

Business Process Digitalization and Cloud Computing

1. Introduction

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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
- Blockchain Technology

Current Position

- Post-doc at University of Camerino

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Course Overview

- **Teaching Hours:** Wednesday 09:00 - 11:00 (AB1)
Thursday 11:00 - 13:00 (AB1)
- **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 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 (SOA)** and **Blockchain (Smart Contracts)** 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 blockchain 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

- **BPM Platform Camunda**

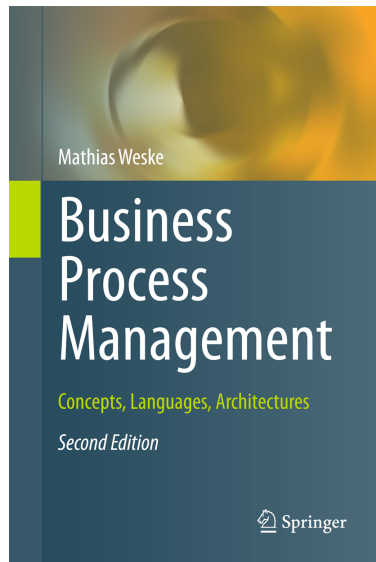
- ▶ Overview
- ▶ Architecture
- ▶ Modeler
- ▶ Engine
- ▶ Runtime
- ▶ Logging
- ▶ Security

- **Blockchain & Ethereum**
 - ▶ Theoretical Background
 - ▶ Ethereum
 - ▶ Smart Contracts
 - ▶ Remix IDE
 - ▶ Experiments

- **Business Process Management. Concepts, Languages, Architectures.**

Weske, Mathias 2007,
ISBN: 9780321155559.

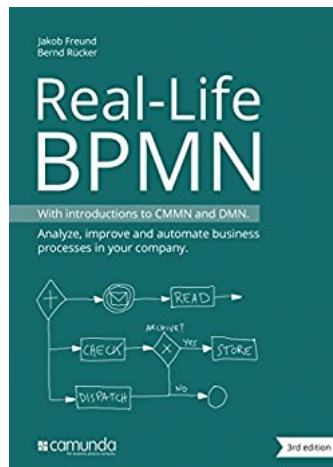
- **Chapter 2** - Introduction



- **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 -**



Software Project

Groups of maximum 2 people will have to choose an open problem or follow the assigned one, and provide a complete software solution with artifacts.

The project need to be discussed with the teacher by mail, sending a small description of the requirements and final goal.

Oral exam + Project Presentation

A report have to be delivered before the oral part.

Exam Dates

- 06/02/2019 - 11:00
- 20/02/2019 - 11:00
- 05/06/2019 - 11:00
- 19/06/2019 - 11:00
- 10/07/2019 - 11:00
- 24/07/2019 - 11:00
- 11/09/2019 - 11:00
- 25/09/2019 - 11:00

Questions?

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

Why?

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
- ④ to automatically deploy and enact new processes system

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 Processes Management

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 Management

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

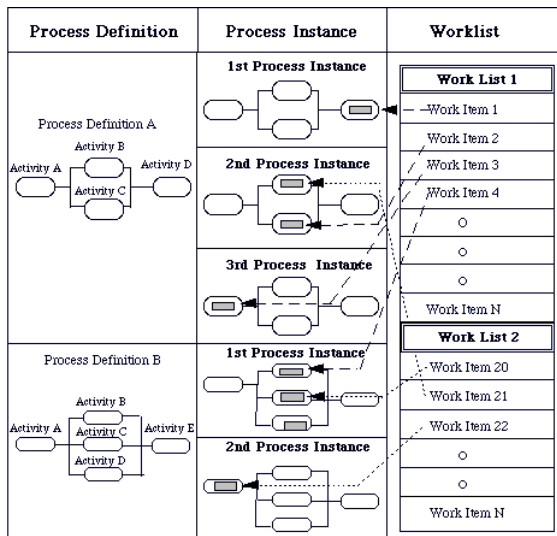
- **Participant** A resource which performs the work represented by a workflow activity instance. This work is normally manifested as one or more work items assigned to the workflow participant via the worklist.
- **Item** The representation of the work to be processed (by a workflow participant) in 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

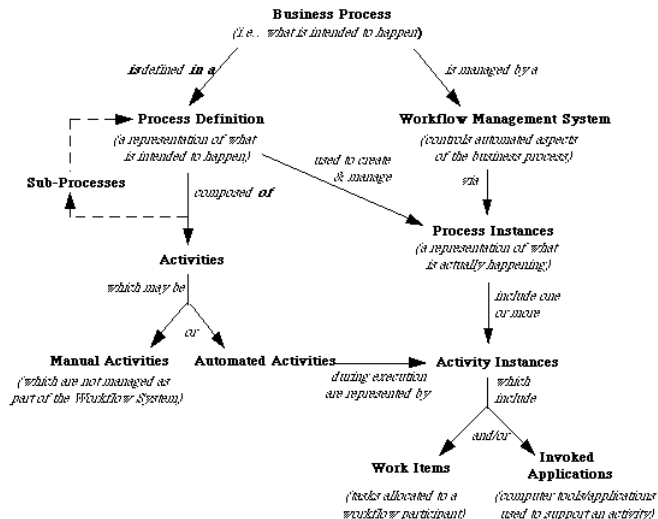
- **Activity** A description of a piece of work that forms one **logical step within a process**. An activity may be a **manual activity**, which does not support computer automation, or a **automated activity**.
 - ▶ **Manual Activity** An activity within a business process which is not capable of automation 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.

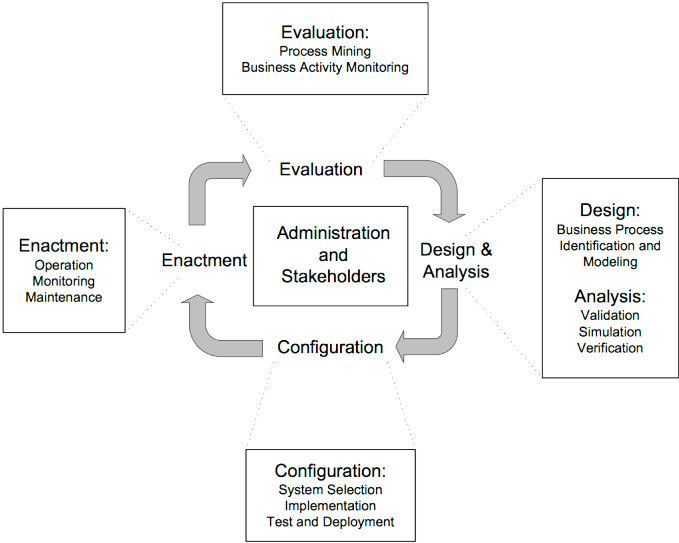
Business Process Relationships



Business Process Relationships

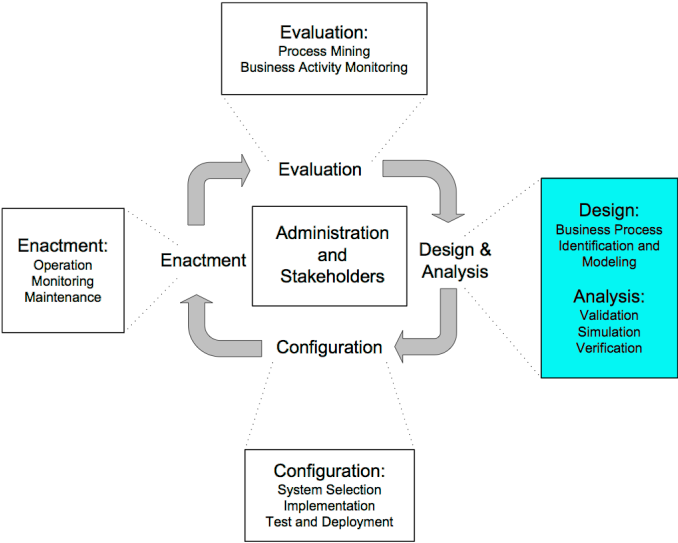


Business Process Lifecycle



M. Weske: Business Process Management,
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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)

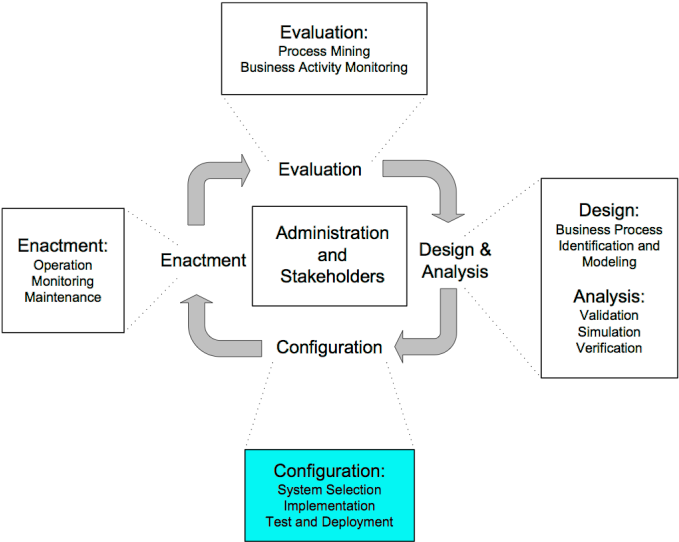
Simulation

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)

Business Process Lifecycle



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

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).

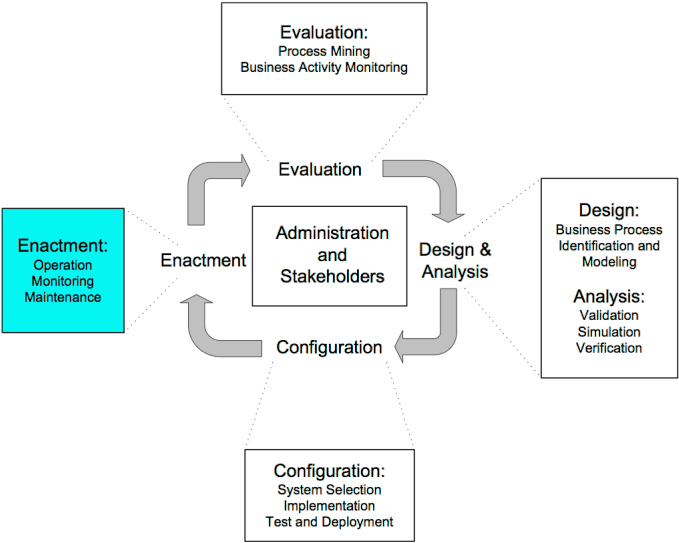
Configuration: Test

- 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

Business Process Lifecycle



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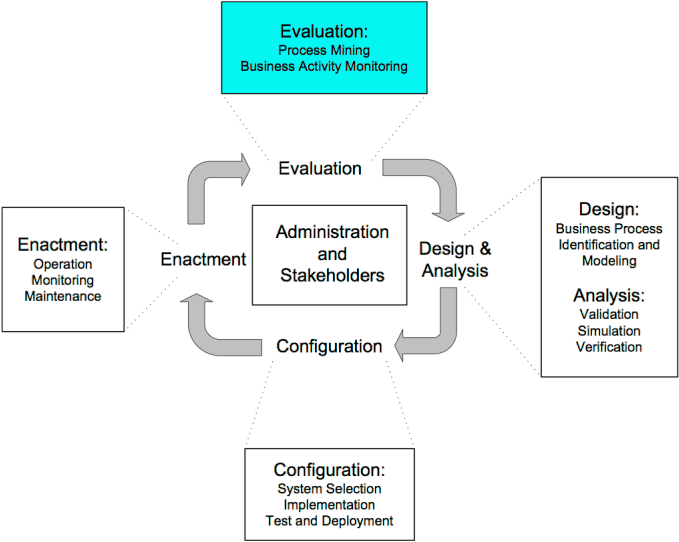
Business process instances are **initiated** to fulfil the business goals of the company.

- **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

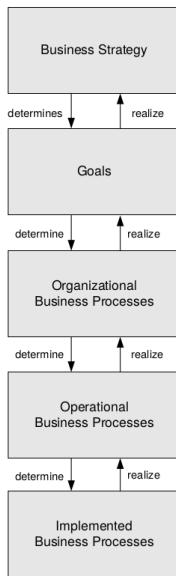


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Evaluation uses information available to **evaluate** and **improve** business process models and implementation, by means of **process mining** and **analytics**.

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

Organization vs Operational



Classification

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

Questions?