INTRODUCTION TO SOFTWARE ENGINEERING

3. SOFTWARE PROCESS MODELS

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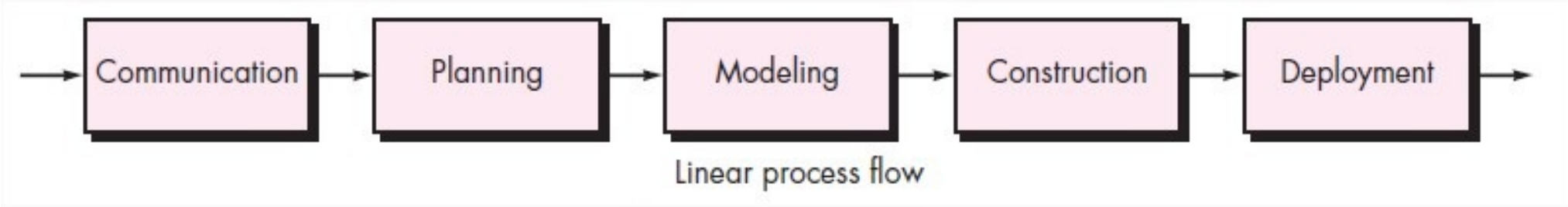
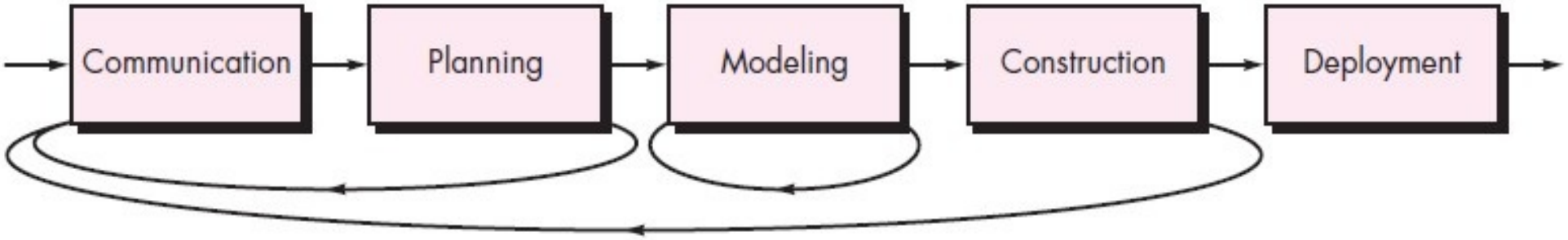
What is a Process Model?

- Prepresent a networked sequence of activities, objects, transformations, and events that embody strategies for accomplishing software evolution

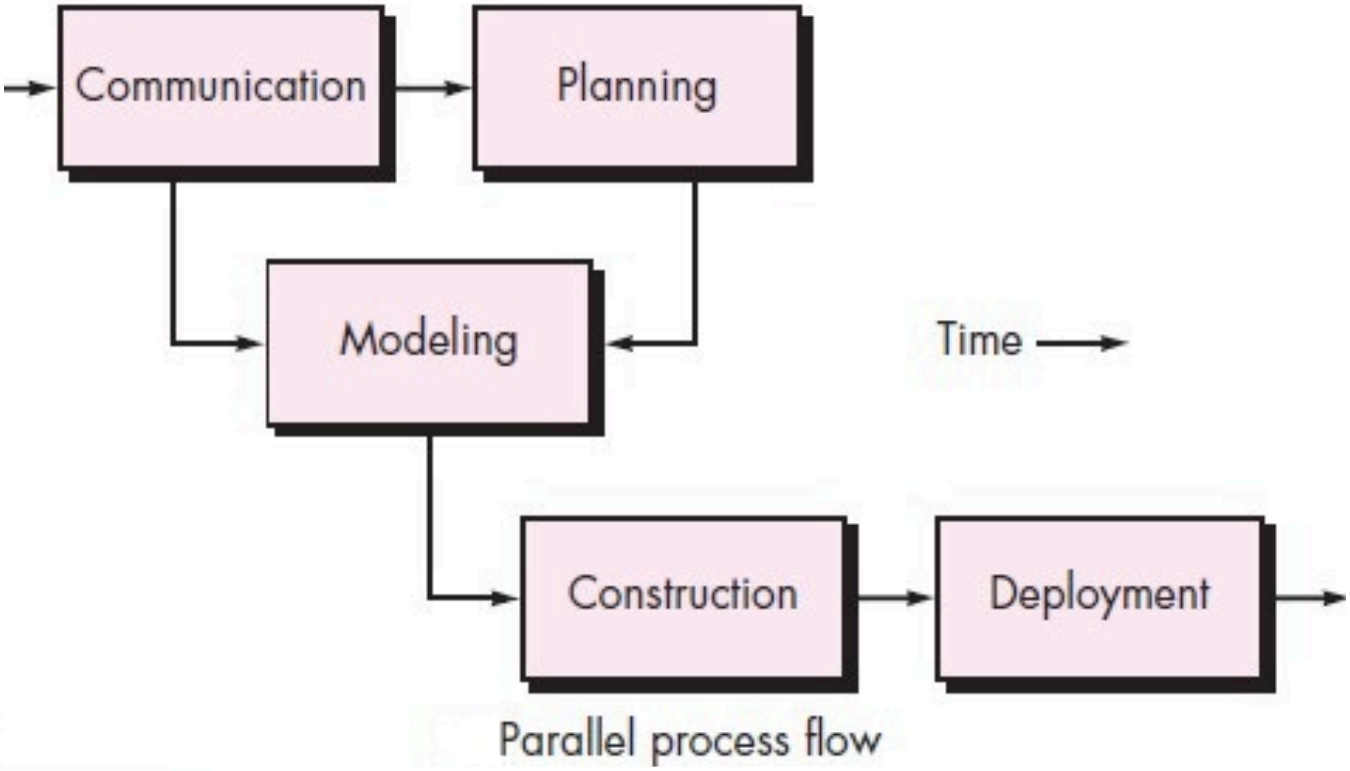


Linear process flow

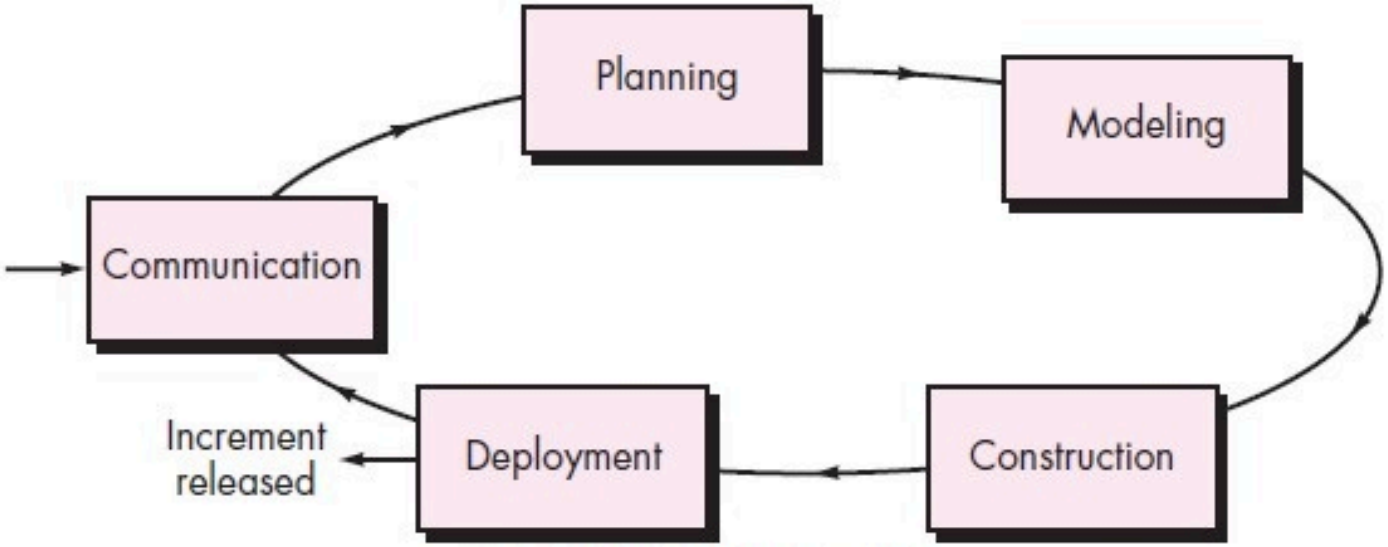


Iterative process flow

Process Flow

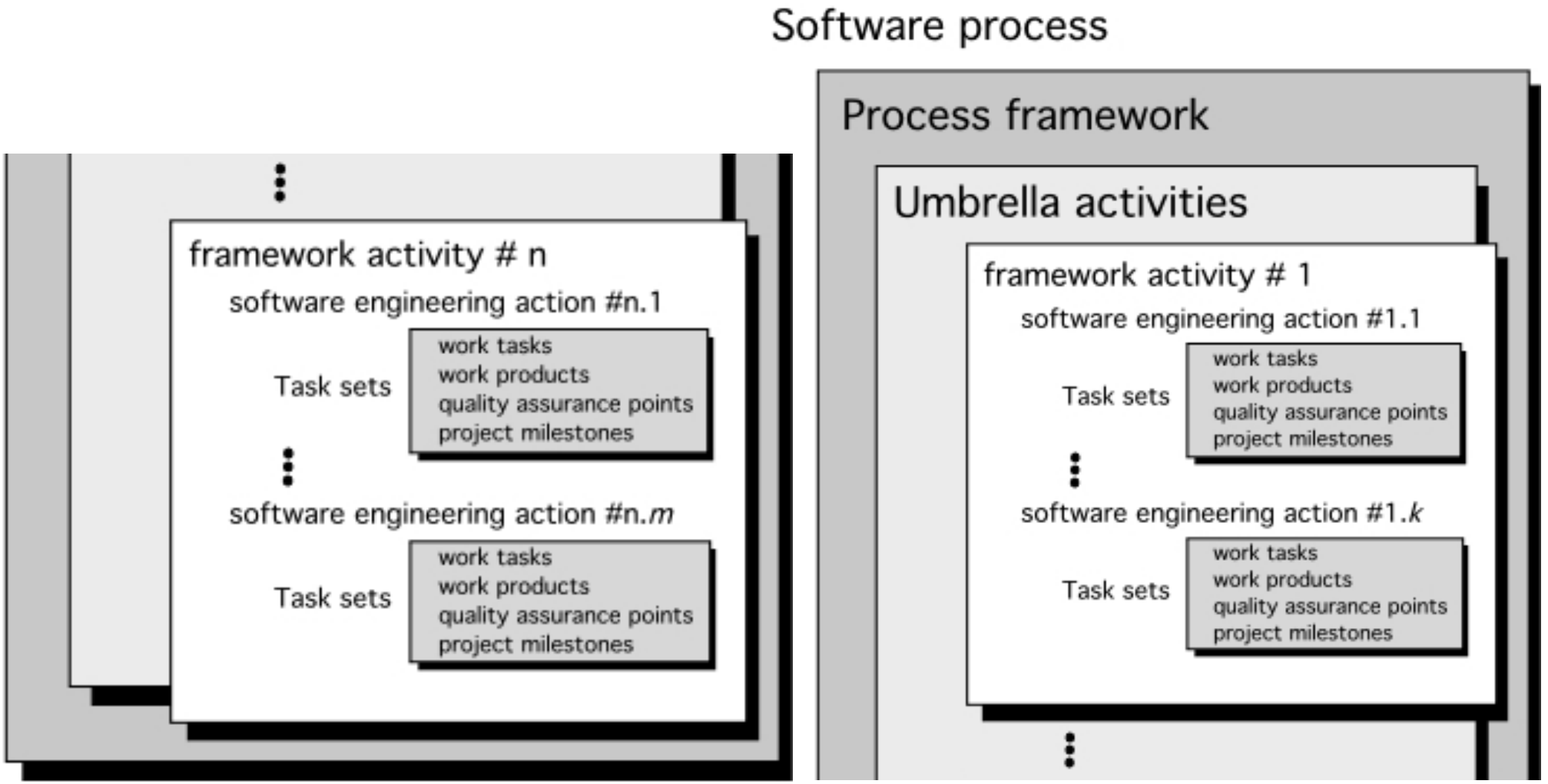


Parallel process flow



Evolutionary process flow

A Generic Process Model



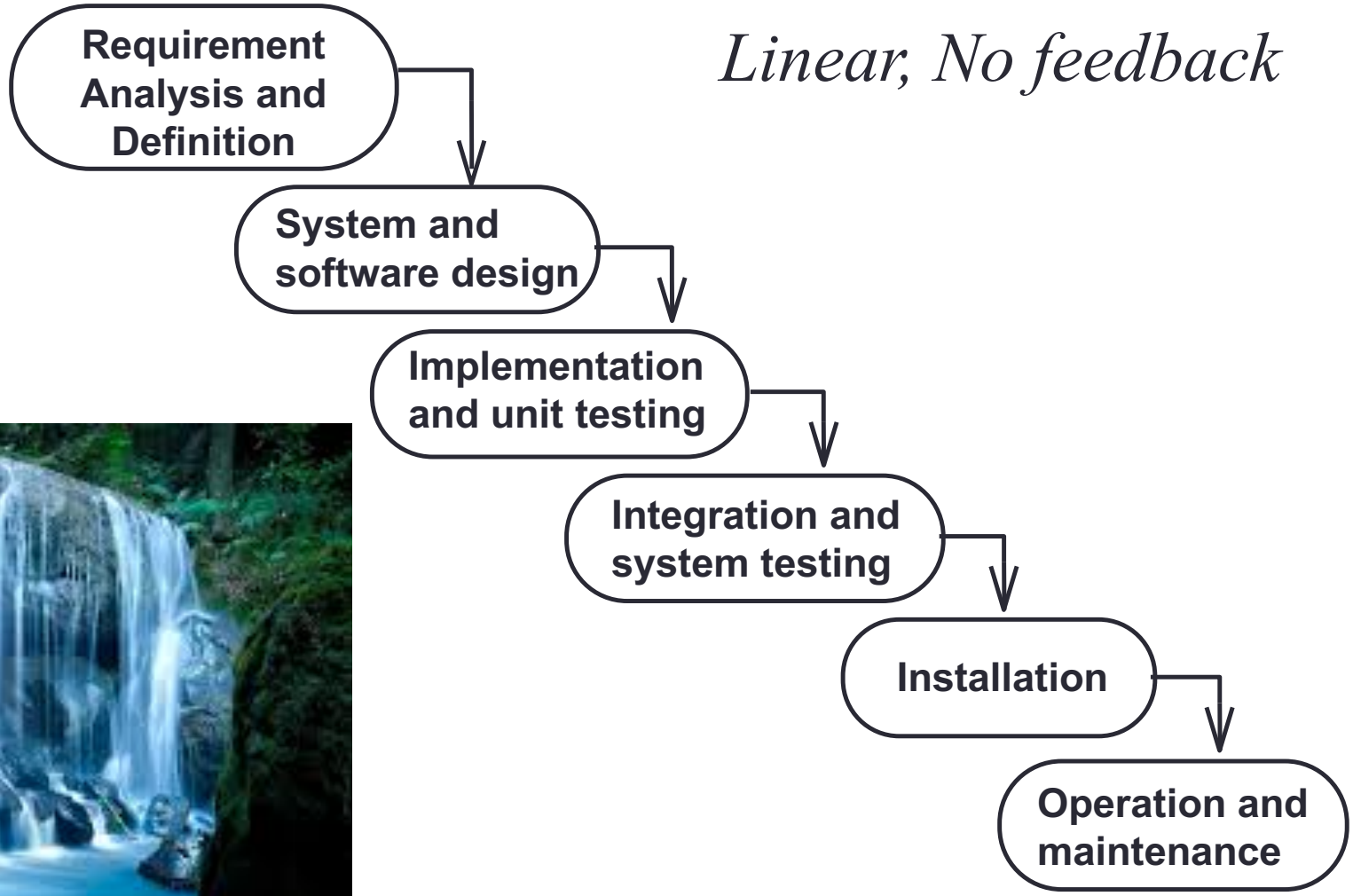
framework activity #n
action #n.1 => #n.m

Content

1. Waterfall model
2. Prototype model
3. Evolutionary model
4. Incremental model
5. RAD model
6. Spiral model
7. Agile methodology

Waterfall model - Video

1. The Waterfall/Linear Model

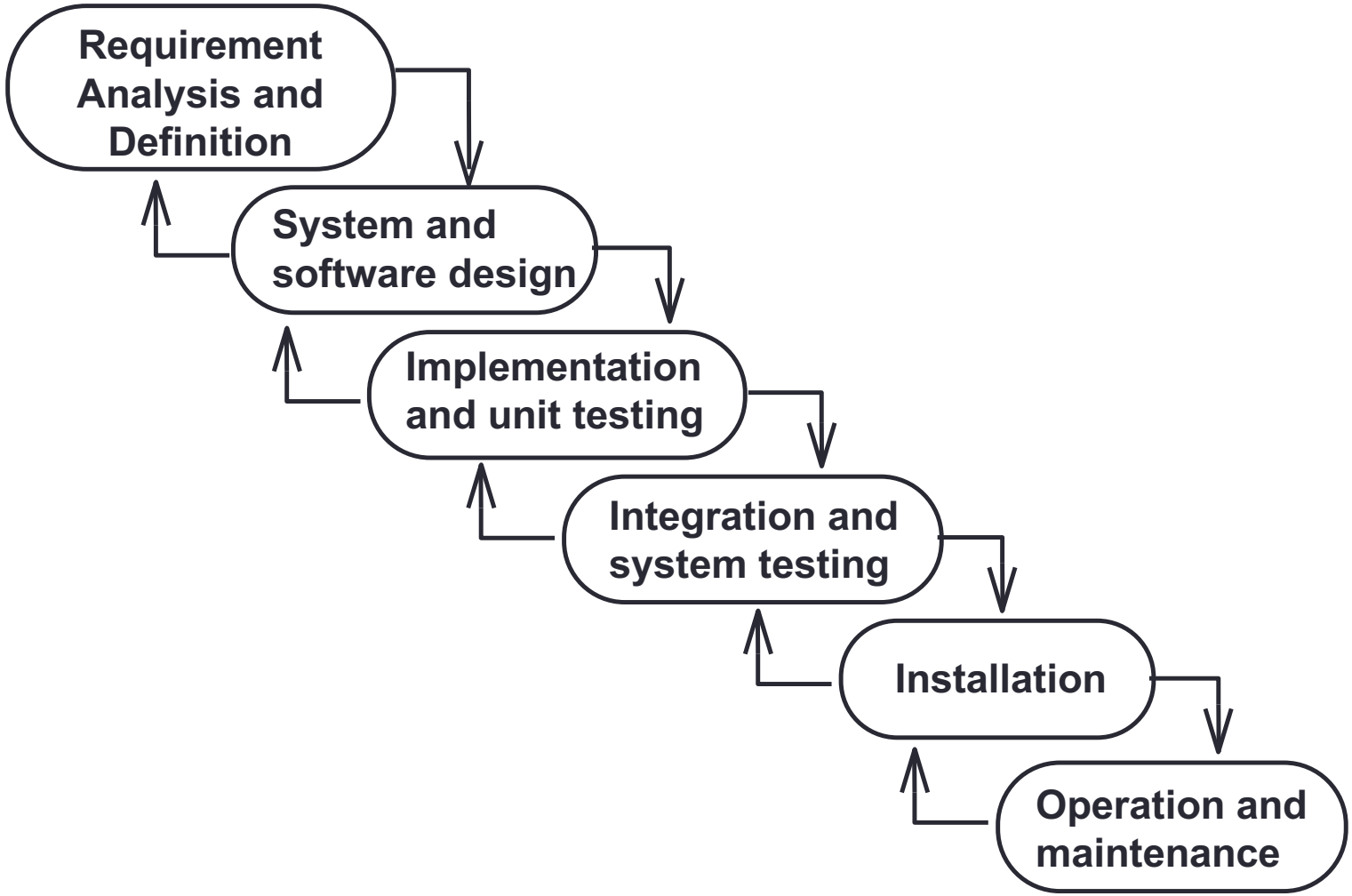


Linear, No feedback

The Waterfall model

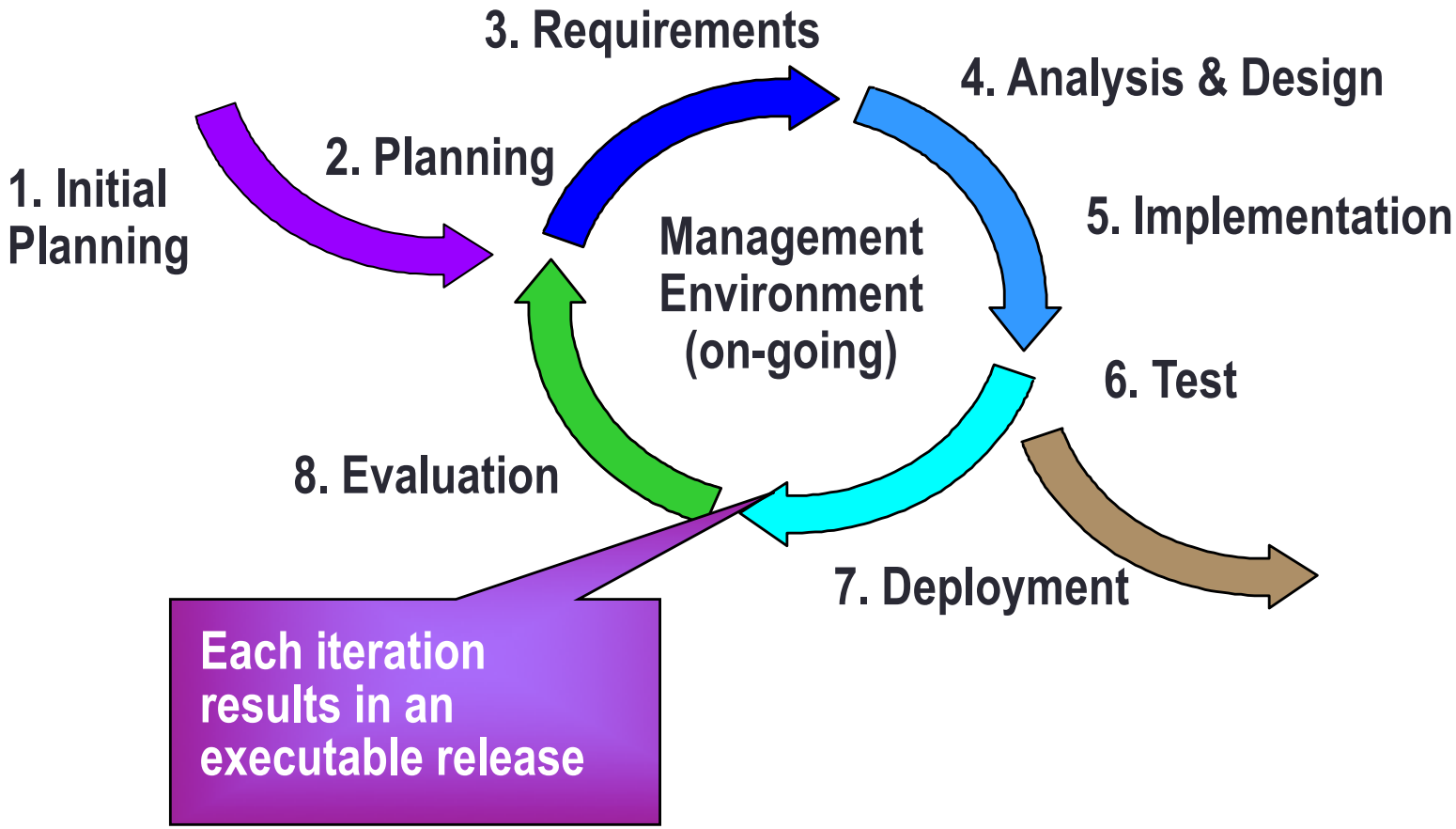
- The *Waterfall model* is also called the *linear sequential model* or *classic life cycle model*
- Each phase has a defined a start point and an end point, and clear deliverables from one phase to the next
- Is ideal in situations where the requirements are well defined from the beginning, and undergo only minor changes
- Most software systems are dynamic – they are required to change over time as they acquire more users. Therefore, this model can prove counter-productive

Iterative Waterfall/Linear Model

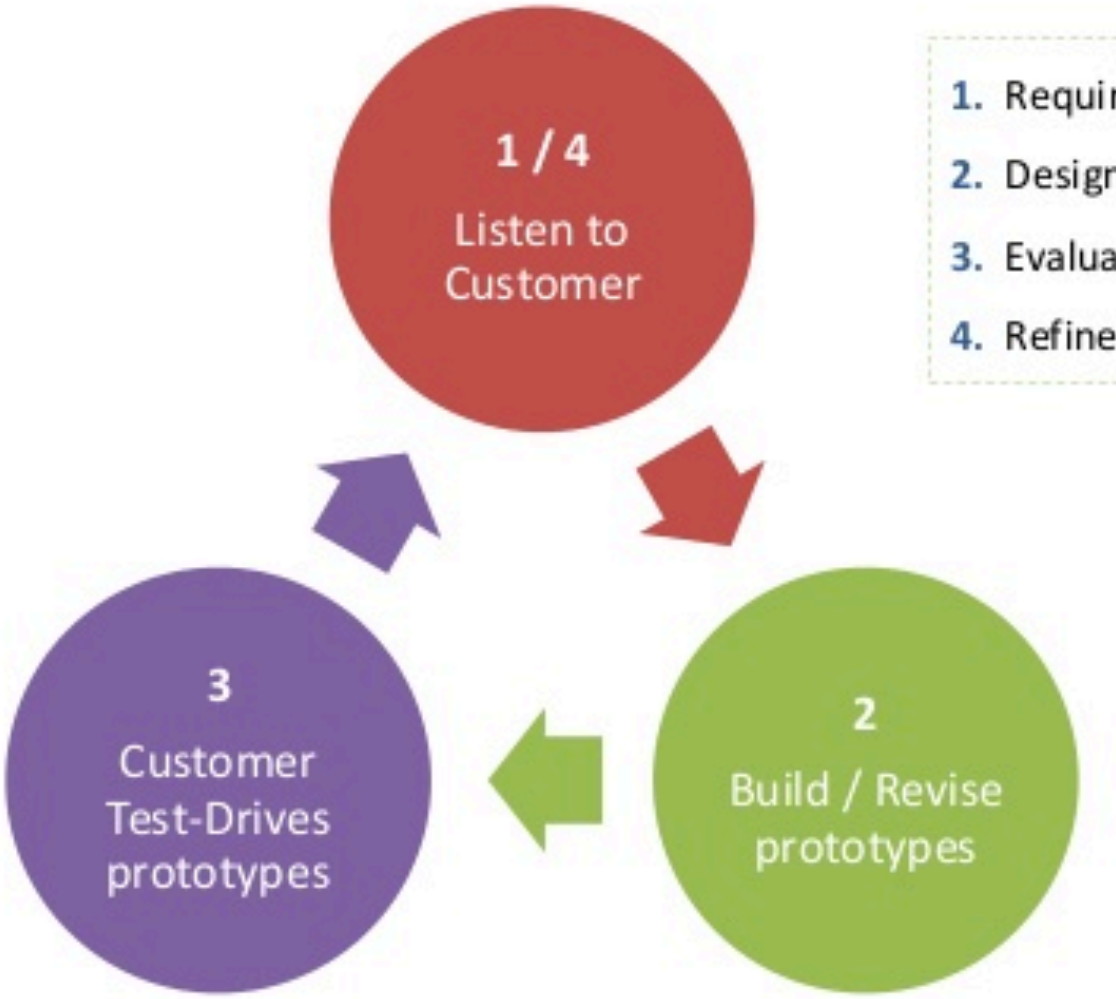


Iterative Model

- Each iteration produces an executable



2. Prototype model



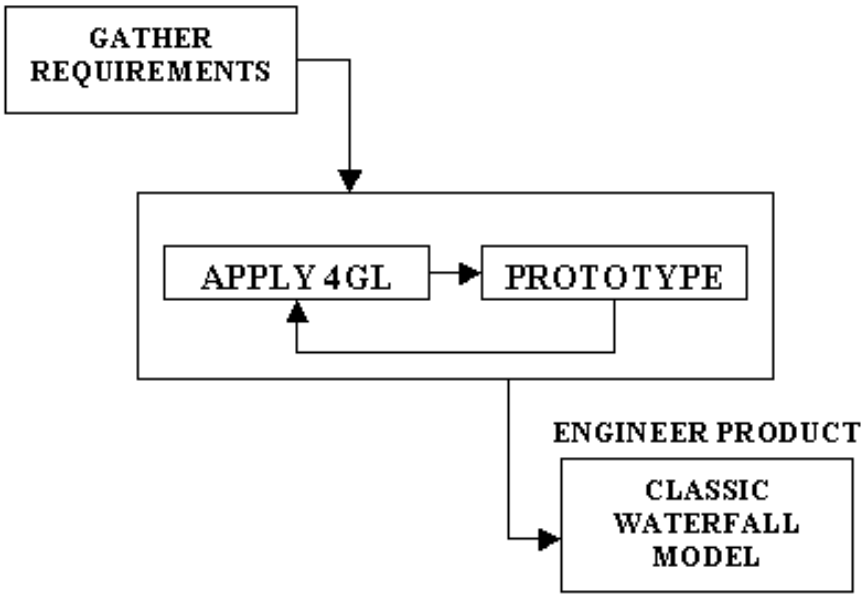
1. Requirements gathering.
2. Design and build SW prototype.
3. Evaluate prototype with customer.
4. Refine requirements.

Prototype model

- The first version of the product is viewed as a trial
- The main purpose of this trial is to assess the feasibility of the product and to verify the requirements
- This “first version” of the product is called a *prototype*
- This product is discarded and real development starts on more solid foundations
- Prototyping is best suited in situations where the user is unable to precisely articulate his or her requirements

Combining process models

- Prototyping and structured techniques of the Waterfall model can be used together
- The prototype is used only until it provides enough feedback to the software engineer on what the exact requirements of the user are
- The second version is then developed following the Waterfall model

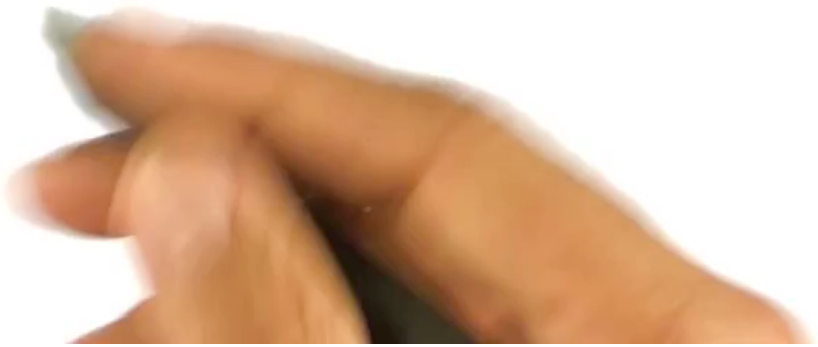


3. Evolutionary model

- A model whose stages consist of expanding increments of an operational software product
- The requirements for the increments are analyzed;
- Each increment is then separately designed, coded, tested, integrated, and delivered to the customer
- The second version is then developed following the Waterfall model

Evolutionary Prototyping model - Video

EVOLUTIONARY PROTOTYPING

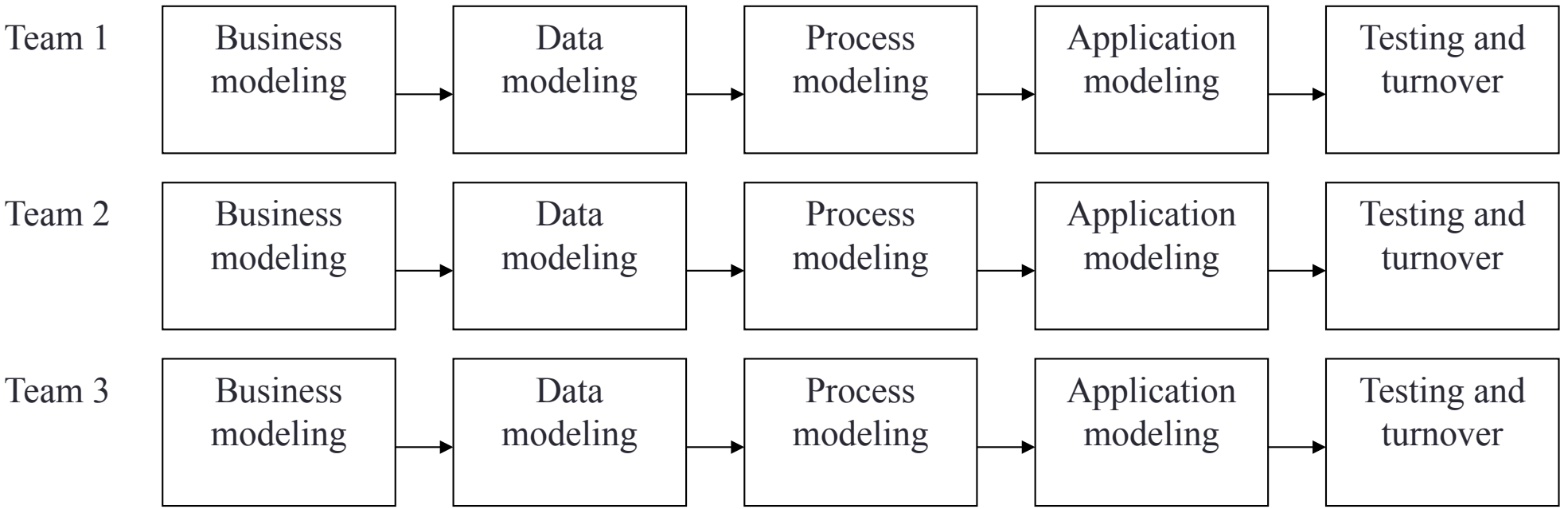


4. Rapid Application Development Model (RAD)

- A linear process model that leads to fast development of applications
- Uses component-based systems, such as object-oriented systems
- More than one team is usually involved in the development process simultaneously
- Each team follows the RAD processes independently
- The RAD model has the following five phases:
  - Business modeling
  - Data modeling

The RAD Model

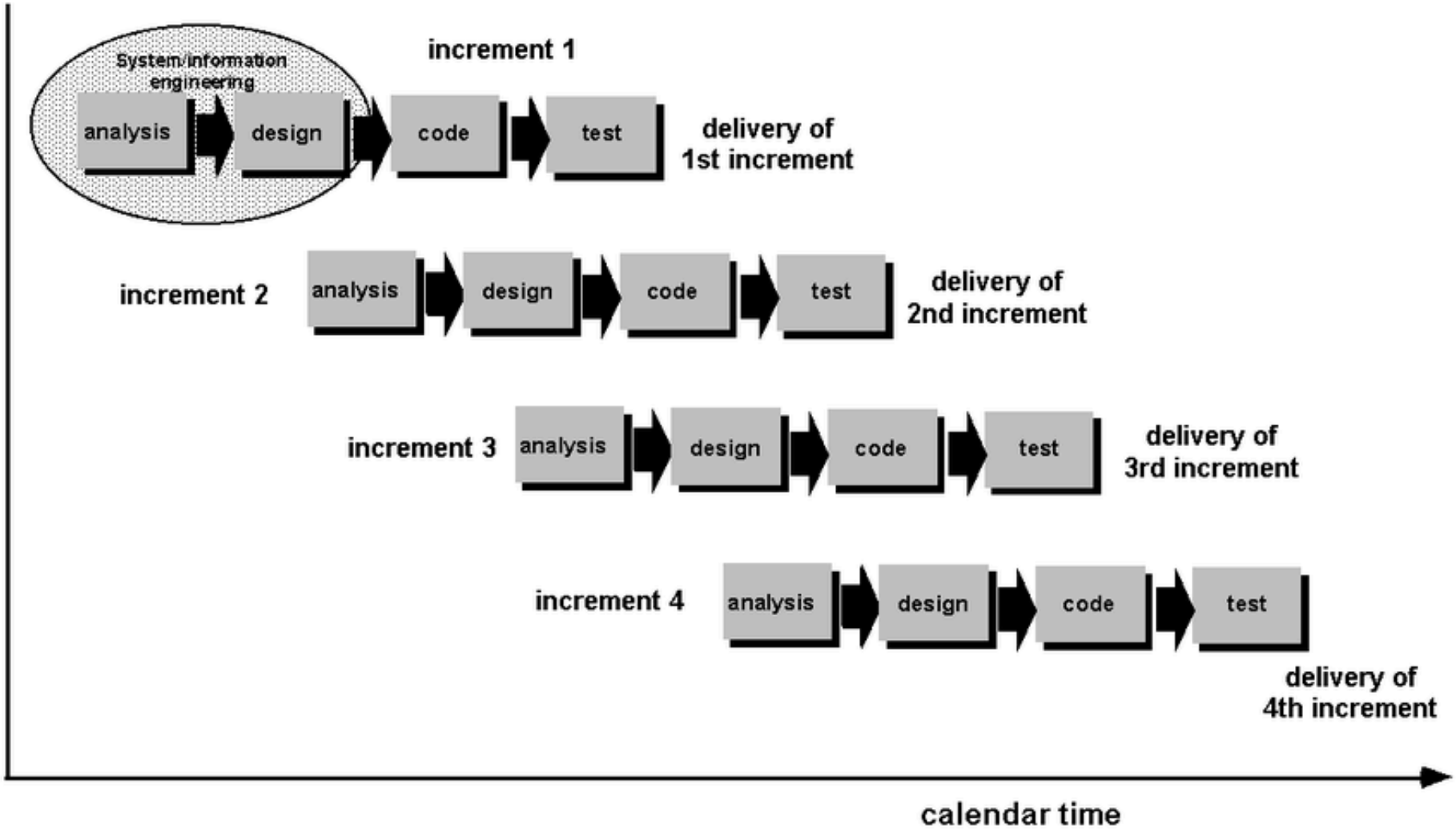
- Process modeling
- Application generation
- Testing and turnover



5. Incremental model

- The product is decomposed into a number of components, each of which are designed (called increment), implemented and tested incrementally (a little more is added each time) until the product is finished.
- It involves both development and maintenance
- Each new increment must be integrated with previous increments and any existing systems
- The Incremental approach uses a set number of steps and development goes from start to finish in a linear path of progression.

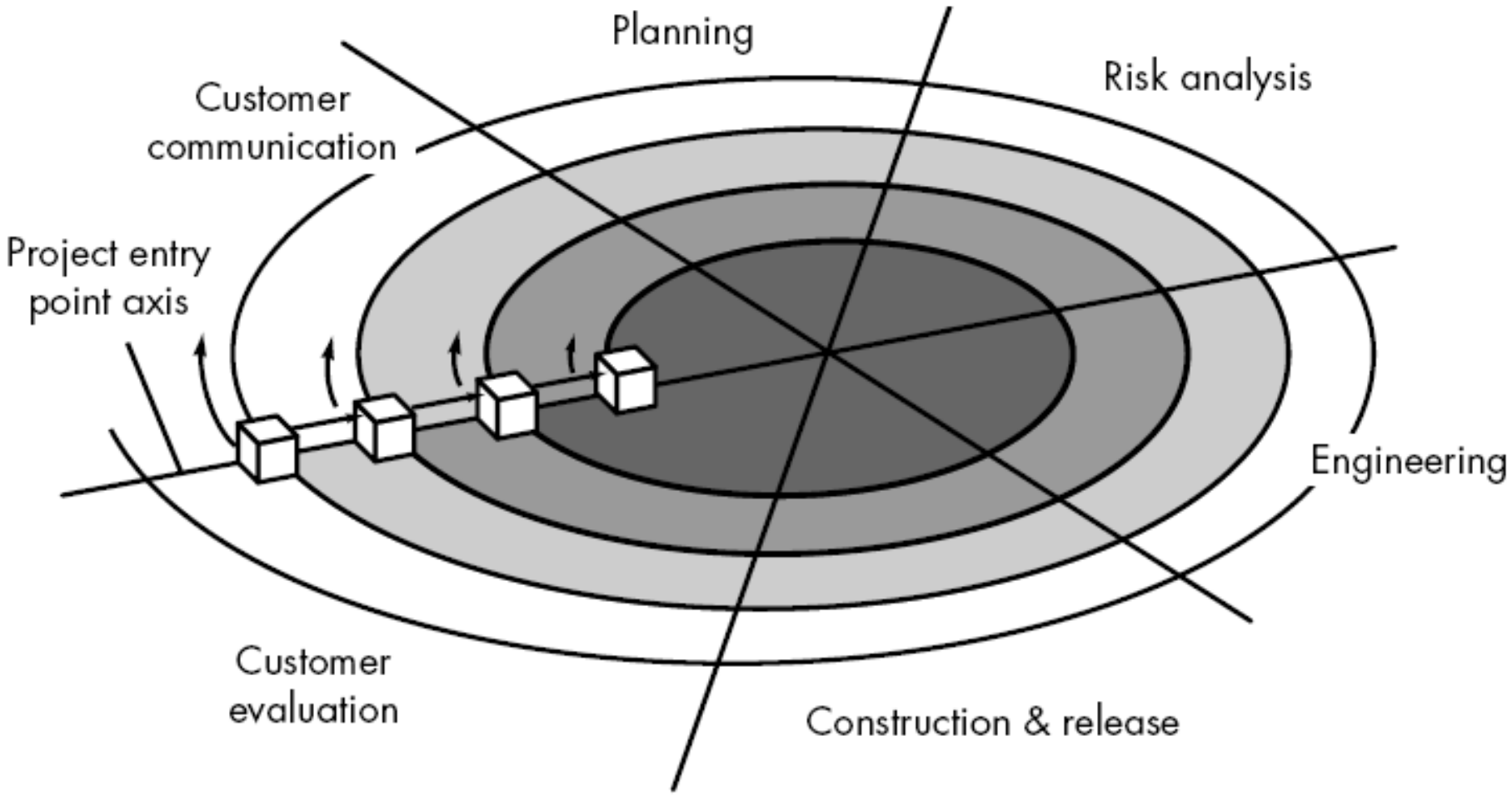
Incremental model



6. Spiral model

- One of the major causes of project failures in the past has been the negligence of project risks
- This model shifts the management emphasis to risk evaluation and resolution
- This model can be implemented effectively in projects involving a high degree of complexity and risk

Spiral model



Spiral model

Summary

- Process models combine the software development life cycle with various tools to implement the different phases to projects
- The waterfall model is a linear model with sequential phases
- The prototype model starts with the development of a prototype
- The evolutionary model combines both the prototype and waterfall model
- The RAD model is used for fast development of applications by using 4GT