



# Business Process Digitalization and Cloud Computing

## 1. Introduction

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October 3, 2016

Computer Science Division

## Education

- Bachelor and Master Degree in Computer Science
- Phd in Computer, Decision, and System Science

## Main Interests

- IoT (energy-aware devices)
- Mobile Cloud Computing
- Business Process
- Formal Verification

## Current Position

- Post-doc at University of Camerino

**What about you?**

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## **General Information**

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- **Teaching Hours:** Monday, Tuesday 15:00 - 17:00
- **Office Hours:** After lesson or by appointment
- **Web site:**  
`http://didattica.cs.unicam.it/doku.php...` [▶ Link](#)
- **Email:** andrea.morichetta@unicam.it

## Prerequisite knowledge:

Business process management and flexibility, BPMN, Choreography, Programming experience

## Course Objectives:

The course introduce the student to the basic **knowledge of Business Process Management** and **workflow management system**. The course then aims at supporting business process within an **application software system** or between a set of application systems, effectively integrated in an enterprise software system architecture. The course introduce the notions of **software oriented architecture** and **cloud computing** useful for the implementation of business process.

## Learning Outcome

- Understanding the importance of **Business Process management system and workflow management system**.
- Know the most common techniques for **implementing** business process.
- Gain some familiarity with **software oriented architecture and cloud principles**.
- Implement business process into a practical **case studies** using software oriented architecture.



- **Evolution of Enterprise Systems Architectures**

- Traditional Application Development
- Enterprise Applications and their Integration
- Workflow Management
- Enterprise Services Computing

- **Understanding SOA**

- Integration of Applications and Data
- Agility, Flexibility, and Alignment
- Architectural Principles and Practices
- What Is Service-Oriented Architecture?
- What Is a Service?

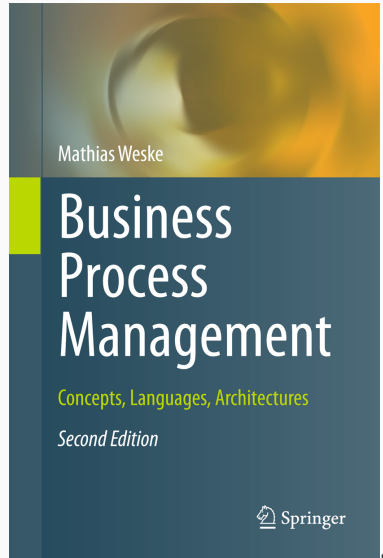
- **Designing SOA for business**

- Starting with the Business
- Designing Service Interfaces
- Designing Service Implementations
- Composing Services
- Using Services to Build Enterprise Solutions

- **Cloud Infrastructures**

- Introduction To cloud
- Cloud Fundamentals
- Cloud Computing Models including Infrastructure/Platform/Software as-a-service
- Public cloud, private cloud and hybrid clouds

- **Business Process Management. Concepts, Languages, Architectures.**  
Weske, Mathias 2007,  
ISBN: 9780321155559.
- **Chapter 2** - Introduction



- **Applied SOA service-oriented architecture and design strategies**

by Michael Rosen, Boris Lublinsky, Kevin T. Smith, Marc J. Balcer,  
ISBN: 0470223650.

- **Chapter - ....**



## Short survey presentation

One scientific topic will be assigned to each group (max 3 people). A short survey on the topic will be performed, and a presentation will be given by the group during the class period. A precise plan of the presentation will be provided.

## Small Software Project

Groups of maximum 2 people will have to choose an open problem, and provide a complete software solution with artifacts. A short report have to be delivered before the oral part. Project selection has to be submitted to my evaluation. In case a group is not able to select a project will have to notify the teacher in advance.

## Oral presentation

## Exam Dates

- 07/02/2017 - 10:30
- 22/02/2017 - 10:30
- 07/06/2017 - 10:30
- 21/06/2017 - 10:30
- 05/07/2017 - 10:30
- 25/07/2017 - 10:30
- 06/09/2017 - 10:30
- 28/09/2017 - 10:30

**Questions?**

# **Introduction to Business Process**

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## Business process

consists of a set of **activities** that are performed in **coordination** in an organizational and technical environment. These activities jointly realize a business goal. Each business process is enacted by a **single organization**, but it may interact with business processes performed by other organizations.

## Business process model

consists of a set of **activity models** and execution constraints between them.

## Business process instance

represents a **concrete case** in the operational business of a company, consisting of activity instances. Each business process model acts as a blueprint for a set of business process instances.

## Business process management

includes concepts, methods, and techniques to support the design, administration, **configuration**, enactment, and analysis of business processes.

## Business process management system

is a generic **software system** that is driven by explicit process representations to coordinate the **enactment** of business processes.

- **Technical challenges**

organizations are **distributed systems** that execute many process instances concurrently in an uncertain environment that includes human intervention and decision making.

- **failures** and **exceptions** occur frequently and re-planning must be integrated with execution
- Need **automated tools** that not only instantiate process templates, but also have the ability to generate **dynamically executable process** templates,

## Workflow

is the **automation** of a business process, in whole or in part, during which documents, information, or tasks are passed from one participant to another for action, according to a set of **procedural rules**.

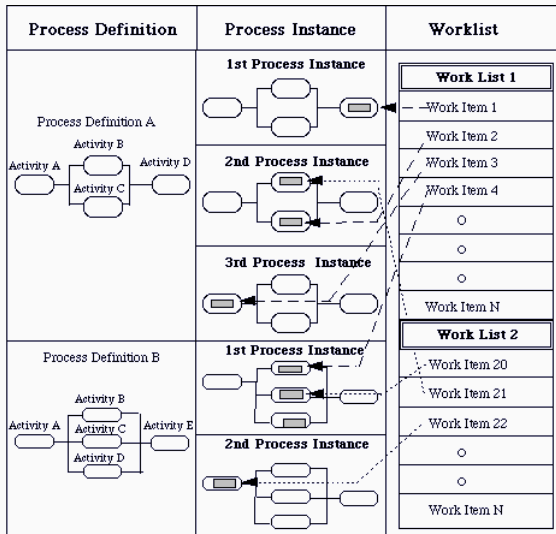
## Workflow management

is a software system that **defines, creates, and manages** the execution of workflows through the use of software, running on one or more workflow engines, which is able to **interpret** the process definition, **interact** with workflow participants, and, where required, invoke the use of IT tools and applications.

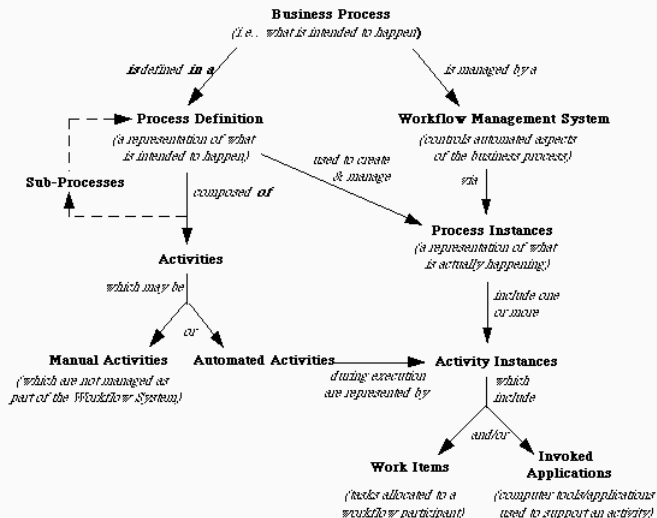
# Business Process VS Workflow

- **Business Processes** are basically **collection of activities** cutting across various departments, producing a valuable output for the customers (e.g. Sales Process, Procurement Process).
- **Workflow** is used to **automate these repetitive activities** and hence business processes. So workflow will bring automation and efficiency to the business process.
  - Workflow is more general term than process. A process has some input and gives some output after performing some series of activities. In contrast, a Workflow shows the flow of activities simply, e.g. flow of document within different departments of an organization. At each stage in the workflow, there may be a specific process.

# Business Process Relationships



# Business Process Relationships

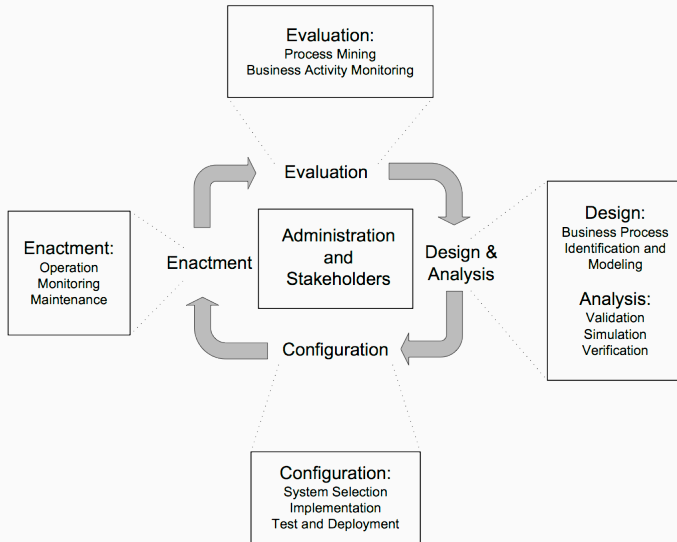


# **Business Process Lifecycle**

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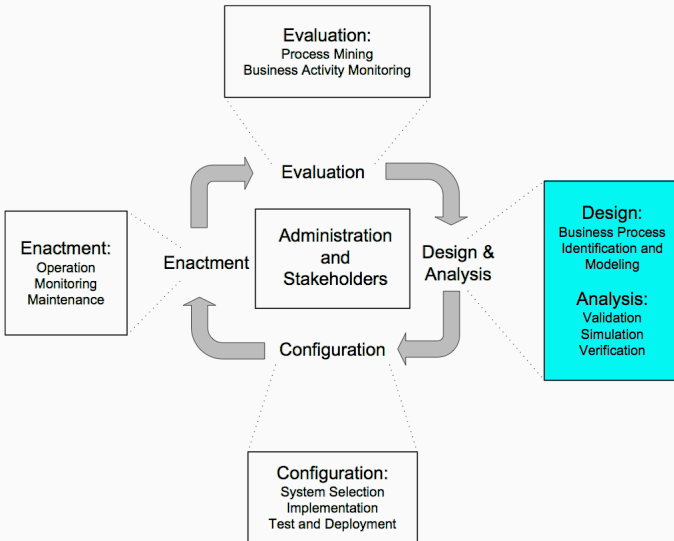


# Business Process Lifecycle



M. Weske: Business Process Management.  
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- Involves **designing**, **modeling**, **evaluating**, **simulating**, **modifying** and **optimizing** processes.
- One must define, for each basic product or service the organization offers, the **activities involved**, the **relationships** among them, their **resource requirements** etc.
- Design decisions are usually made based on **experience** and analogy to previous designs, depending on the **nature** of business, its goals, standards, legacy, infrastructure etc

## Validation

- **Workshops** checking that model captures all possible instances
- **Simulation** reveal model deficits, wrong behaviour

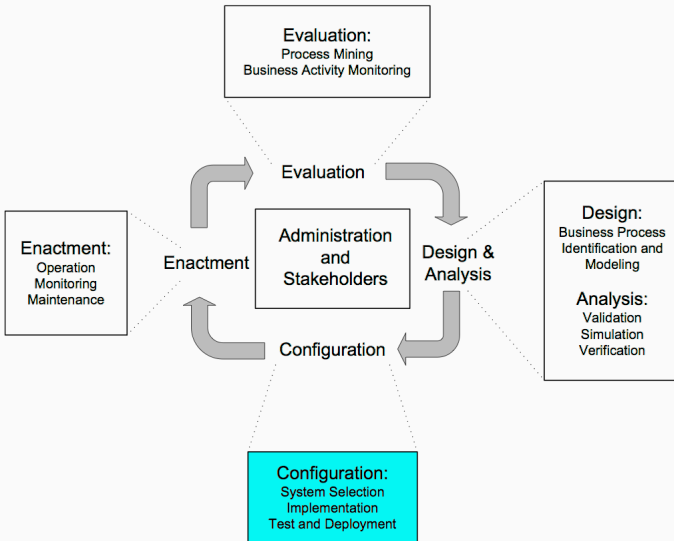
## Simulation

permit to **walk through the process** step-by-step and check if it exposes the **desired behavior** or **deficits**.

## Verification

is used to check for the satisfaction of particular properties (e.g., no deadlocks)

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Business process needs to be implemented:

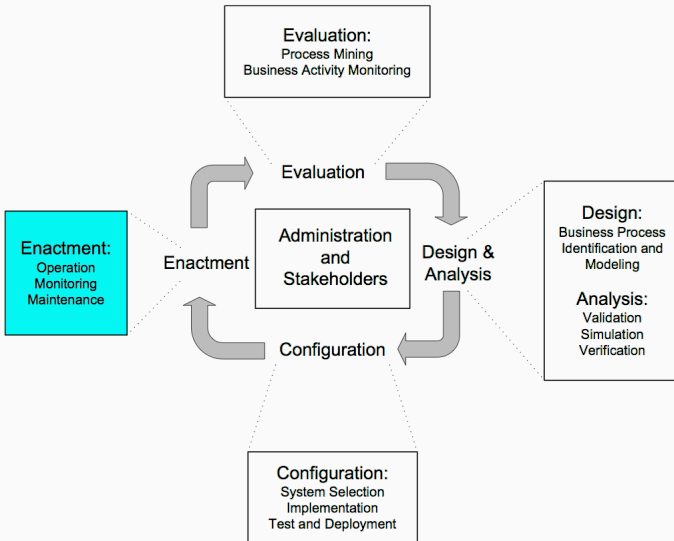
- set of **policies** and **procedures** (without any support by a dedicated business process management system)
- dedicate **software system**. The system should be configured according the organizational environment:
  - **interaction** (employees & system )
  - **integration** (existing software & BPMS)
- **transaction aspects** like atomicity, consistency, isolation and durability (to system failure).

1. Implementation then needs to be **tested** to detect potential runtime problems:

**Integration & performance** tests

2. Finally, the business process system is **deployed** in the target environment
3. Additional steps might be required, such as:
  - **Training** of personnel
  - **Migration** of process data to the new applications

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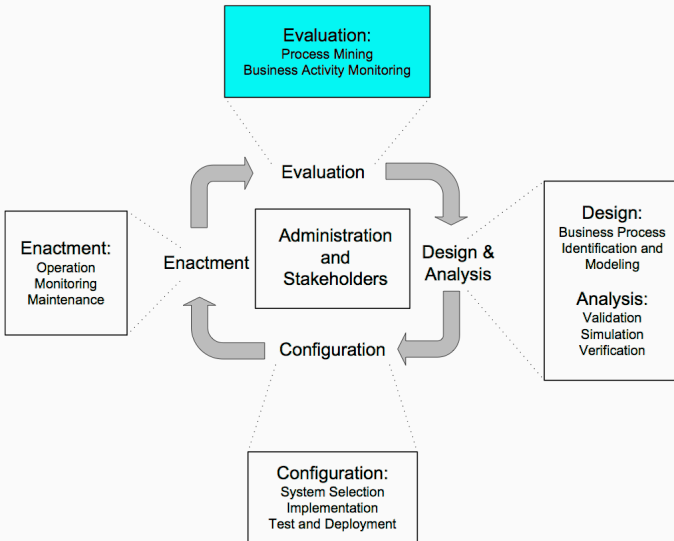
Business process instances are **initiated** to fulfil the business goals of the company.

- **Initiation** usually follows a defined **event** (e.g. receipt of an order)
- Activities have to be **orchestrated** to ensure **correct sequencing** specified in the process model and that **compatible variants** of the activities are performed
- Coordination takes place via mechanisms such as events, **message passing**, **document transfer** etc.

**Process monitoring** provides accurate **information** (e.g., notification about completed tasks, delays, interrupts) on the **status** of process instances (the state in particular) & **statistics** on process performance.

- Log data consist in a set of **log entries** indicating **events** that have **occurred** during the process execution

# Business Process Lifecycle



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Evaluation uses information available to **evaluate** and **improve** business process models and implementation, by means of **process mining** and **analytics**.

- **Quality** of business process models
- **Adequacy** of the execution environment

**Questions?**