Business Process Digitalization and Cloud Computing

1. Introduction

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Computer Science Division

Teacher

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

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General Information

Course Overview

- Teaching Hours: Tuesday 14:00 - 16:00 (AB3)
  Wednesday 16:00 - 18:00 (LA2)
- Office Hours: After lesson or by appointment
- Web site:
  `http://didattica.cs.unicam.it/doku.php...` ▸ Link
- Email: andrea.morichetta@unicam.it

Course Overview

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?

Syllabus

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

- **BPM Platform Camunda**
  - Overview
  - Architecture
  - Modeler
  - Engine
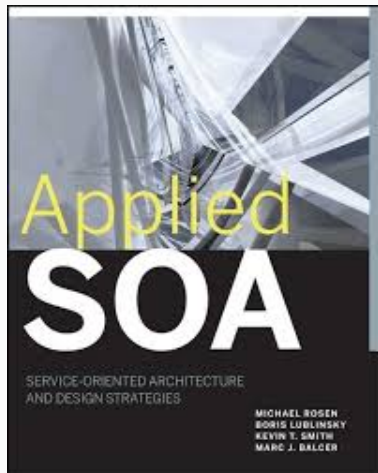 - Runtime
  - Logging
  - Security

- **Business Process Management. Concepts, Languages, Architectures.** Weske, Mathias 2007, ISBN: 9780321155559.
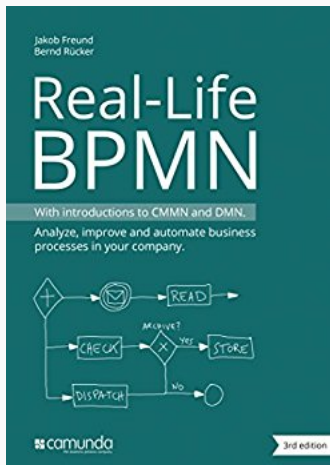
- **Chapter 2** - Introduction
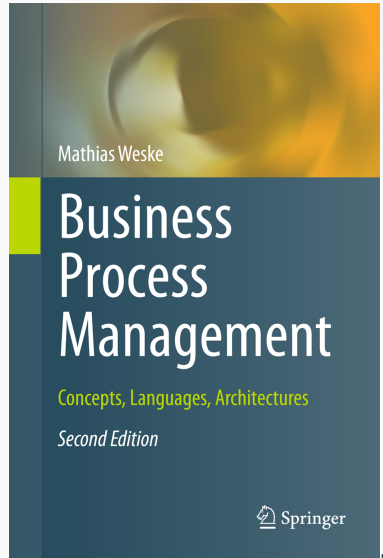
- **Applied SOA service-oriented architecture and design strategies**
  by Michael Rosen, Boris Lublinsky, Kevin T. Smith, Marc J. Balcer,
  ISBN: 0470223650.

- **Chapter** - ....

- **Real-Life BPMN:With
  Introductions to Cmmn and
  Dmn**
  by Jakob Freund, Bernd Rcker
  ISBN: 1541163443

- **Chapter** - ....

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 exam + Project Presentation

Exam Dates

- 06/02/2018 - 11:00
- 21/02/2018 - 11:00
- 06/06/2018 - 11:00
- 20/06/2018 - 11:00
- 11/07/2018 - 11:00
- 25/07/2018 - 11:00
- 12/09/2018 - 11:00
- 26/09/2018 - 11:00
- 10/10/2018 - 11:00

Questions?

Introduction to Business Process

Business process management (BPM)
is a **systemic approach** for:

> capturing,
> designing,
> executing,
> documenting,
> measuring,
> monitoring
> controlling

both **automated and non-automated processes** to meet the **objectives** and **business strategies** of a company.

Companies achieve better results faster and more flexibly

BPMN is important for who wants:

1. to **improve a process** using information technology (IT)
2. **documentation** about company processes
3. to introduce entirely new processes

Business Processes Challenges

- **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,

Business Processes

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.

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.
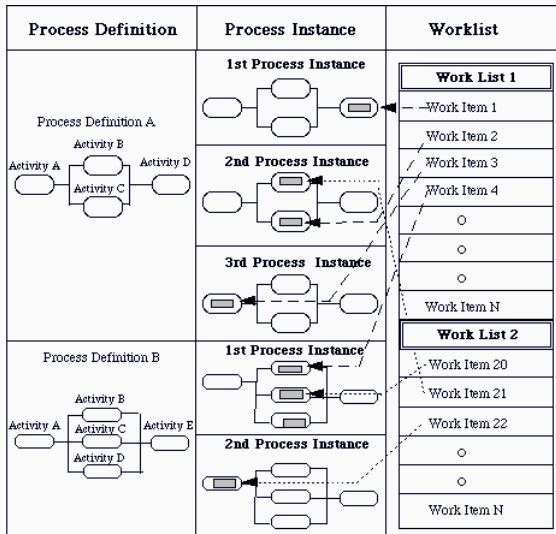
Workflow figure

- **Participant** A resource which performs the work represented by a workflow activity instance. This work is normally manifested as one or more work items assigned to the workflow participant via the worklist.

- **Item** The representation of the work to be processed (by a workflow participant) in the context of an activity within a process instance.

- **Worklist** A list of work items associated with a given workflow participant (or in some cases with a group of workflow participants who may share a common worklist). The worklist forms part of the interface between a workflow engine and the worklist handler

Activities

- **Activity** A description of a piece of work that forms one **logical step within a process**. An activity may be a **manual activity**, which does not support computer automation, or a **automated activity**.
    - **Manual Activity** An activity within a business process which is not capable of automation and hence lies outside the scope of a workflow management system. Such activities may be included within a process definition, for example to support modelling of the process, but do not form part of a resulting workflow.
    - **Automated Activity** An activity which is capable of computer automation using a workflow management system to manage the activity during execution of the business process of which it forms a part.
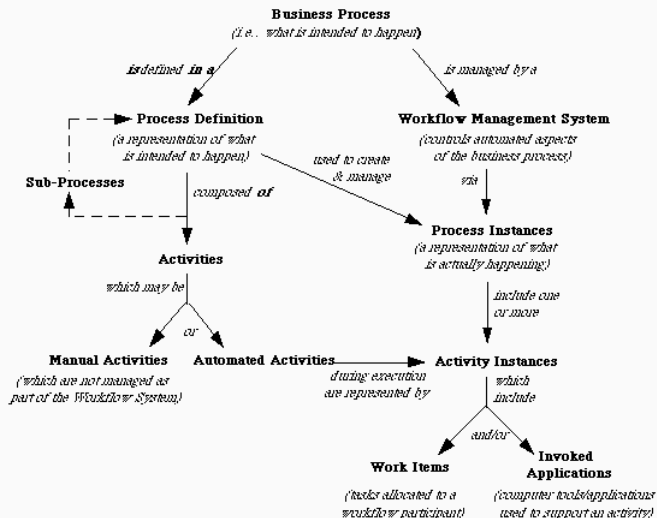
- **Process Instance** The representation of a single enactment of a process.

- **Activity Instance** The representation of an activity within a (single) enactment of a process, i.e. within a process instance.
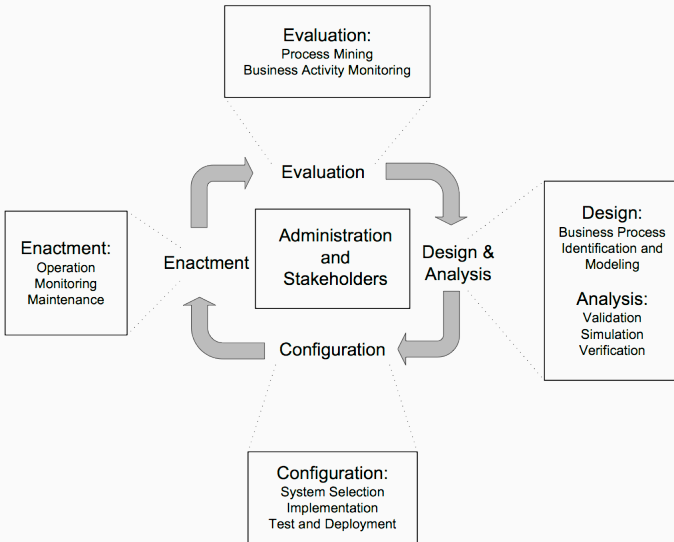
Business Process
(i.e., what is intended to happen)

is defined **in a**

is managed by a

Process Definition
(a representation of what
is intended to happen)

Workflow Management System
(controls automated aspects
of the business process)

used to create
& manage

via

Sub-Processes

composed **of**

Process Instances
(a representation of what
is actually happening)

Activities

include one
or more

which may be

or

Manual Activities
(which are not managed as
part of the Workflow System)

Automated Activities

Activity Instances
which
include

during execution
are represented by

and/or

Work Items
(tasks allocated to a
workflow participant)

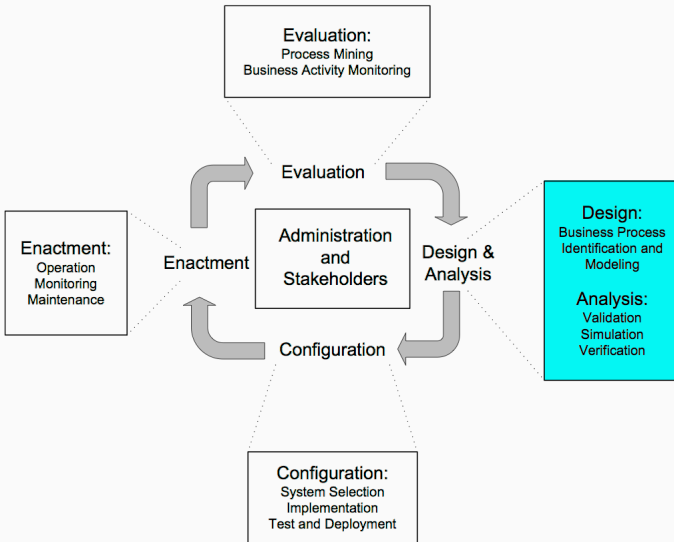Invoked
Applications
(computer tools/applications
used to support an activity)

Business Process Lifecycle

M. Weske: Business Process Management,
© Springer-Verlag Berlin Heidelberg 2012, 2007

Design

- 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. (Check if all valid process instances are reflected by the business process)
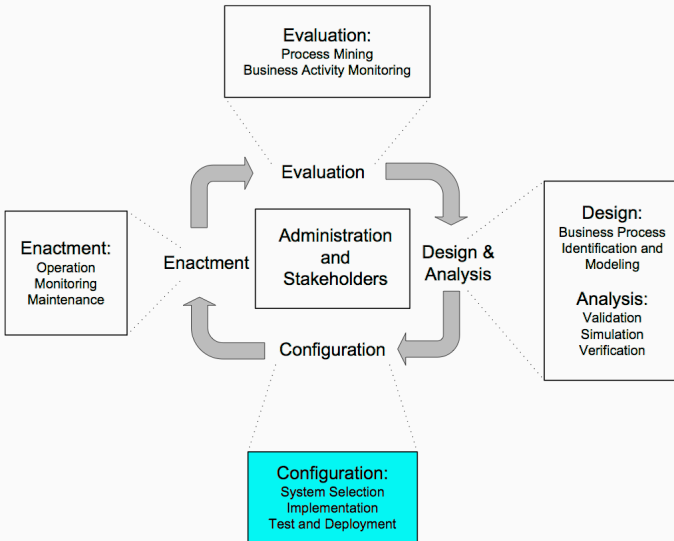
Simulation

allow stakeholders 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)

Evaluation:
Process Mining
Business Activity Monitoring

Evaluation

Enactment:
Operation
Monitoring
Maintenance

Enactment

Administration
and
Stakeholders

Design &
Analysis

Design:
Business Process
Identification and
Modeling

Analysis:
Validation
Simulation
Verification

Configuration

Configuration:
System Selection
Implementation
Test and Deployment

M. Weske: Business Process Management,
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Configuration

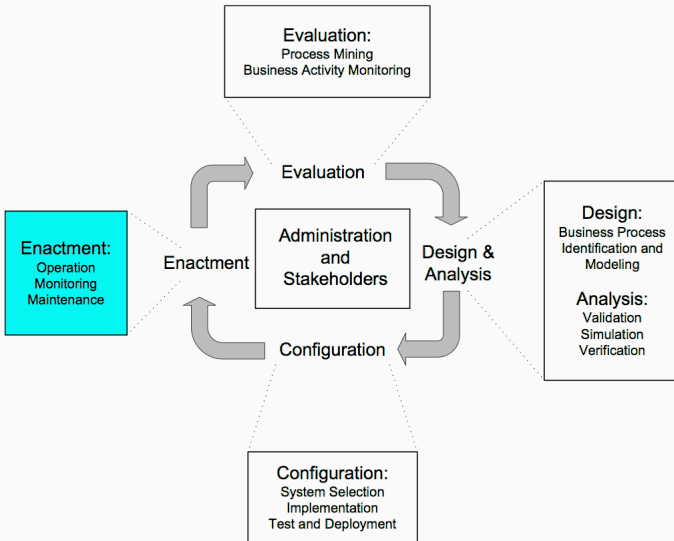Business process needs to be implemented:

- 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).

Configuration: Test

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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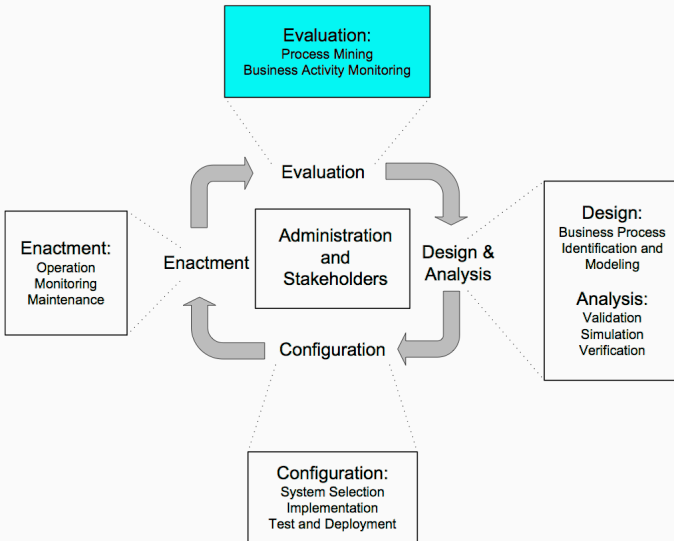
Enactment: operation

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

Evaluation:
Process Mining
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Evaluation uses information available to **evaluate** and **improve** business process models and implementation, by means of **process mining** and **analytics**.
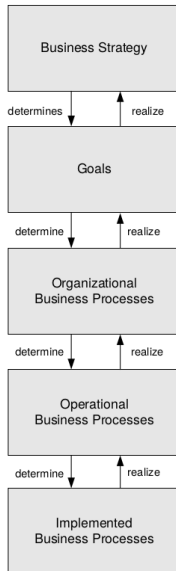
- Quality of business process models
- Adequacy of the execution environment

Classification of Business Process

Classification

- Degree of Automation
- Degree of Repetition
- Degree of Structuring

Questions?