Methods for the specification and verification of business processes
MPB (6 cfu, 295AA)
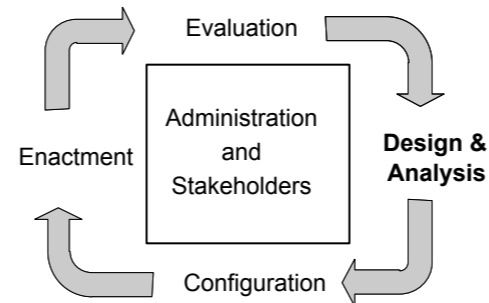
Roberto Bruni

http://www.di.unipi.it/~bruni

03 - Lifecycle

Object

Evaluation

Administration and Stakeholders
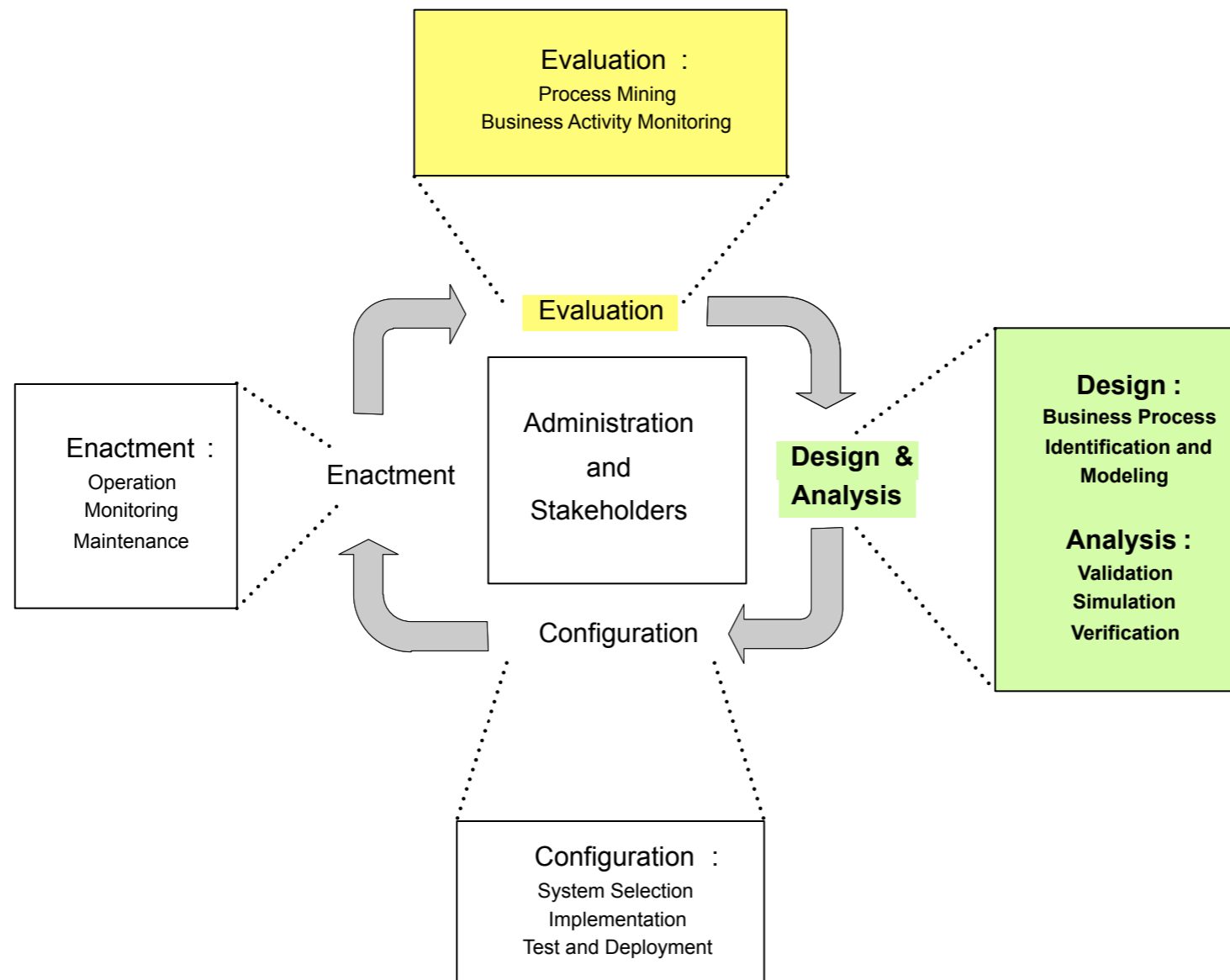
Enactment

Design & Analysis

Configuration
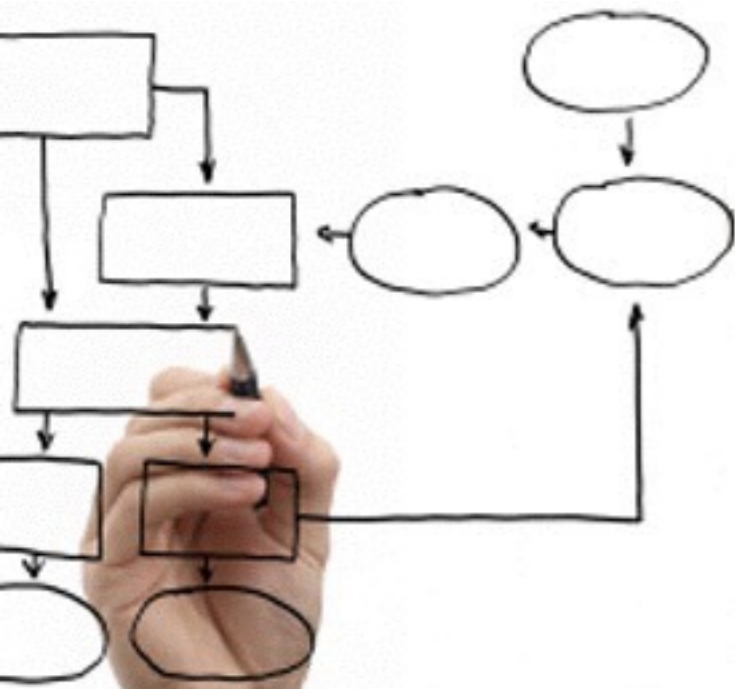
Overview the business process lifecycle

Sect.1.2 of Business Process Management: Concepts, Languages, Architectures

BP lifecycle

## Five phases with logical dependencies, organized along a cyclic structure

Evaluation :
Process Mining
Business Activity Monitoring

Evaluation

Enactment

Enactment :
Operation
Monitoring
Maintenance

Administration
and
Stakeholders

Design & Analysis

Design :
Business Process
Identification and
Modeling

Analysis :
Validation
Simulation
Verification

Configuration

Configuration :
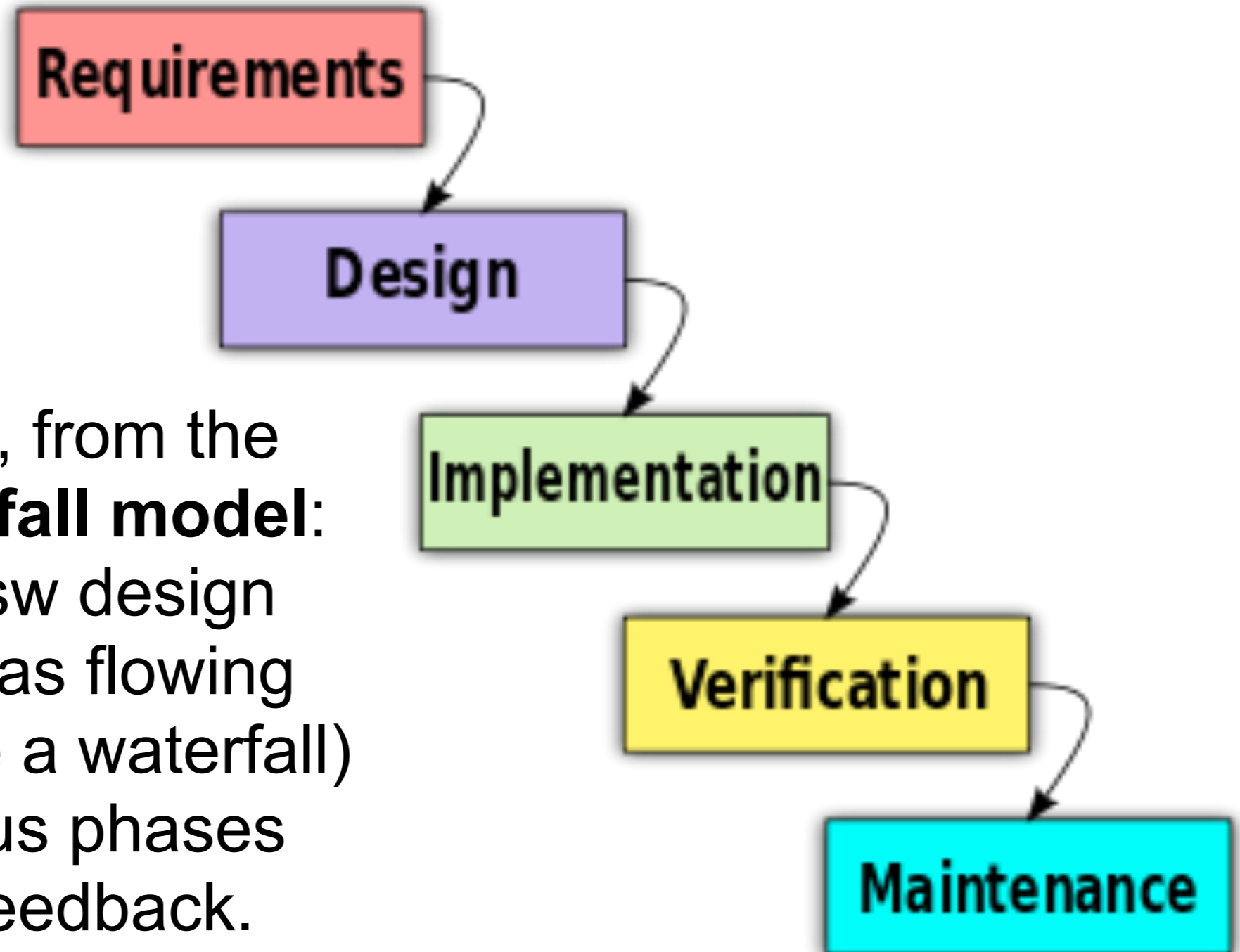System Selection
Implementation
Test and Deployment

BP lifecycle

Similar to the **PDCA** scheme
(you may have heard of):
a management method for the control and
continuous improvement of products
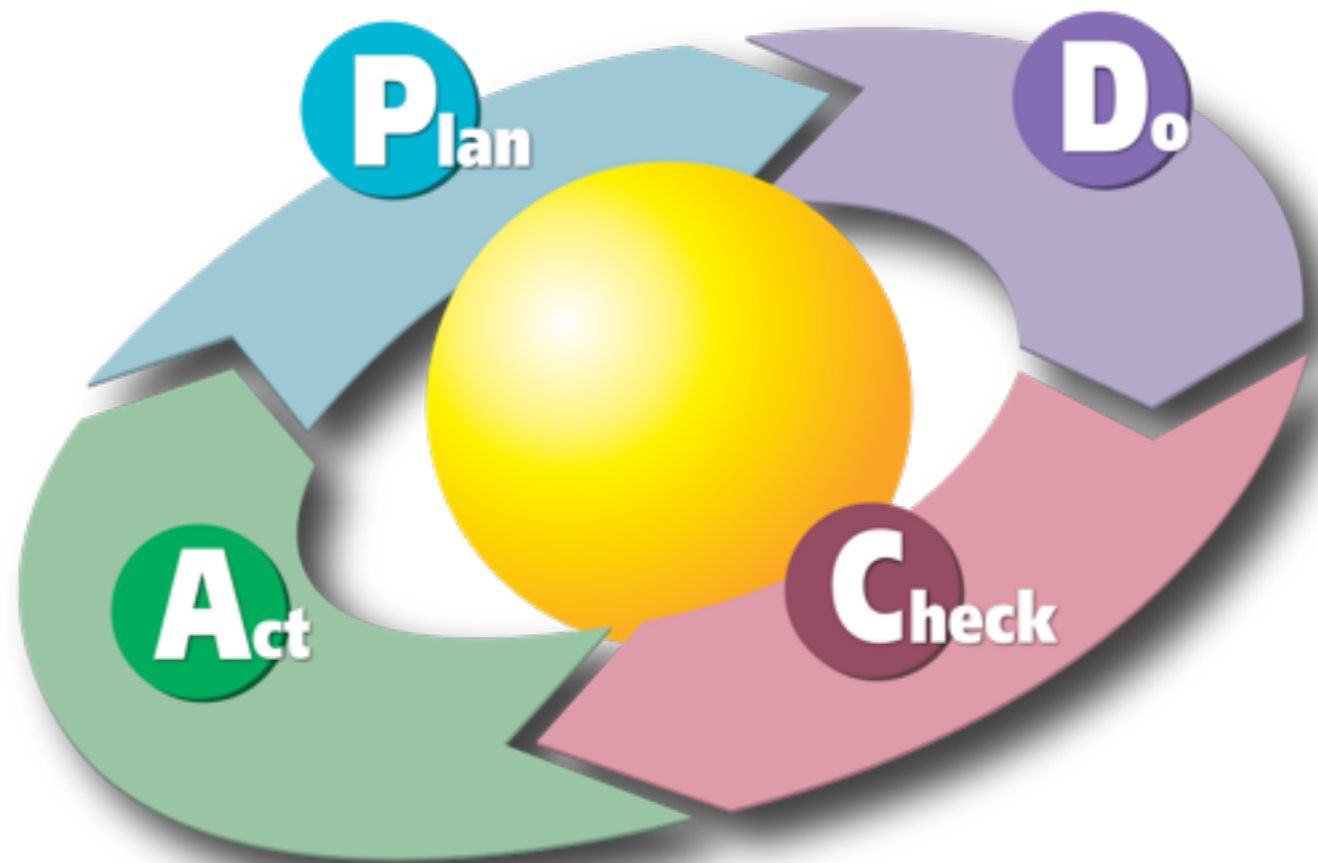
BP lifecycle vs waterfall

Different, e.g., from the classical **waterfall model**: a sequential sw design process seen as flowing downwards (like a waterfall) through various phases but without feedback.

BP lifecycle vs XP

Better structured than, e.g., **extreme programming** methodology: intended to improve responsiveness to changing requirements and productivity, advocates frequent releases, avoiding features until needed and a flat management structure
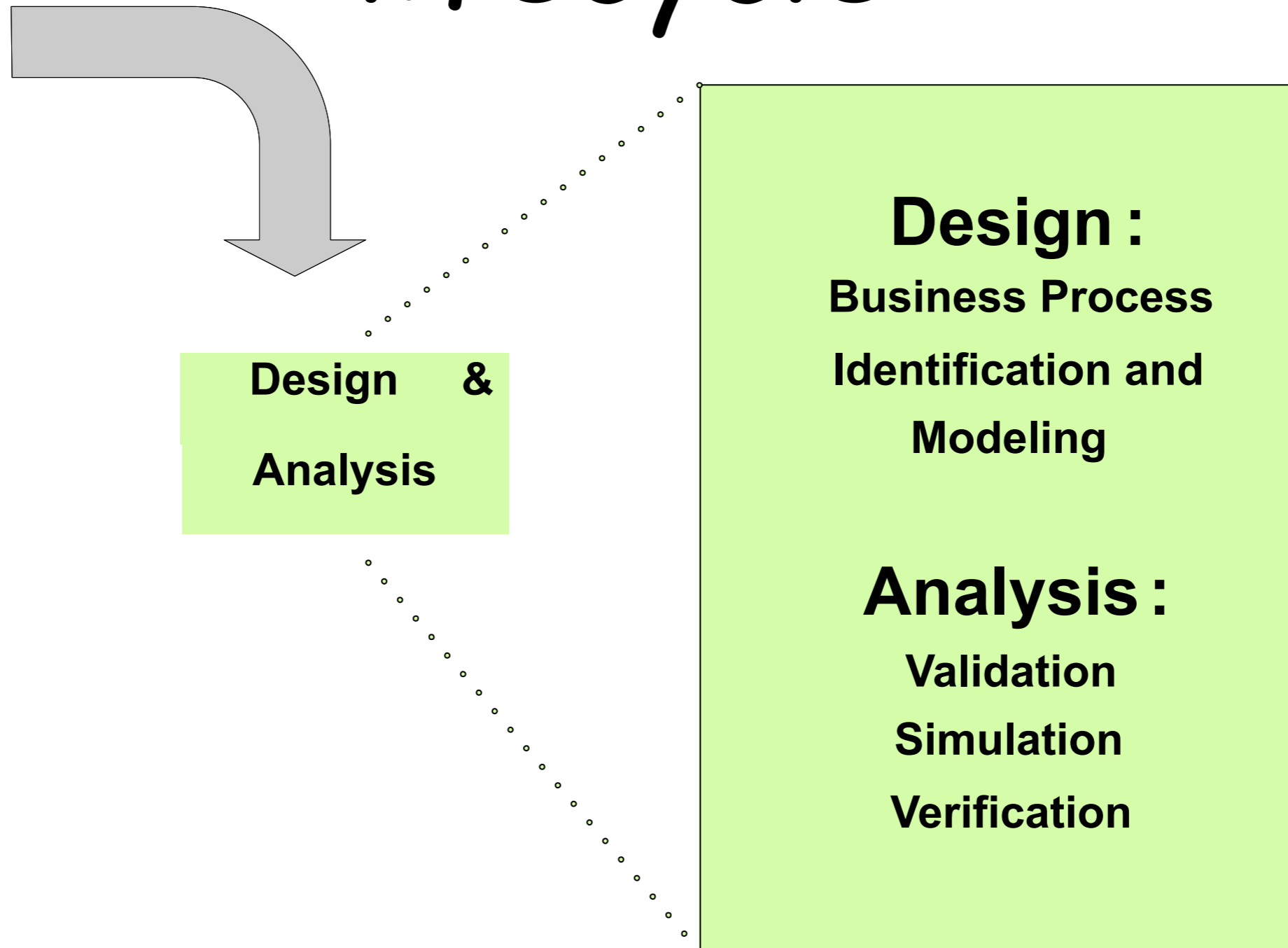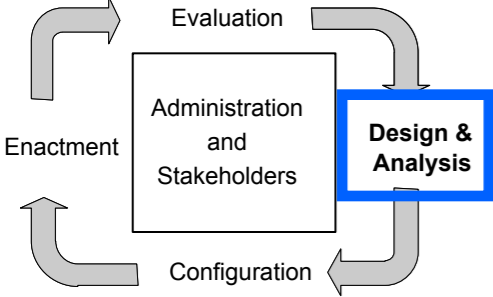
Planning/Feedback Loops

Release Plan
Months
Iteration Plan
Weeks
Acceptance Test
Days
Stand Up Meeting
One day
Pair Negotiation
Hours
Unit Test
Minutes
Pair Programming
Seconds
Code

BP lifecycle

The logical dependencies between different phases
do not imply a strict temporal ordering
of their execution

Incremental and evolutionary approaches
involving concurrent activities in multiple phases
are frequently used

Business process lifecycle

Design & Analysis

Design :
Business Process
Identification and
Modeling

Analysis :
Validation
Simulation
Verification

Evaluation

Administration
and
Stakeholders
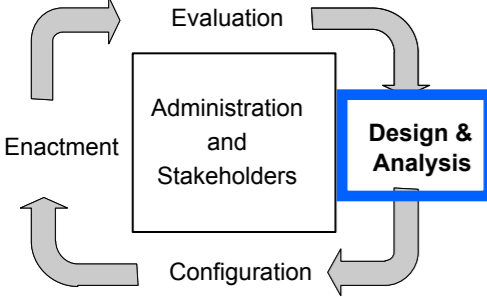
Enactment

Design &
Analysis

Configuration

Design and analysis phase

Require **surveys** on:
the business processes
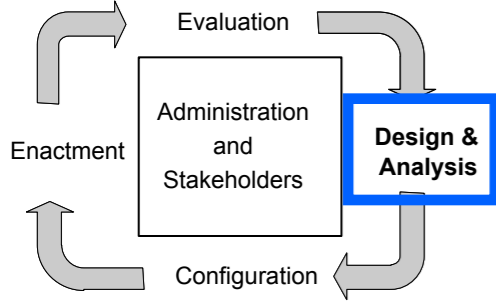their organizational environment
their technical environment

Based on these surveys, business processes are:
identified
reviewed
validated
represented (by business process models)

Design and analysis phase

Context: matrix organizational structure

Evaluation

Administration
and
Stakeholders

Design &
Analysis

Enactment

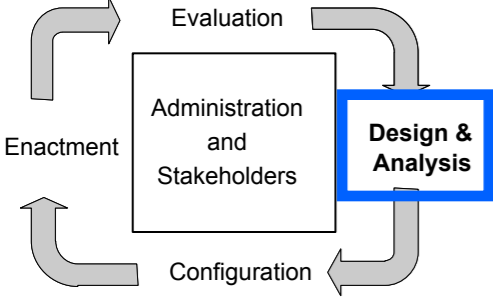Configuration
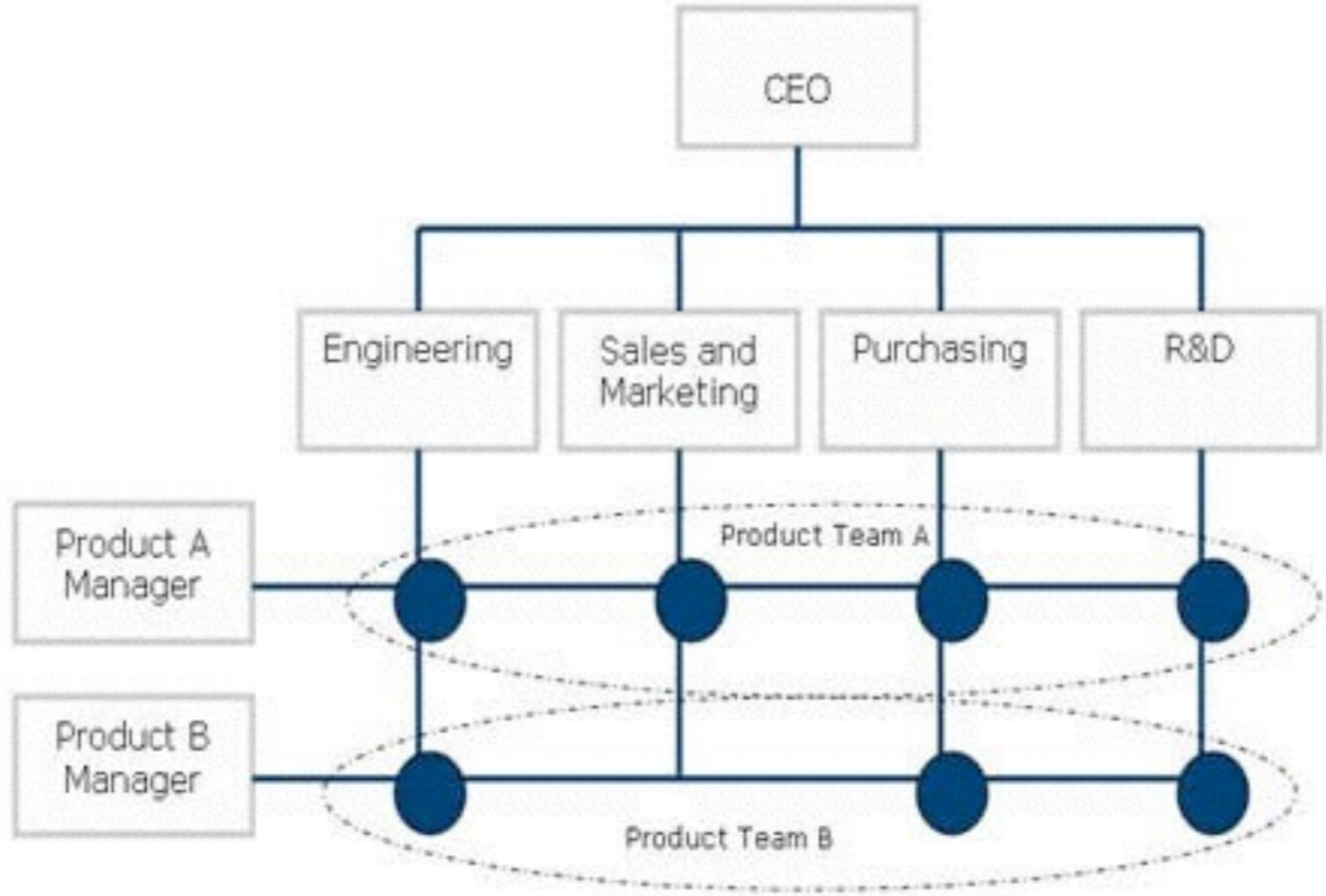
Modeling

Core technical sub-phase

From informal descriptions
to a particular business process modeling notation

Explicit business process models expressed in a
graphical notation facilitate communication about
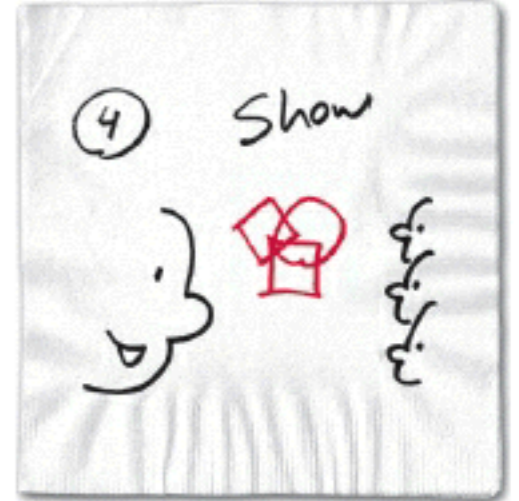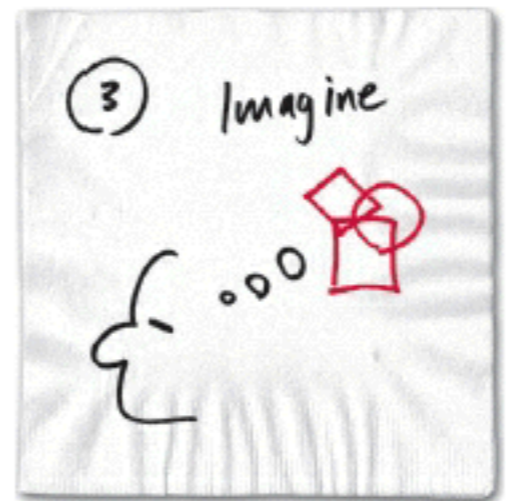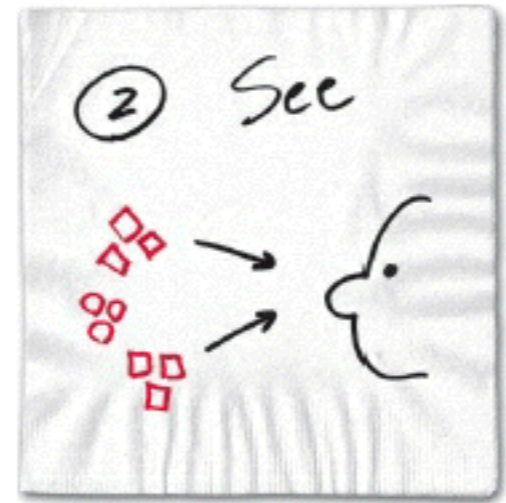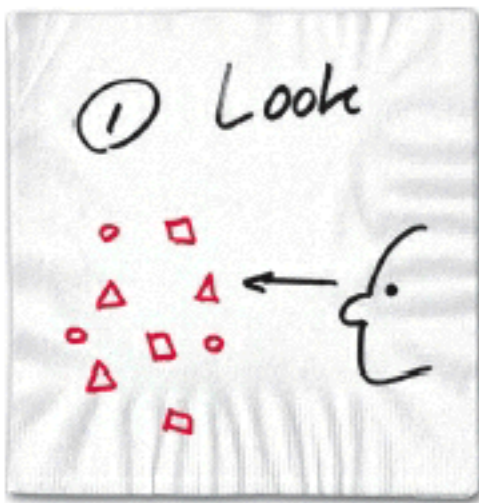these processes so that different stakeholders can:
communicate efficiently
refine them
improve them

Look, see, imagine, show

Evaluation

Administration
and
Stakeholders

Design &
Analysis

Enactment

Configuration
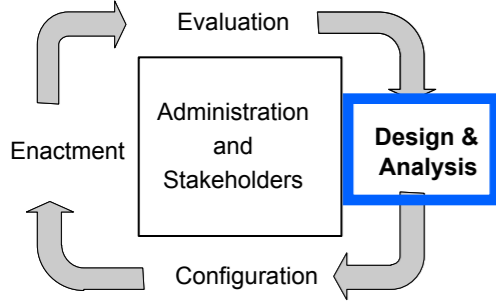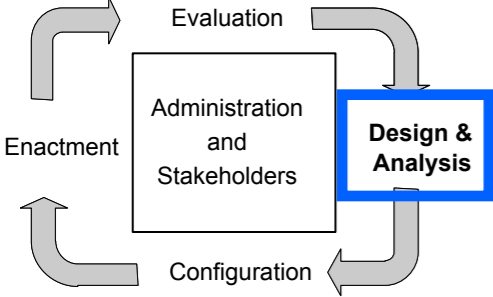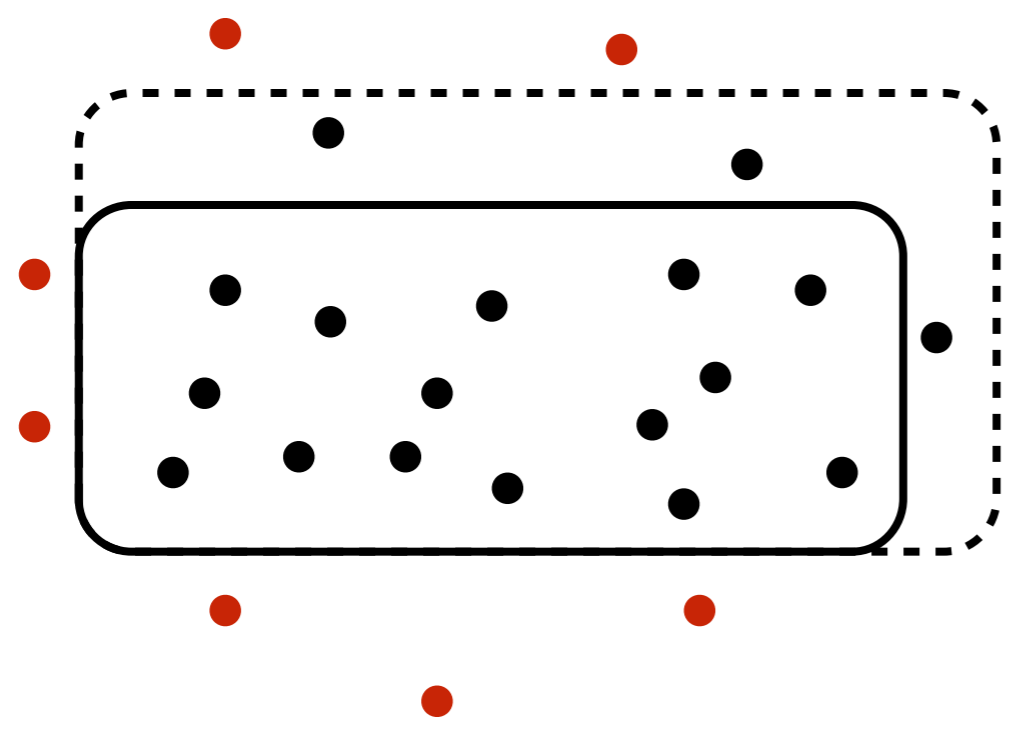
Validation

The initial design must be validated by checking that **all valid process instances are reflected** by the business process model

Useful instrument: a **workshop** where the persons involved can discuss the business process model

Validation

- ● desired instances
- ● undesired instances
- ▭ proposed process
- ⊓ desired process

Evaluation

Administration
and
Stakeholders

Design &
Analysis

Enactment

Configuration
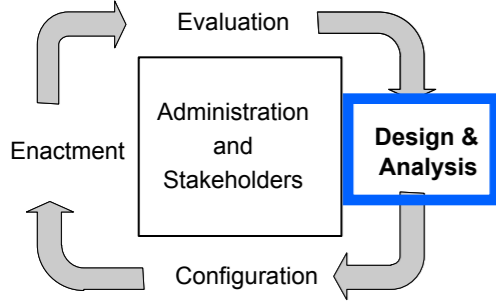
Simulation

Simulation techniques can support validation

Stakeholders can walk through the process in a step-by-step manner

Check whether processes expose all desired behaviour

Discover undesired execution sequences to show deficits in the process model

Verification
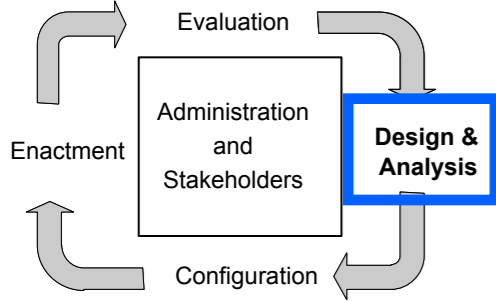
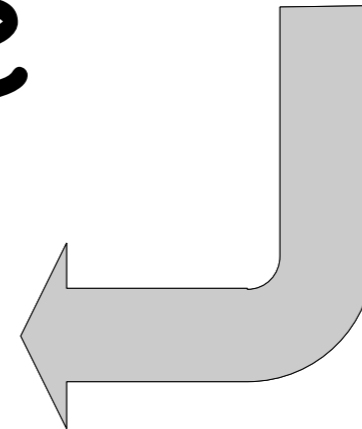The business process model must be analyzed and improved to make sure:

it actually includes all desired instances

it does not contain any undesired properties (e.g., absence of deadlock)

Error-prone activities, to be repeated several times, for which automatic tools are necessary

Business process lifecycle

Configuration

Configuration :

System Selection

Implementation

Test and Deployment

Evaluation

Administration
and
Stakeholders

Enactment

Design &
Analysis
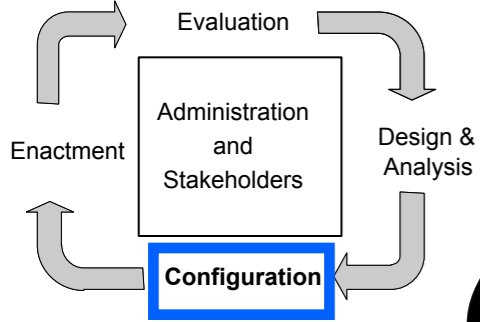
Configuration

Configuration phase

From (verified) business process models to
implementation as

a set of policies, guidelines and procedures
(to be followed by employees)

a dedicated software system
(over a chosen implementation platform: a
business process management system)

Evaluation

Administration
and
Stakeholders

Enactment

Design &
Analysis
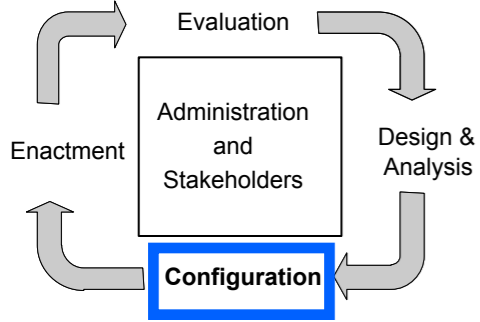
Configuration

Enhanced models

Software systems usually require additional
technical information

The model must be decorated with such data, to be
exploited for configuring the system

Examples: interactions of the employees with the
system, integration of existing systems, wrapping
of legacy software

Evaluation

Administration
and
Stakeholders

Enactment

Design &
Analysis
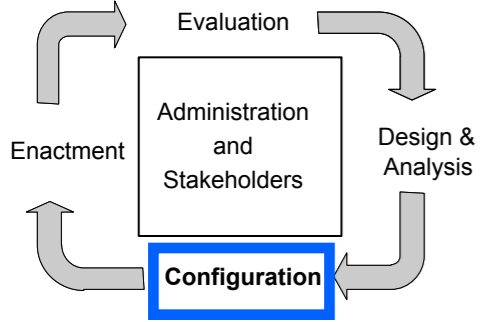
Configuration

Testing

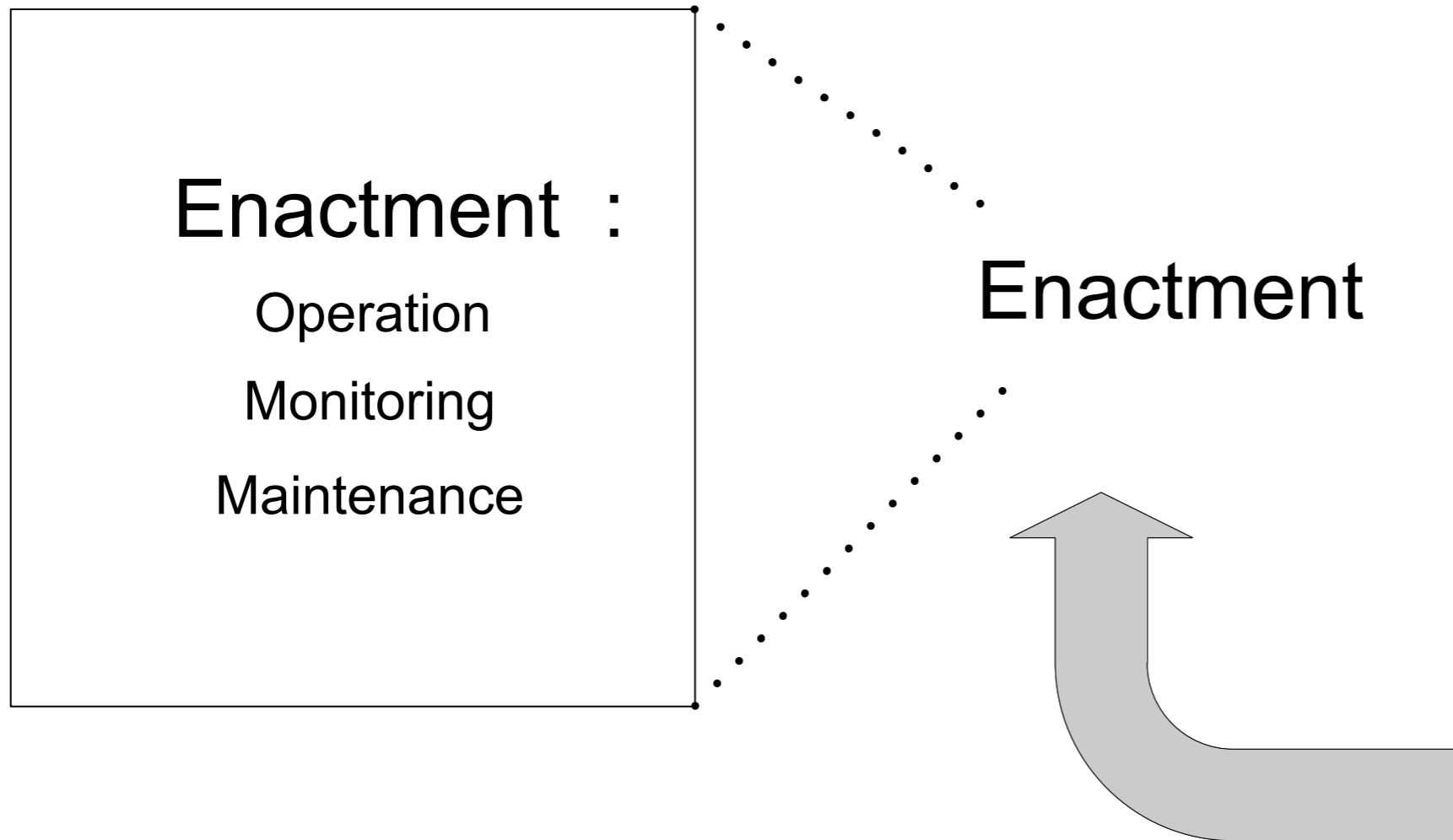When the system is configured,
it must be tested before deployment

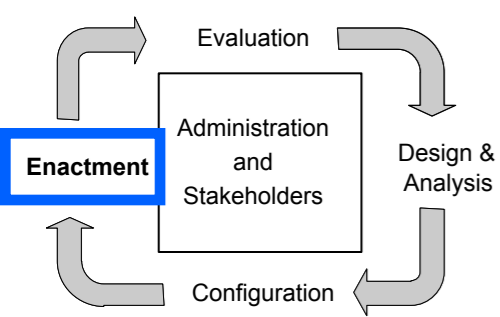Usual testing techniques from sw engineering
Integration tests
Performance tests

Other possible activities: training of personnel,
migration of application data

Business process lifecycle

Enactment :

Operation

Monitoring

Maintenance

Enactment

Evaluation

Administration
and
Stakeholders

Enactment

Design &
Analysis

Configuration

Enactment phase

When the system is deployed,
business process instances can be **enacted**

Typically, each process instance is initiated after
an **event** occurs
(e.g., the receipt of an order)

The system must control and monitor the
execution of all instances according to the model
to guarantee a correct process **orchestration**
(e.g., respecting dependencies)

Evaluation

Administration
and
Stakeholders

Enactment

Design &
Analysis

Configuration
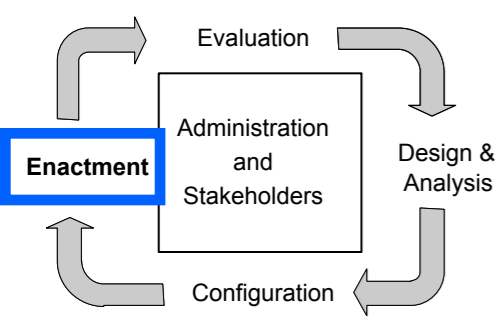
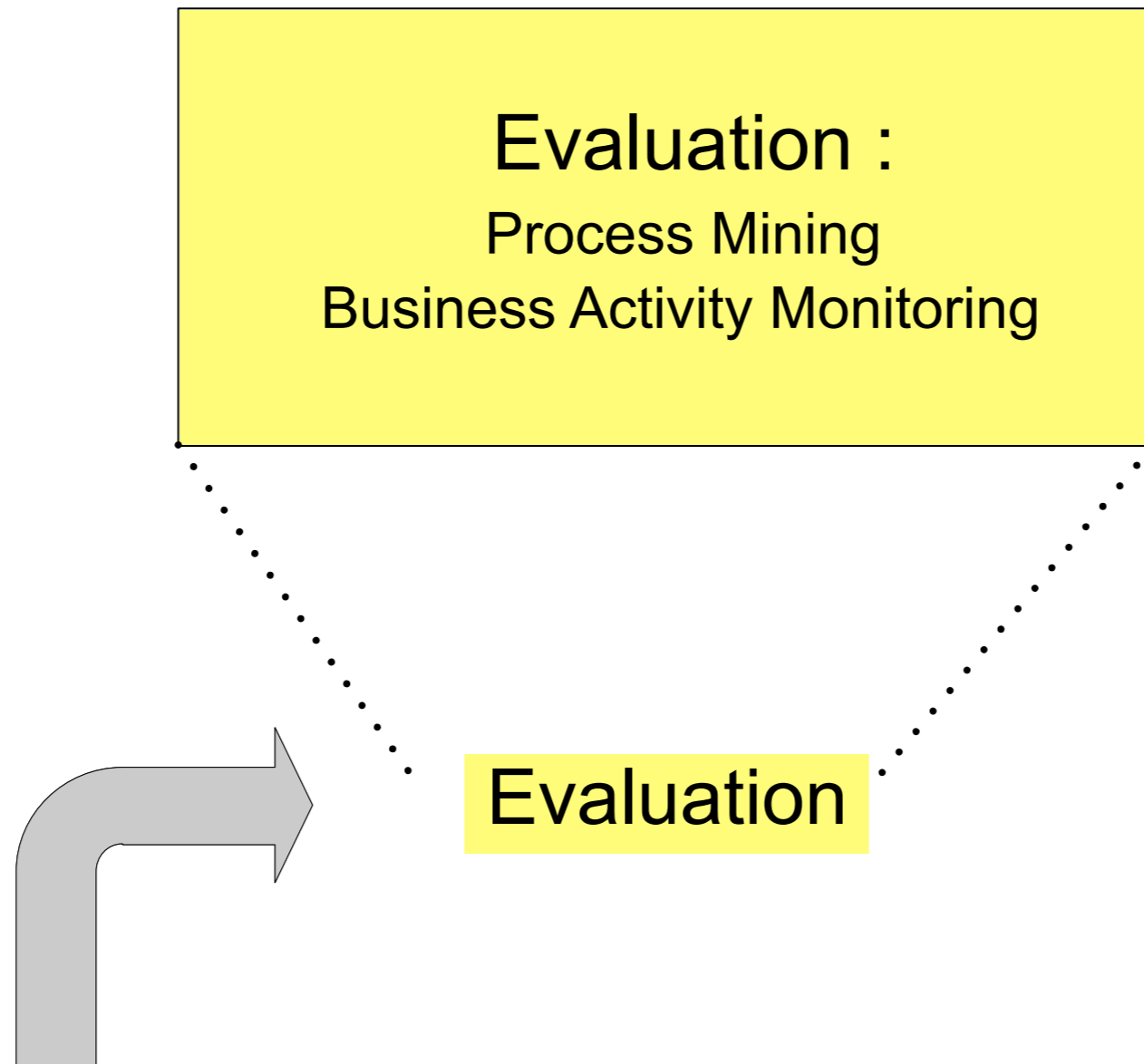# Monitoring

At each moment in time, the current **status** of any instance must be **known** (and **logged**) by the system as accurately as possible
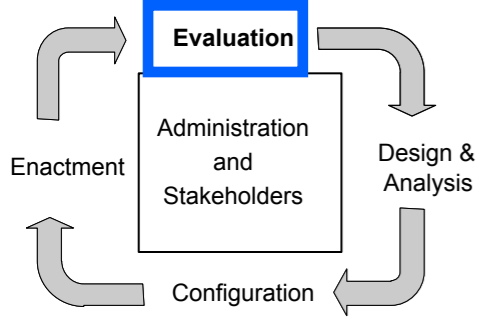
Both for process instances and activity instances

Fancy visualization techniques are usually provided by business process management systems (e.g., coloured activities)

Such information is highly valuable for customers (e.g., tracking of orders)

Business process lifecycle

Evaluation :

Process Mining
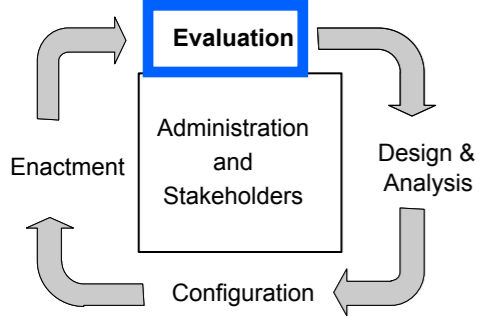Business Activity Monitoring

Evaluation

Evaluation phase

Execution **logs** are of fundamental importance

The information collected during instances enactment can be used to evaluate and improve business process models

Business **activity monitoring** and **process mining** techniques aim at identifying the quality of the model and the adequacy of the environment

BA monitoring

Log files typically include information such as the start / end timestamps of activity instances

Activity monitoring serve to identify that certain activities take too long or need more resources

The same information can be also exploited in the simulation sub-phase of the design and analysis phase

Evaluation

Enactment

Administration
and
Stakeholders

Design &
Analysis

Configuration
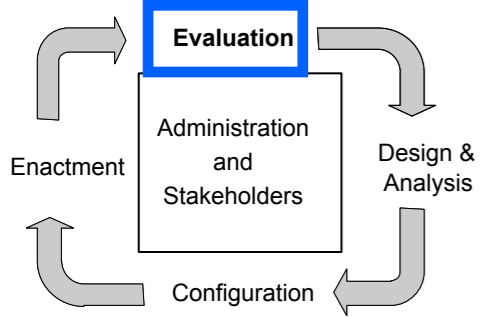
Mining

Process mining has recently turned into an active field of research

Thanks to mining techniques, execution logs can be used for the automatic generation of business process models in the design and analysis phase

They can also be used to assess and compare different models to see which fits best the enacted instances

Business process lifecycle

Administration

and

Stakeholders

Evaluation

Administration
and
Stakeholders

Enactment

Design &
Analysis

Configuration
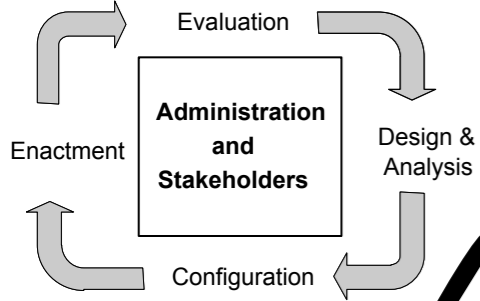
Administration phase

Business process management involves
numerous artifacts
at different levels of abstraction

Such artifacts need to be organized and managed
(storage, retrieval, disposal)

A well-structured repository is needed, with
powerful query mechanisms

Evaluation

Administration
and
Stakeholders

Enactment

Design &
Analysis
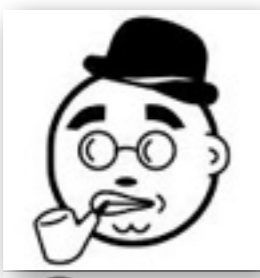
Configuration
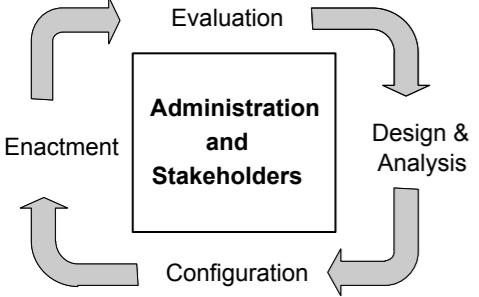
Stakeholders

Several types of stakeholders co-exist in the process domain

They have different kind of educational background, knowledge, expertise, experience

Roughly, they can be classified into a few roles
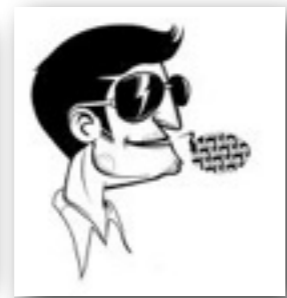
| CPO | BE | PD | PP | KW | PR | SA | Dev |

Chief process officer

Top level management
(CPO reports directly to CEO / board of directors)

Responsible for defining rules, policies and guidelines and establishing control mechanisms

Responsible for standardizing and harmonizing business processes in the enterprise

Responsible of business process evolution in the presence of changing market requirements

Business engineer

Business domain expert

Responsible for defining strategic goals of the company and organizational business processes

Often equipped with non-technical educational background (mostly economics)

It is preferred to communicate with these stakeholders by means of simple-to-use process modeling notation

Process designer

Responsible for modeling business processes by communicating with business domain experts and other stakeholders

Must be equipped with good analytical capabilities and excellent communication skills

Process participants

Conduct the actual operational work during the enactment of business process instances

They are knowledgeable about the activities conducted and thus play a fundamental role for the modeling phase

Their information must be assembled by the process designer to compose an overall picture and put it in the process model

Knowledge worker

Process participants who use software systems to perform activities in a business process, often autonomously

Process responsible

Each business process model is assigned an individual who is held responsible for the correct and efficient execution of all business process instances of this model

Responsible for detecting inefficiencies and improving the process model

Close collaboration with process participants and the process designer is needed

System architect

Responsible for developing and configuring business process management systems on the information system infrastructure at hand

Developers

Information technology professionals

Responsible for creating the software artifacts required to implement business processes

Implementation of interfaces is a relevant part of the work done by developers