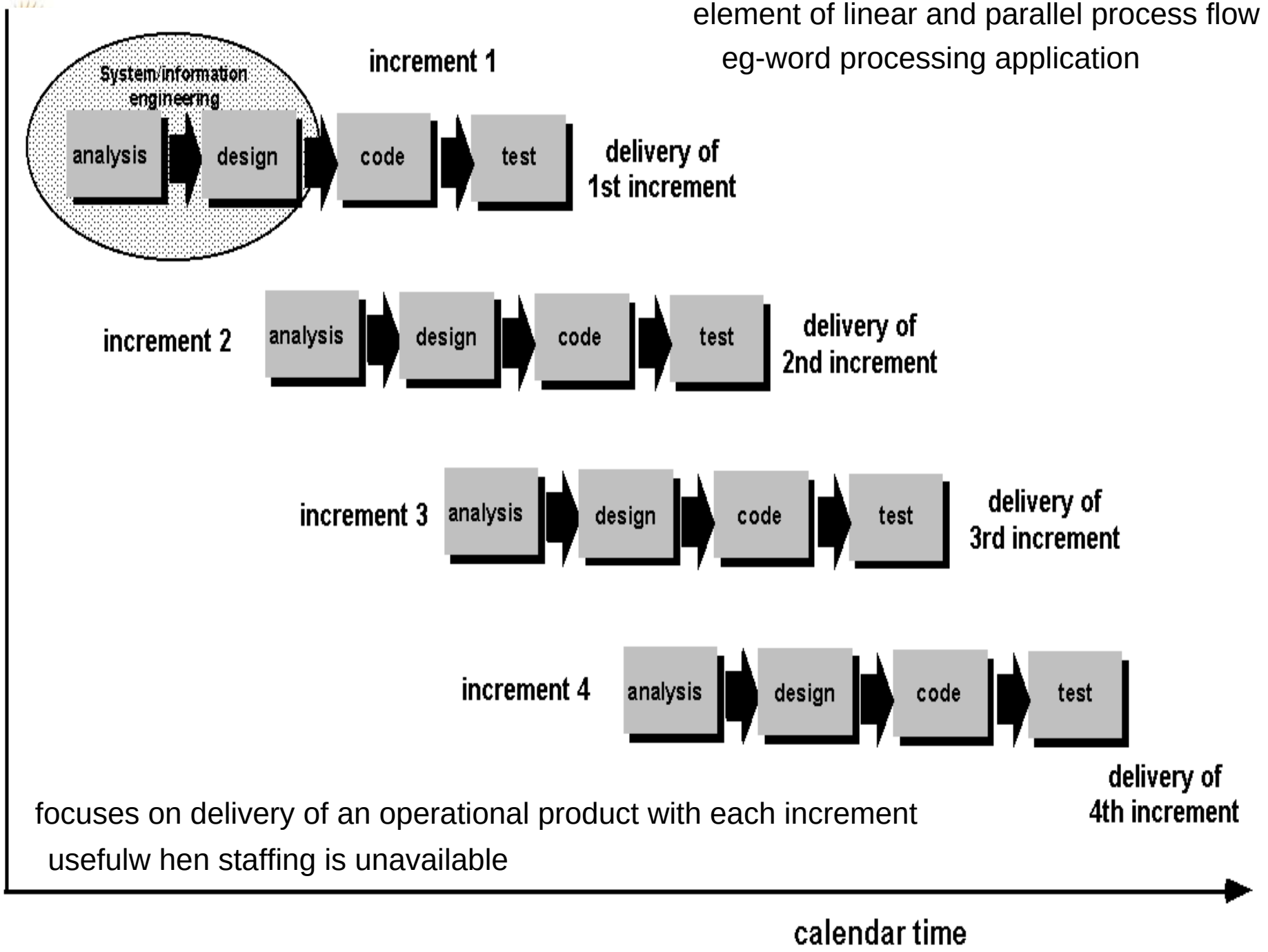
Incremental Model (2)

- Team size is small
- Returning to earlier phase is possible
- User Involvement is intermediate
- Very Long duration oriented
- Risk involvement is low
- Testing done after every iteration
- Overlapping phases due to parallel development
- Model becomes invalid at time constraints

element of linear and parallel process flow
eg-word processing application



focuses on delivery of an operational product with each increment

usefulw hen staffing is unavailable

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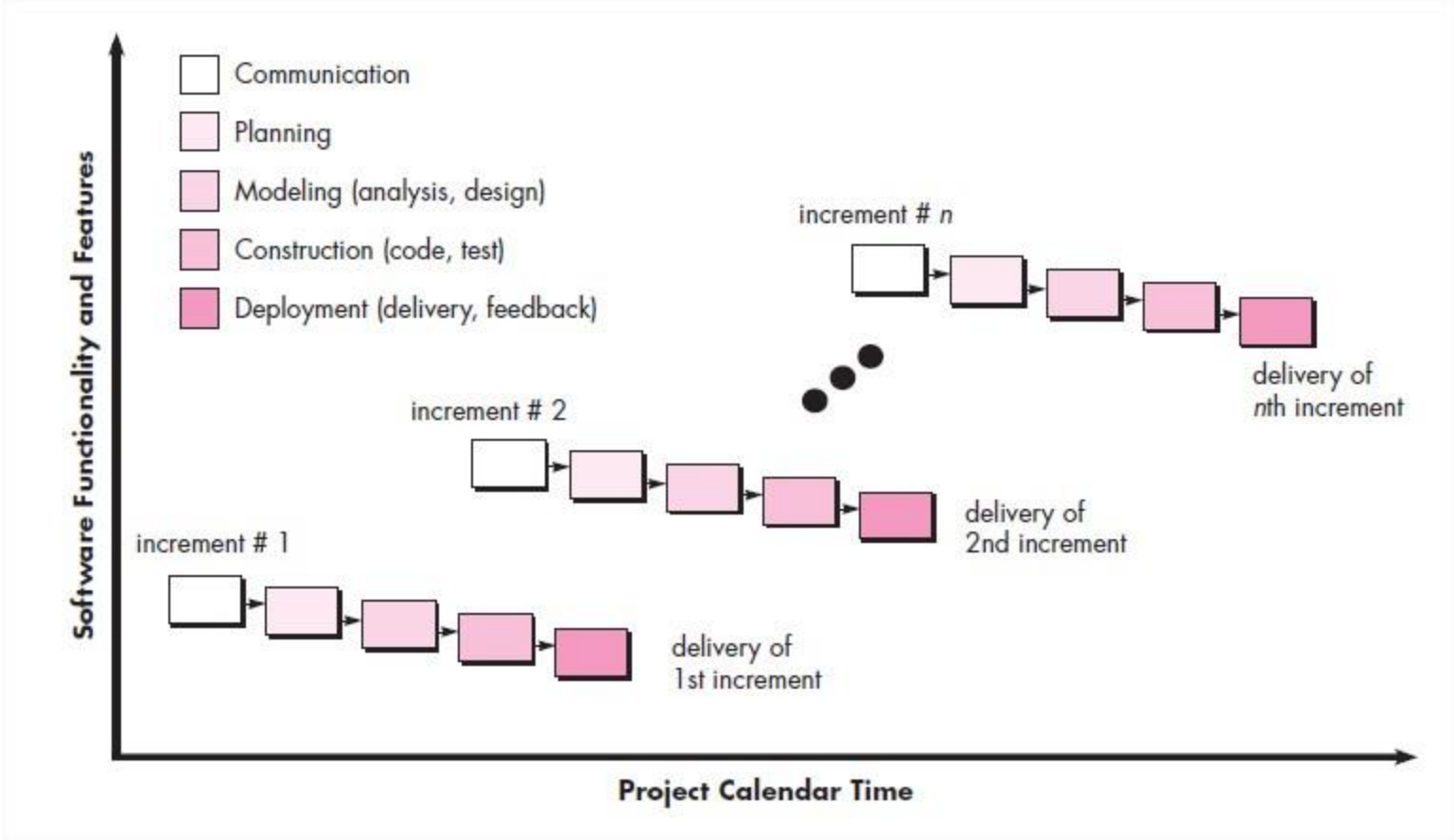
Incremental Model*



* Software Engineering : A Practitioners Approach, Roger Pressman, 7e, McGraw Hill Education

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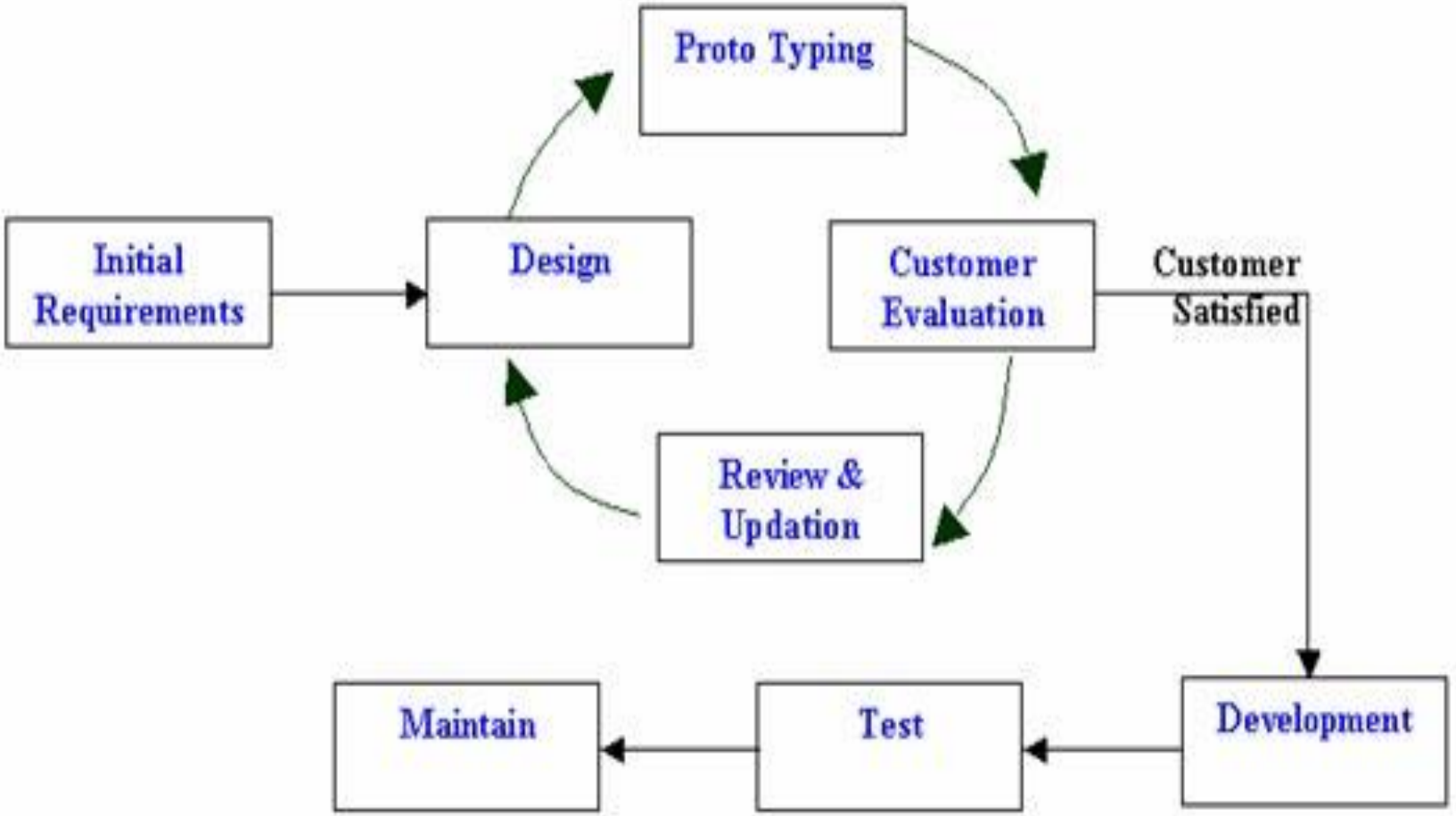
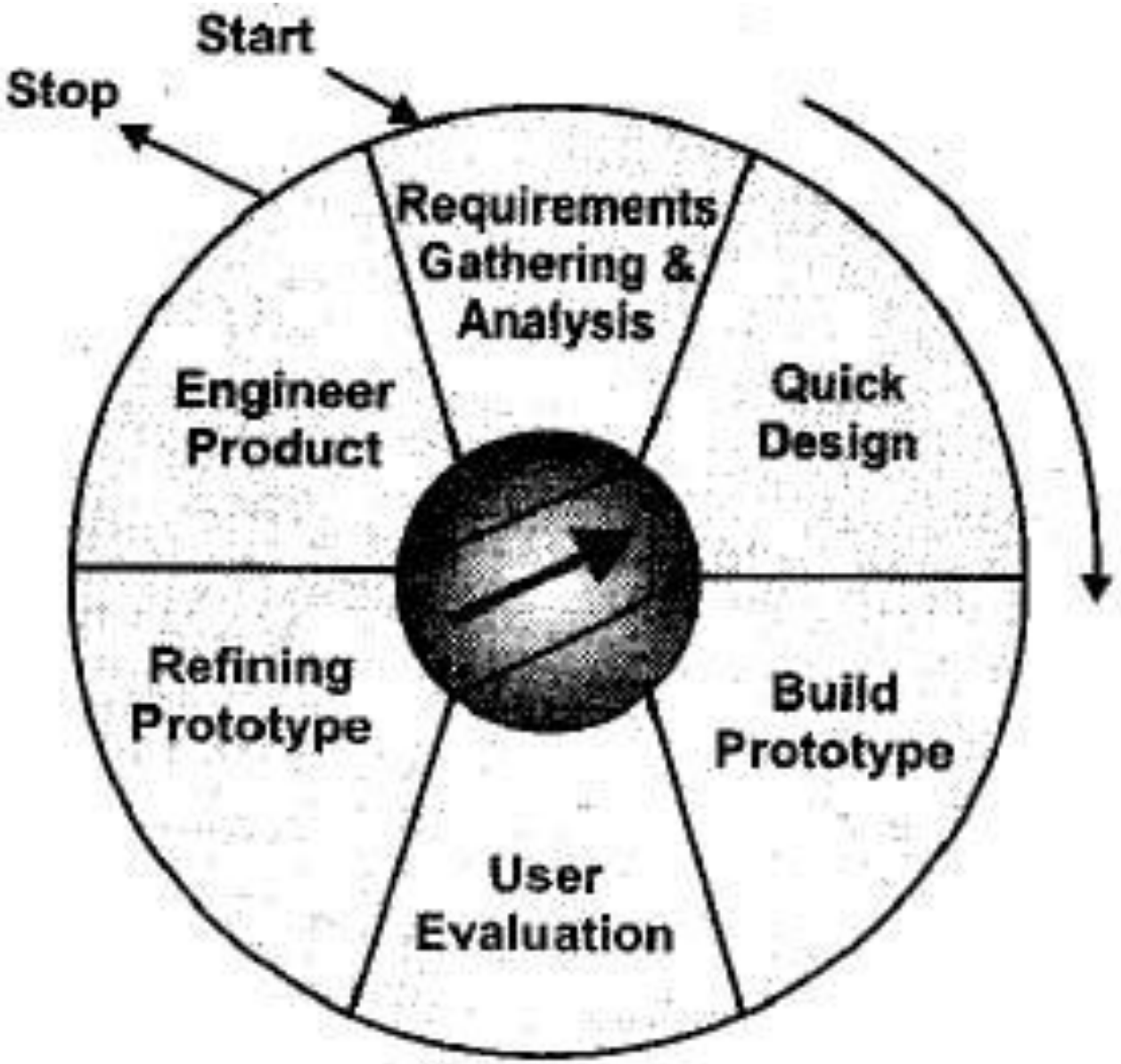
Prototyping Model



Proto Type Model


Start
Stop
Requirements Gathering & Analysis
Quick Design
Build Prototype
User Evaluation
Refining Prototype
Engineer Product

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Prototype Model

- Contradiction to Freezing of Requirement
- A throwaway prototype is built
- Actual feel of a system
- Does not contain all the features
- An iterative process
- Good for Complicated and large projects
- Quick approach rather than quality
- Testing phase is reduced
- Risk reduction

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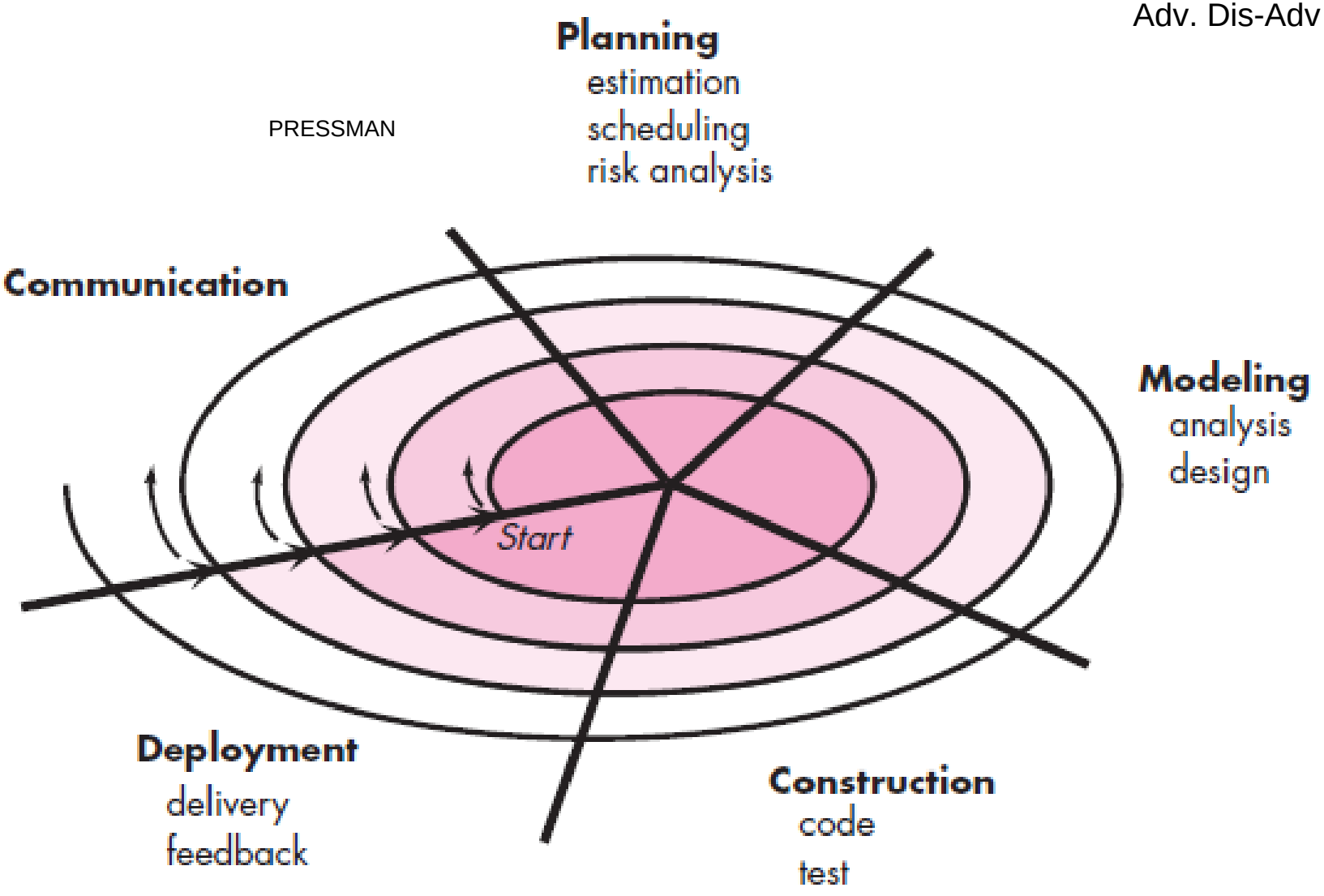
Prototype Model(2)

- Enables early user assessment
- Serves to clarify requirements
- Better implementation of requirements
- Great user involvement
- Helps in Risk Reduction
- Time consuming model

Spiral Model

Adv. Dis-Adv

PRESSMAN



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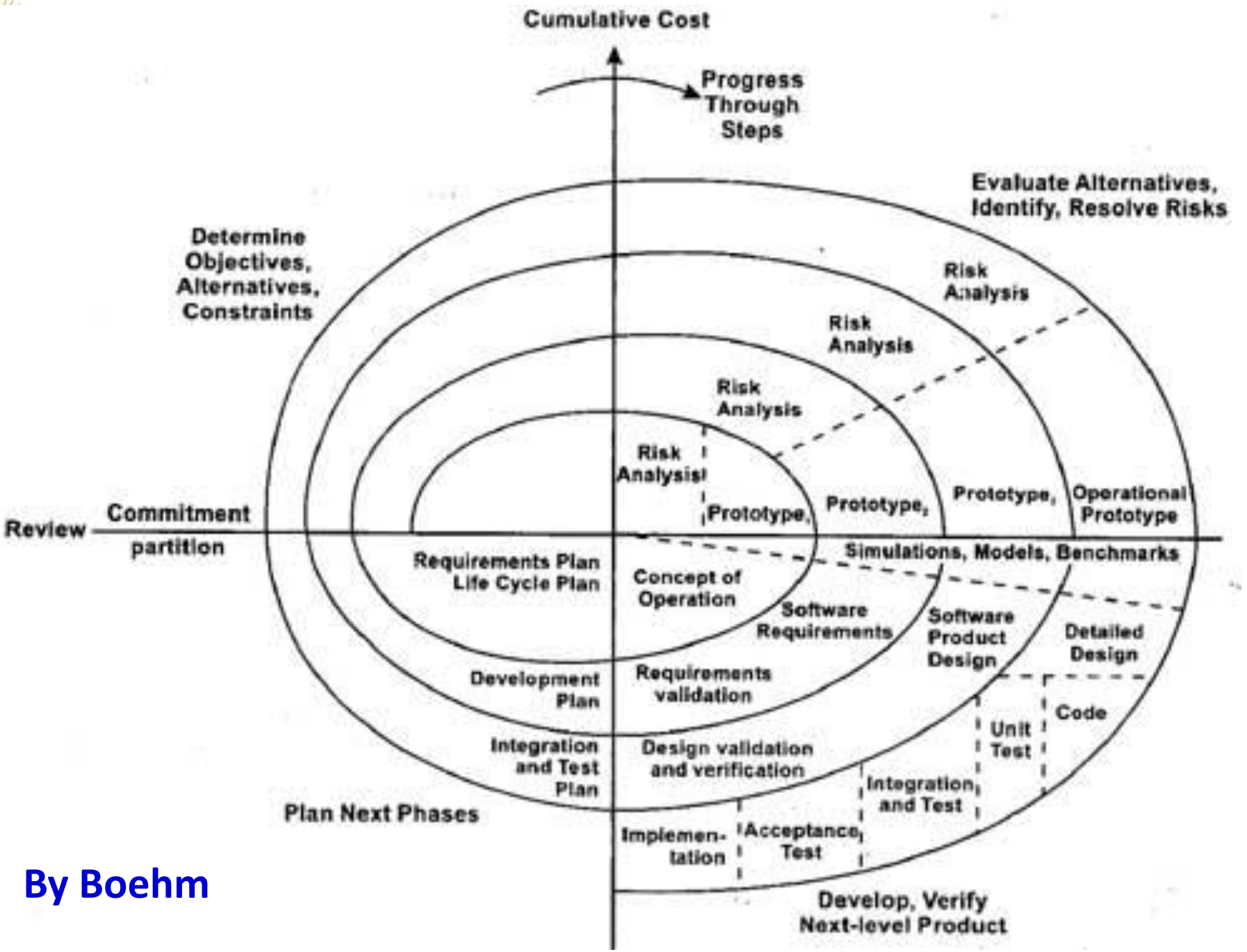
Spiral Model

- Activities are organized in spiral
- Quadrant identifies the different activities
- Risk Driven nature
- Each cycle is completed by a review
- Suitable for both development and Enhancement based projects
- Encompass Management activities
- Suitable for high risk projects
- Radius of spiral represents cost incurred so far in progress


Cumulative Cost
Progress Through Steps
Evaluate Alternatives, Identify, Resolve Risks
Determine Objectives, Alternatives, Constraints
Risk Analysis
Risk Analysis
Risk Analysis
Risk Analysis
Prototype,
Prototype,
Prototype,
Operational Prototype
Review
Commitment partition
Requirements Plan Life Cycle Plan
Concept of Operation
Simulations, Models, Benchmarks
Software Requirements
Software Product Design
Detailed Design
Development Plan
Requirements validation
Code
Unit Test
Integration and Test Plan
Design validation and verification
Integration and Test
Plan Next Phases
Implementation
Acceptance Test
Develop, Verify Next-level Product

By Boehm

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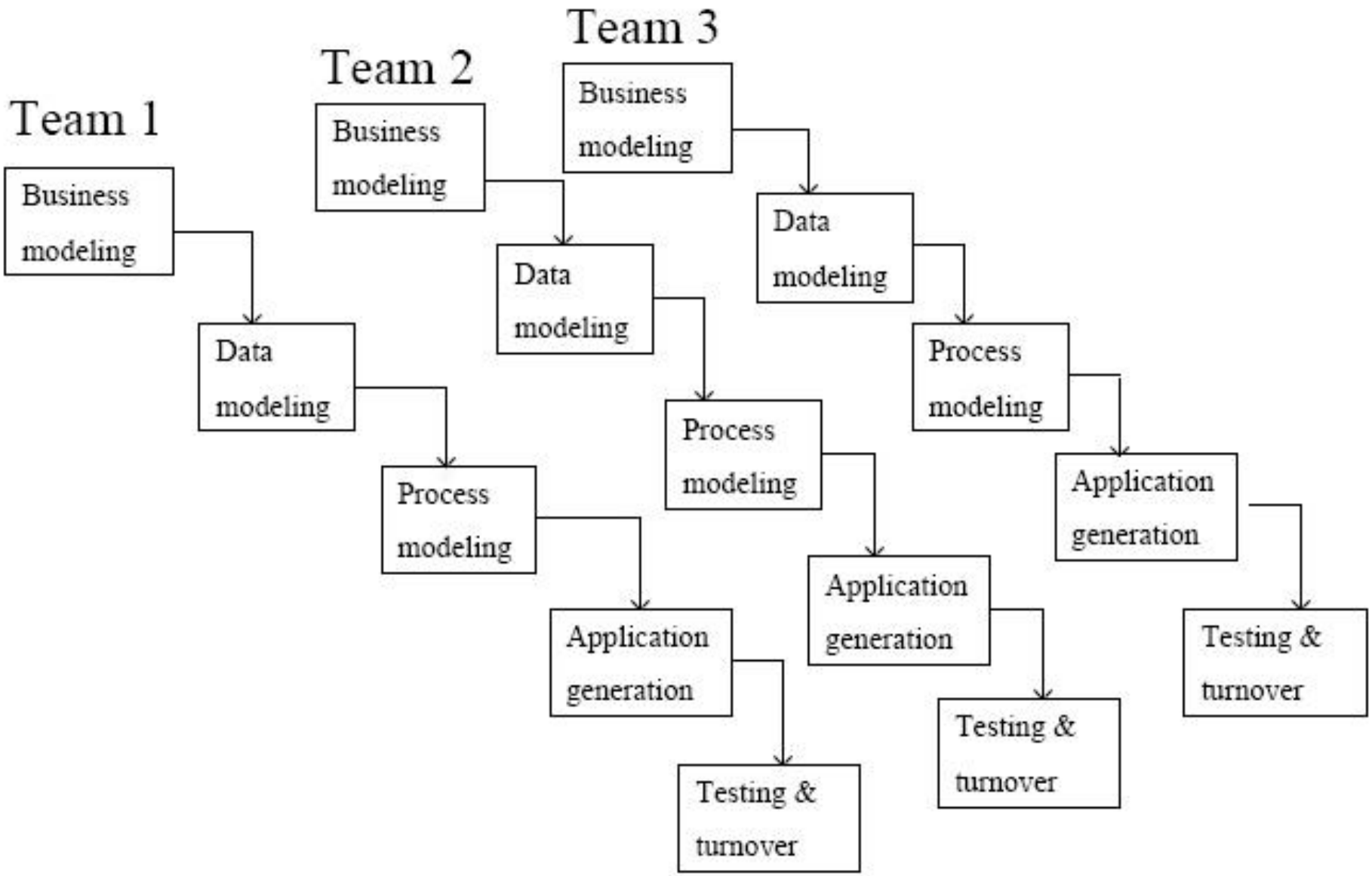
RAD Model

JAWADEKAR



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RAD Model

- An incremental software development process
- Short development cycle
- High-speed adaptation of the linear sequential model
- Use of Automated Tools
- Emphasizes Reuse

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RAD Model (2)

- Lesser defects due to prototyping nature
- No early stage planning
- Return to early state is possible
- No detailed documentation
- Development is time boxed
- Working prototype is delivered
- Encourages customer feedback

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Concurrent Development Model

represents iterative and concurrent element of any of the process model.

Diagram provides a schematic representation of one of the S/w engineering activity within the modeling activity using a concurrent modeling approach.

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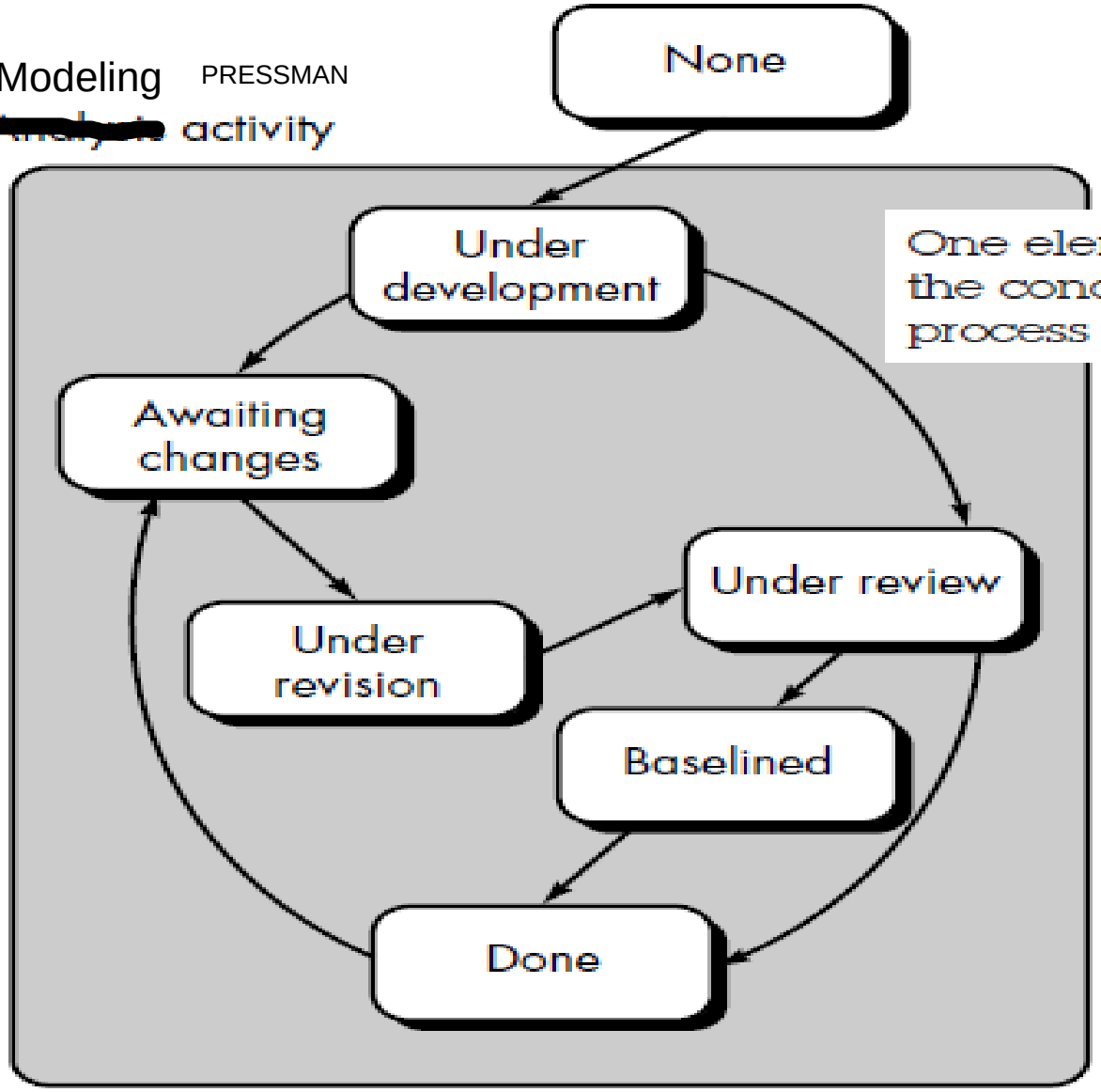
Modeling PRESSMAN

[redacted] activity



defines events that triggers transition from state to state

Represents a state of a software engineered activity

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Unified Process Model

Unified Process Model

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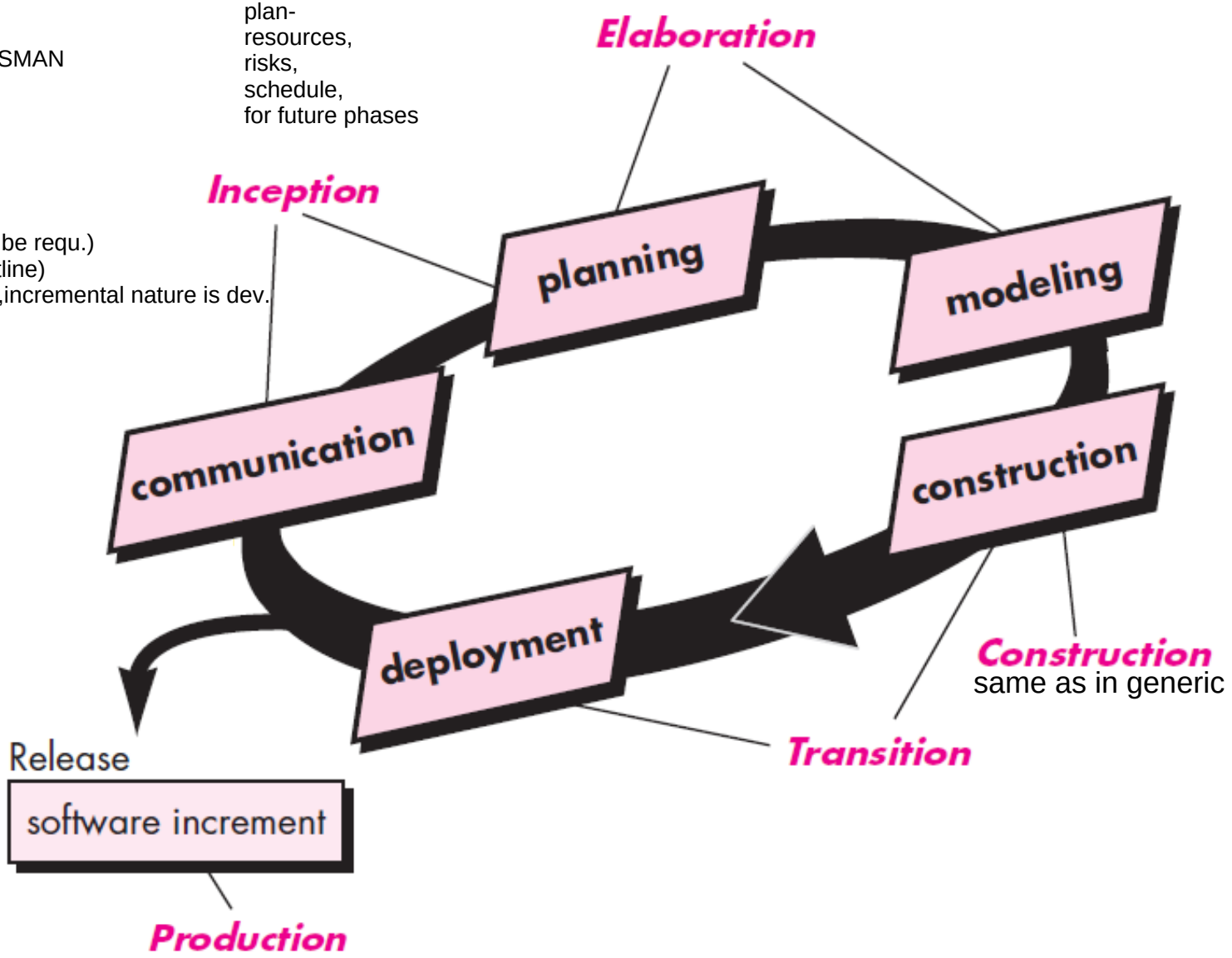
plan-
resources,
risks,
schedule,
for future phases

use case,(describe requ.)
rough archi.,(outline)
plan for iterative,incremental nature is dev.



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Unified Process Model

- Unified Process, a framework for Object Oriented Software engineering using UML
- A set of Preliminary Use Cases are the initiative
- Use Cases are Expanded and refined
- A software Increment is created and Use cases are reviewed
- A Workflow based model

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Inception Phase

- Business Case Creation
- Defining Project Scope
- Preliminary Use cases
- Outlining the major sub systems
- Risks Identification
- Preliminary Schedule preparation
- Cost Estimation

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Elaboration Phase

- **Preliminary Use case refinement** and elaborated
- **Expansion to sub model views**
  - **Use case model**
  - **Requirements model**
  - **Design model**
  - **Implementation model**
  - **Deployment model**
- **Executable Architectural Baseline (deliverable)** first cut
- **Scope, Risks, and delivery dates are reviewed**
- **Plan modifications** plan is reviewed at the end of this phase

Construction Phase

input- architectural model.

by development

- Use cases are made operational
- Required Functionalities as increments

reflect final ver of s/w

feature and Fns,

- Conversion to source code
- Unit and Integration testing
- Acceptance test checked with use cases

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Transition Phase

S/w is given to end user

- **Deployment for Beta Testing**
- **Receiving Feedback**
- **Refinements based on iterations**
- **Create Documentation for release**
- **User Training** for support teams makes user manual,guides,etc
- **Usable Software Release (deliverable)**

S/w becomes usable

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Production Phase

- Coincides with the deployment of Generic process
- Monitoring the ongoing use
- Defect Reports and Request for changes submitted
- Changes evaluated

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Agile Modeling

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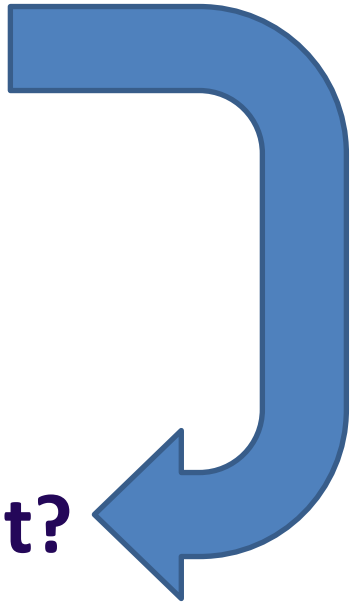
Agile Software Engineering

- What is Agile Software Engineering?
- What is an agile team?
- Why it is required?
- What are the Phases?
- What is a work product?
- Whether the work is right?



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Agile Process

PRESSMAN

- A Process to manage Unpredictability
- A process adaptable to rapidly changing project and technical conditions
- A process which adapts Incrementally
- A Process which includes Customer Feedback through an Operational Prototype
- A process which enables the Customer to Evaluate

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Agile Principles

- Customer Satisfaction **is the Highest Priority**
- Welcome Changing **requirements**
- **Deliver working software** frequently
- **Business people and developers** work together
- **Build projects around** motivated Individuals
- Face-to-Face **Conversation**
- Working software **as primary Progress measure**
- **Promote** Sustainable **Development**
- Continuous attention to technical excellence and good design **enhances agility**
- **Simplicity**
- Best Work products **emerge from Agile Teams**
- **Team's** behavioral Progress

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Extreme Programming(XP) Model

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Extreme Programming(XP)

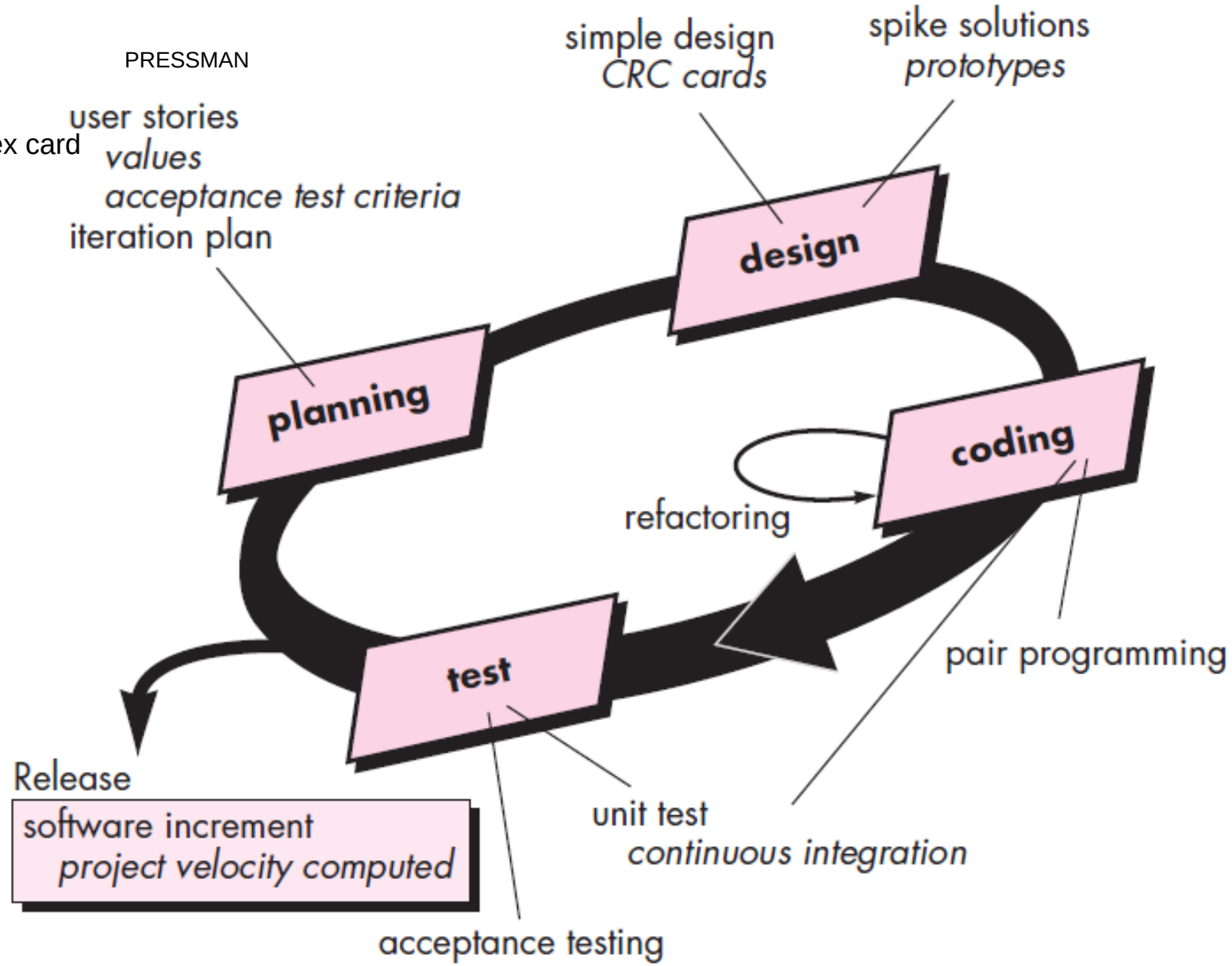
Foundation values

- Communication (verbal, close)
- Simplicity (only immediate needs)
- Feedback (software, Customer, software team)
- Courage
- Respect

Extreme Programming (XP)

PRESSMAN

are written in Index card



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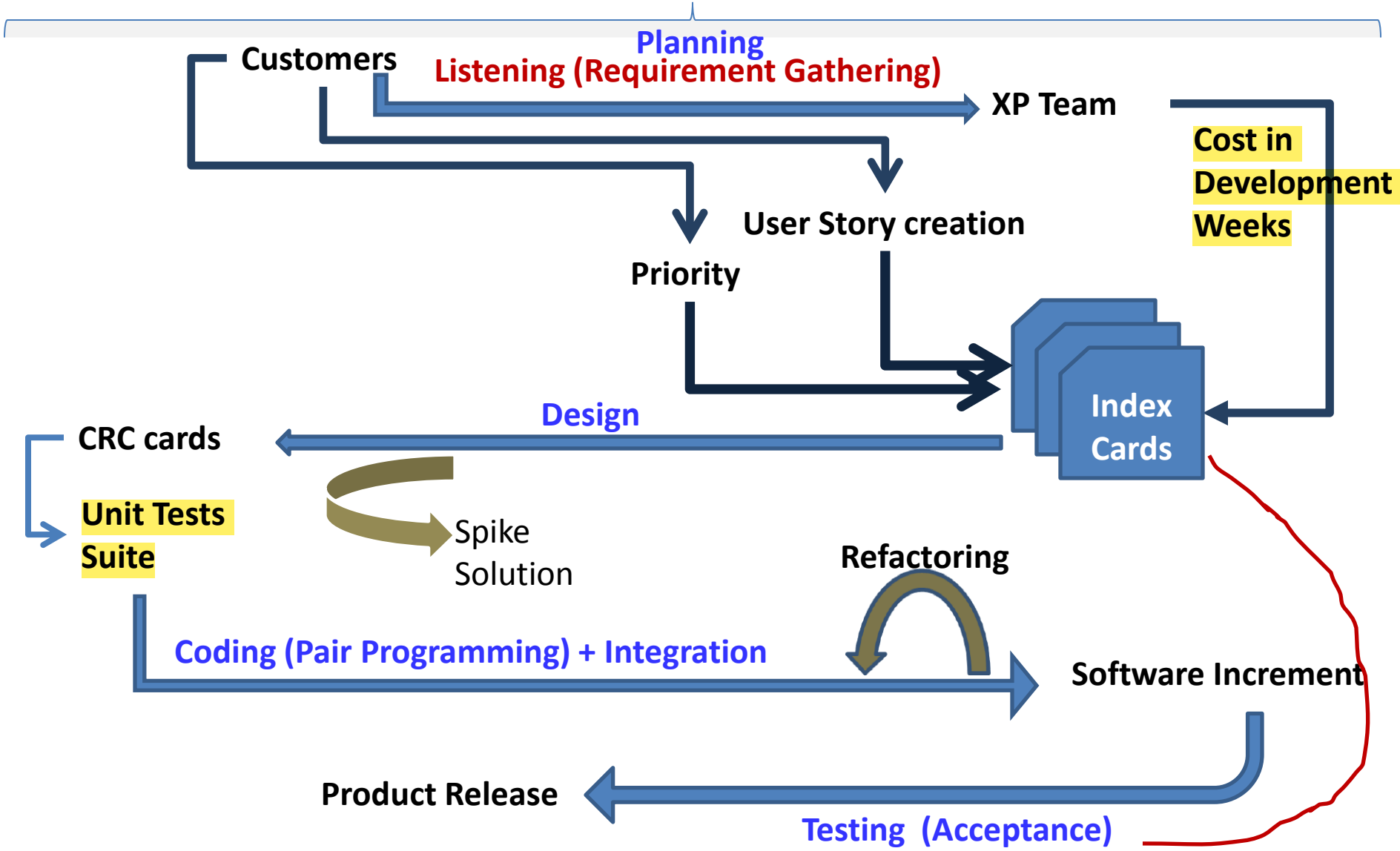
XP Process

Object Oriented Approach



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Example: User Stories

- Students can purchase monthly parking passes online.
- Parking passes can be paid via credit cards.
- Parking passes can be paid via PayPal.
- Professors can input student marks.
- Students can obtain their current seminar schedule.
- Students can order official transcripts.
- Students can only enrol in seminars for which they have prerequisites.
- Transcripts will be available online via a standard browser.

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Example: Story Index Card

173. Students can purchase parking passes.

Priority: [redacted] 8
Estimate: 4

173

As a student I want to purchase a parking pass so that I can drive to school

Priority: [redacted] Should
Estimate: 4

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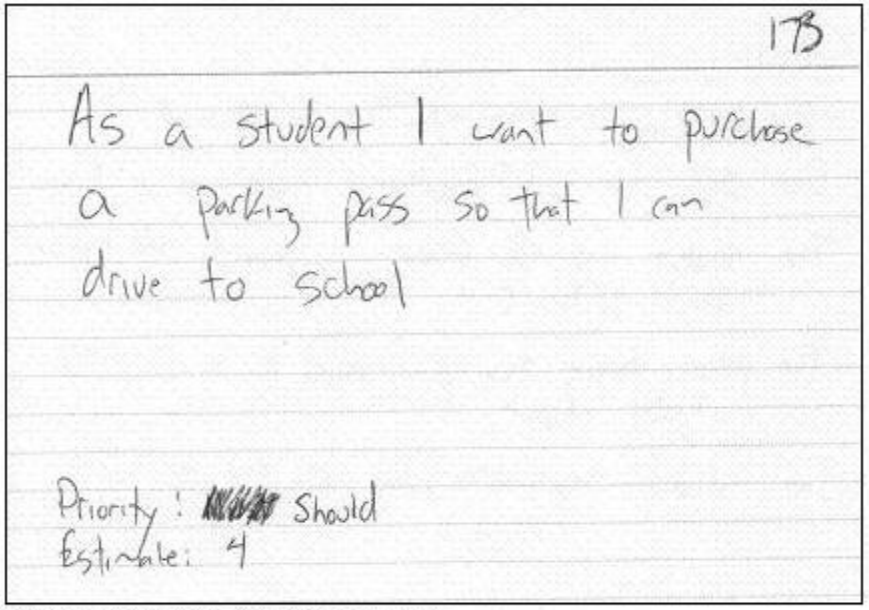
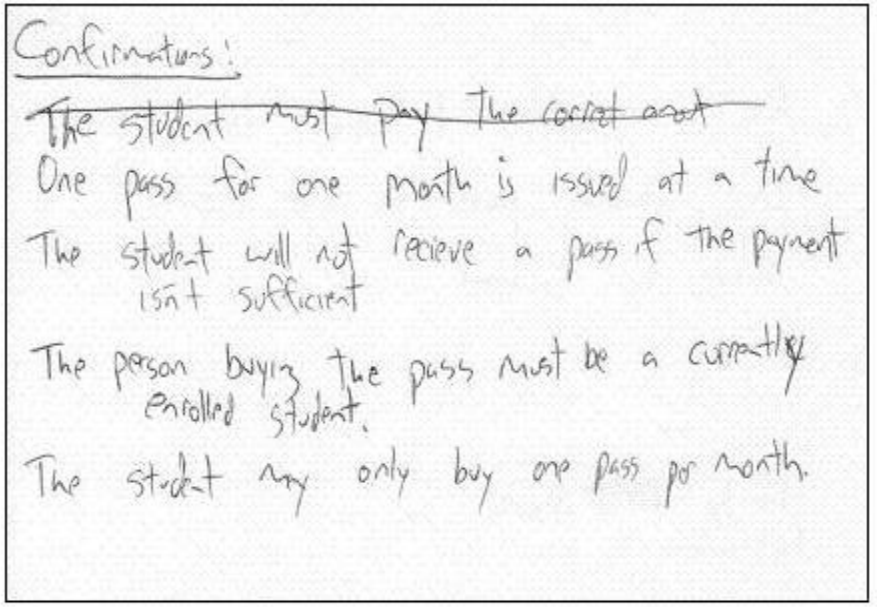
Example: Story Index Card

Front of Card



Back of Card



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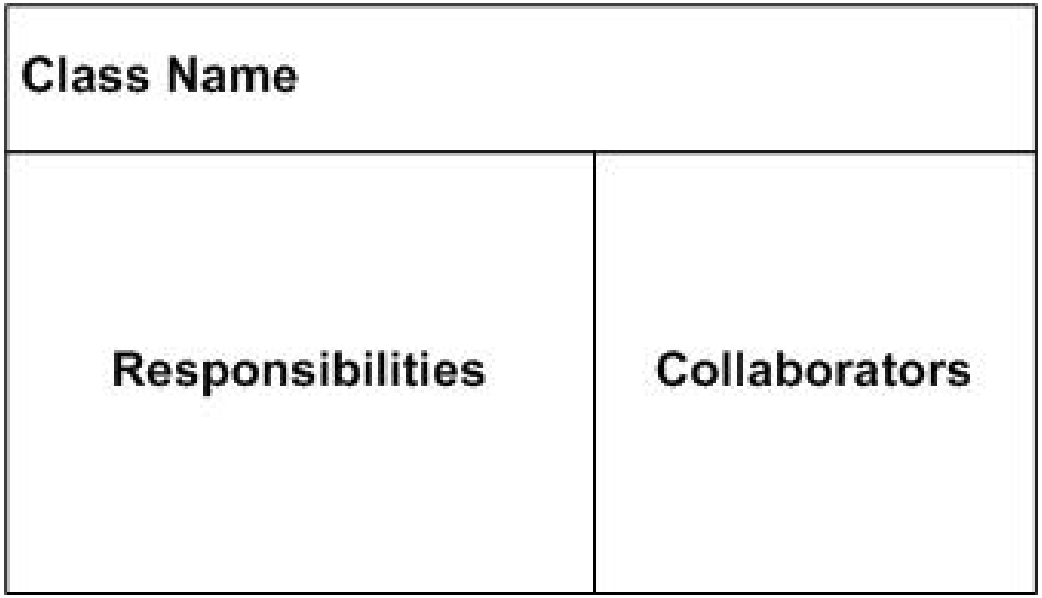
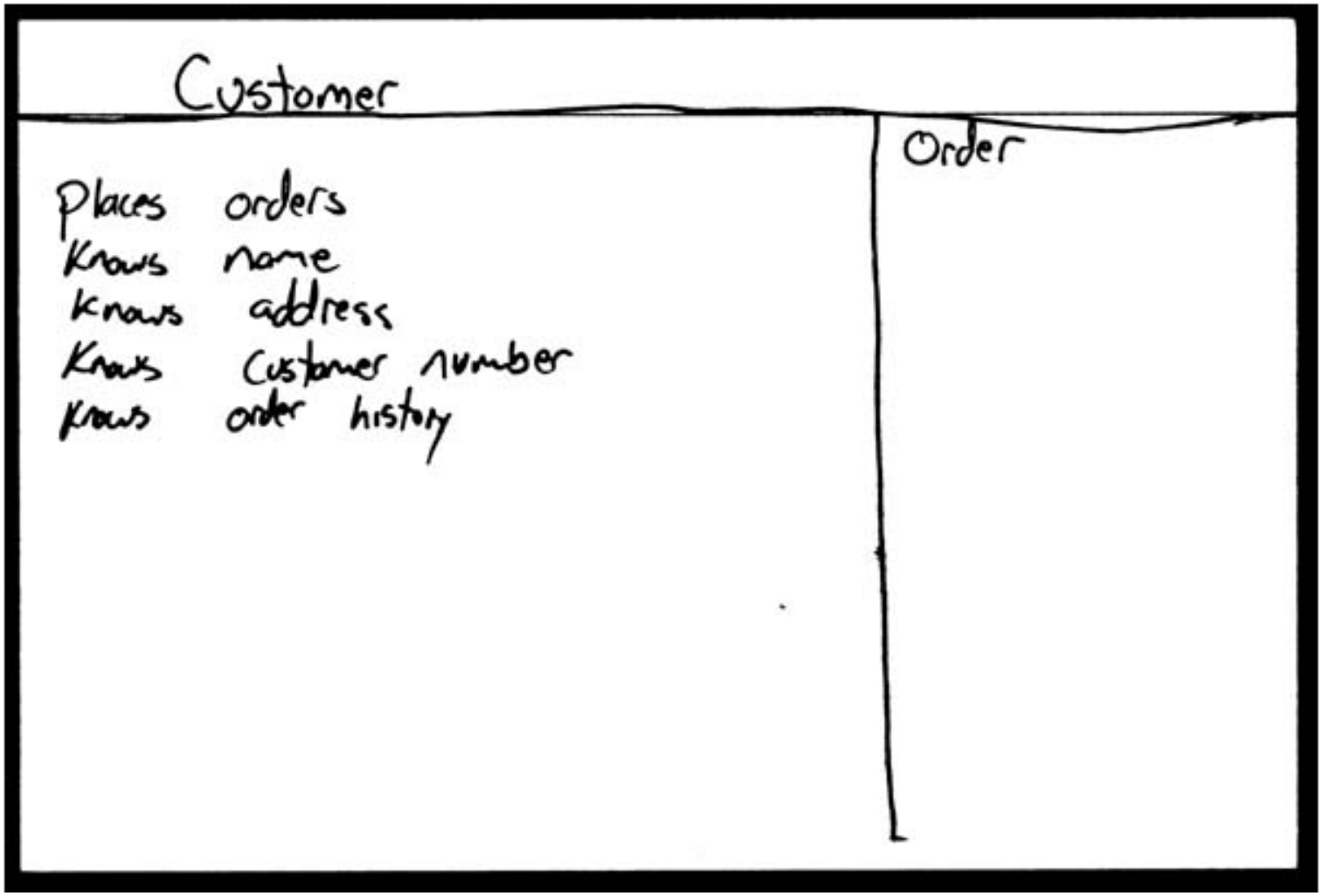
CRC Card Format

Class-responsibility-Collaboration (CRC) Card is a brainstorming tool used to design softwares.
It was proposed by Ward Cunningham and Kent Beck as a teaching tool



Source: http://www.agilemodeling.com/artifacts/crcModel.htm

Example: Hand drawn CRC Card



Source: http://www.agilemodeling.com/artifacts/crcModel.htm

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Example: A CRC Card

Class ShoppingCart	
Responsibility	***Collaboration***
Add items	ProductCatalog
Remove Items	

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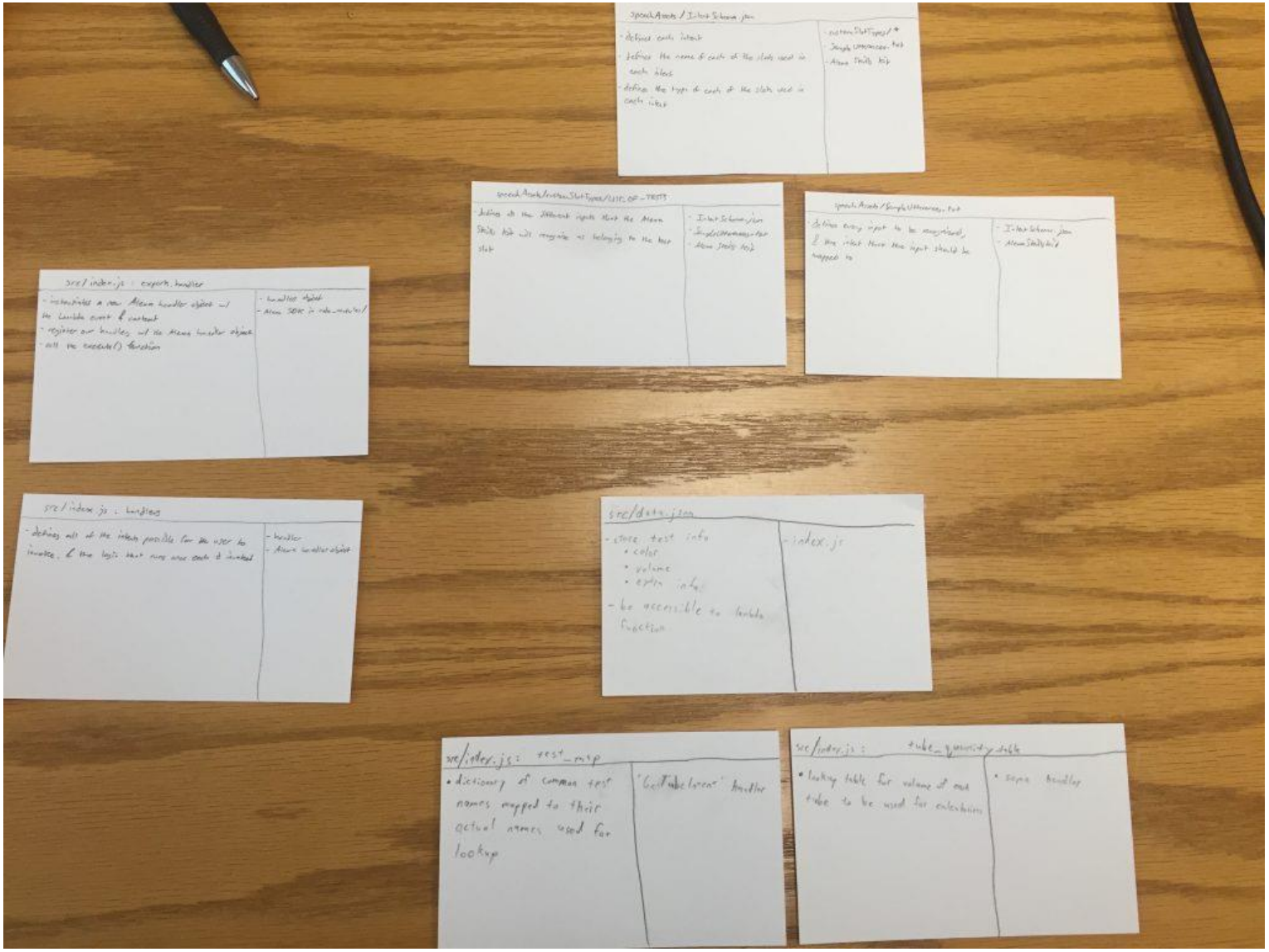
Example: CRC Cards



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Scrum Model

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Scrum

PRESSMAN

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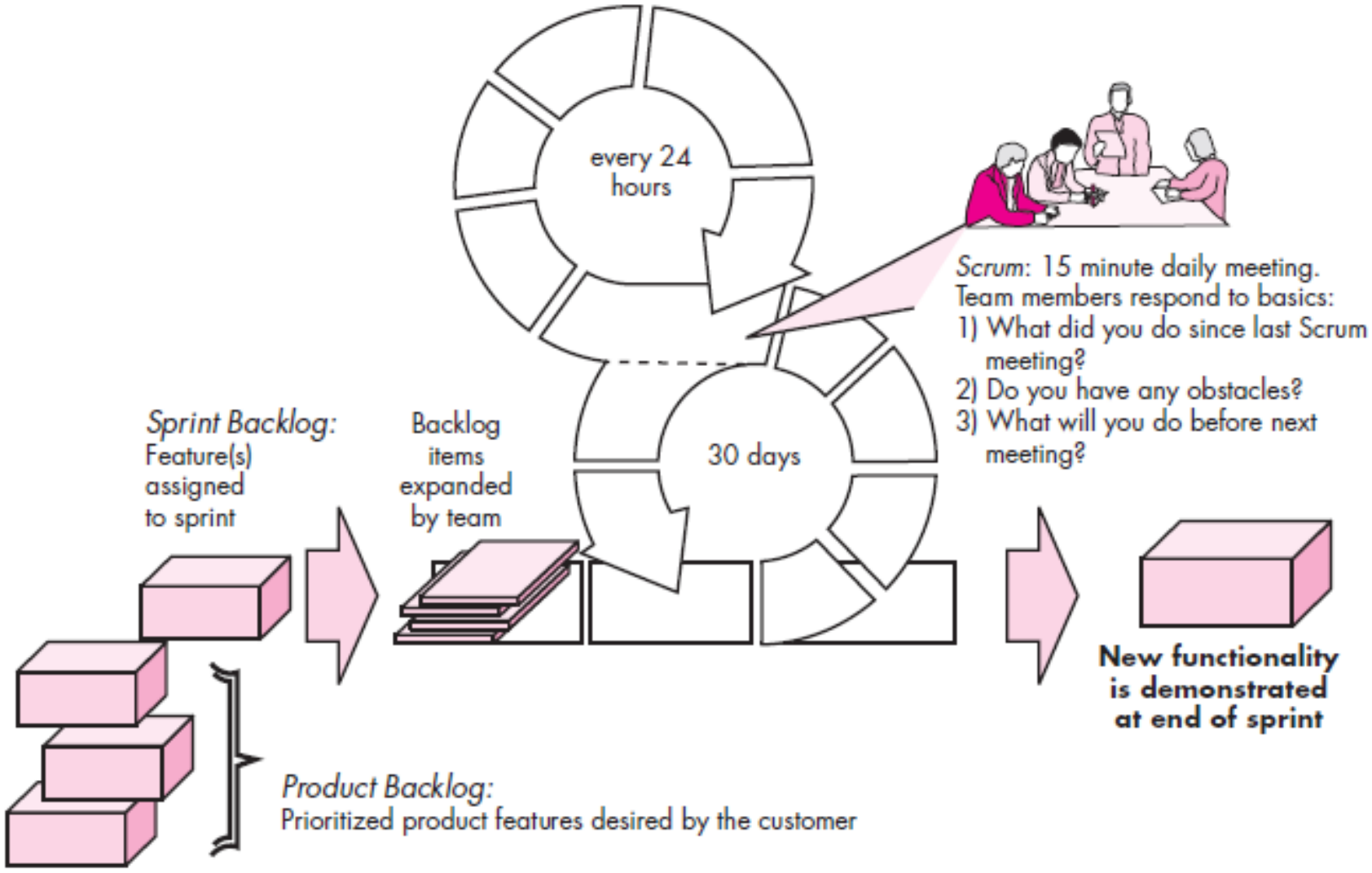
Scrum Model



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Scrum Model

- **Used for Projects with tight timelines, Changing requirements, and business criticality**
- **Backlog- A prioritized list of requirements**

can be added any time

- **Sprints- Work Units (30 day time box)**

to achieve requ, define in backlog

- **Scrum Meetings (15 Minutes)**

3Q

- **Scrum Master leads the Meeting**

this helps team to uncover problems

- **Demos (Software increments)**

may not be all planned Fns but those that can be delivered with in time box