Business Process Management (BPM)

Day 1: Introduction to BPM & BPMN

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(invited lecturer: Marlon Dumas)
Course Objective

The objective of this course is to introduce the principles and methods of business process management.

The course emphasises the role of business process modelling as an instrument to understand and analyse business operations, and to drive the design of Information Technology solutions to support the automation of business processes.
Structure of the Course

• Five sessions
  1. 05.09 – Introduction to BPM and BPMN
  2. 20.09 – Advanced BPMN
  3. 04.10 – Process Analysis & Improvement
  4. 01.11 – Process Automation
  5. 15.11 – Process Mining

• Four homeworks worth 10 points each
• Exam (60 points)
## Agenda for Today

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<tr>
<th>Time</th>
<th>Contents</th>
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<tr>
<td>14.00-15.40</td>
<td>Introduction to BPM</td>
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<td>15.40-15.50</td>
<td>Break</td>
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<td>15.50-17.30</td>
<td>Introduction to Process Modeling and BPMN</td>
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Part I

Introduction to Business Process Management
BPM: What is it?

Body of methods to design, analyze, execute and monitor business operations involving humans, software, information and physical artifacts using process models.
So What is a (Business) Process

“a collection of activities that takes one or more inputs and creates an output that is valuable to a customer.”
Hammer & Champy, 1993 ("Reengineering the Corporation")

“any work that is recurrent, requires coordination, affects some aspect of organizational capabilities, can be accomplished in different ways that make a difference in terms of cost, value, service or quality.”
Peter Keen, 1997 ("The Process Edge")

“Collection of inter-dependent activities whose collective performance is intended to achieve a goal such as delivering a product or a service.”

Examples:
• Order-to-Cash
• Procure-to-Pay
• Claim-to-Resolution
“My washing machine won’t work!”

fault-report-to-resolution process

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Origins of BPM

- Organisational Management
  - Smith, Taylor, Ford, Sloan

- Operations Management
  - MRP II, Kanban, Optimized Production Technology (OPT)

- Business Process Re-Engineering
  - Hammer & Champy, Davenport & Short

- Quality Management
  - Total Quality Management (TQM), Six Sigma

- Business Process Automation (BPA)
Organisational Management
- Adam Smith (1776)

Observation: “a number of specialized workers, each performing a single step in the manufacture of a pin, could make far more pins in a day than the same number of generalists.”

Quoted from Hammer & Champy 1993
Rationale for the Process View

• Division of labor rationale: by focusing on fewer tasks ⇒
  – Workers’ skill level goes up ⇒ work faster
  – No time lost when workers switch between tasks
  – Workers can help develop better techniques and tools

• Weaknesses of functional org. and division of labor:
  – Focus on skills and resource utilization rather than work output
  – Reward systems tailored for the functional unit not the overall firm
  – Group behavior and cultures fostering an “us versus them” mentality
  – Decentralization ⇒ “firms within the firm” with their own agenda

• Relative strengths of a process view
  – Focus on work output ⇒ reduced risk for sub-optimization
  – Helps break down barriers between departments

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Complementarity of Functional and Process Views

[after Rummler 1984]
Why BPM?

“The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency.”
Why BPM?

Information Technology

Yields

Process Change

Enables

Yields

Business Value

Index Group (1982)
Why BPM?

Improving Business Processes = #1 business priority for CIOs internationally, 4 years in a row...

<table>
<thead>
<tr>
<th>Top 10 Business Priorities 2009</th>
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<td>Please select the top five business priorities for your enterprise/business unit in 2009?</td>
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<tr>
<td>Improving business processes</td>
<td>1</td>
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<tr>
<td>Cutting enterprise costs</td>
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<td>Improving enterprise workforce effectiveness</td>
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<td>Attracting and retaining new customers</td>
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<td>Increasing the use of information/analytics in decision making</td>
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<td>Creating new products or services (innovation)</td>
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<td>Managing enterprise change initiatives</td>
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<td>Targeting customers and markets more effectively (more effective service delivery)</td>
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<td>Expanding current customer relationships (expanding “wallet share”)</td>
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<td>Consolidating business operations</td>
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When to do BPM?

• BPM most valuable when considering cross functional processes
  • Challenging coordination issues
  • Process inefficiencies often related to handing off work from one station or person to another – delays and errors – or errors caused by incorrect data transfer

• Two complementary families of BPM approaches
  • Continuous Process Improvement (CPI) – Incremental Change
  • Business Process Reengineering (BPR) – Radical Change
CPI vs BPR

• **CPI**
  - Change that brings a process closer to its normal operating standards
  - Does not question the fundamental assumptions and rules that define the current process design
  - Deductive approach

• **BPR**
  - Questions existing assumptions and rules
  - Requires new perspectives to generate innovative solutions with potential for breakthrough improvements
  - Inductive approach

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Continuous vs. Radical Improvement

- Incremental Improvement
- Radical Improvement

Theoretical Capability

Statistical Process Control

Time

Improvement
BPR vs. CPI

- BPR: impact high, frequency low
- CPI: impact low, frequency high

Diagram:
- Chaos at high impact
- Stagnation at low impact

Graph:
- Change over time
- CPI and BPR trajectories
How to do BPM?

Strategy / Goals

Achieving

To-Be

Utilising (Strengths Enablers)
- IT
- Knowledge
- People
- Ability to change
- Culture

Overcoming (Weaknesses Opportunities)
- Issues
- Barriers

As Is

Guidelines

Learning

Best Practice

- Reference Models
- Benchmarking
- Ideal models
- Study tours

Capabilities
Here’s Where Technology Kicks in..
Simplified Business Process Lifecycle

- Process identification
- Process modelling (as-is)
- Process analysis
- Process re-design (to-be)
- Process implementation
- Process execution
- Process monitoring/controlling

Process Modeling Tools

Process Management Systems
Example – Claims Handling in a Large Insurance Company

• Pilot project – claims handling for replacement of automobile glass
• Springboard for later, more ambitious redesign efforts
• Set up procedure
  1. The CEO appoints an executive sponsor to lead the project
  2. Team members are handpicked by the CEO and the sponsor
  3. The team creates a flowchart of the existing process
• Under the existing process the client may have to wait 1-2 weeks before being able to replace the damaged auto glass

⇒ Goal – A radical overhaul and improvement of the process to shorten the client waiting time
Overview of the existing claims process

- Client
- Local independent agent
- Claims processing center

Request additional information

Pay

Notify agent

Give instructions

File claim

Forward claim

Request quote

Provide quote

Approved glass vendor

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Existing claims process

1. Client notifies a local agent that she wishes to file a claim. She is given a claims form and is told to obtain a cost estimate from a local glass vendor.

2. When the claims form is completed the local agent verifies the information and forwards the claim to a regional processing center.

3. The processing center logs the date and time of the claim’s arrival. The data is entered into a computer-based system (for record keeping only) by a clerk. The claim is then placed in a hard copy file and passed on to a claims representative.

4. a) If the claims representative is satisfied with the claim it is passed along to several others in the processing chain and eventually a check is issued and sent to the client.

   b) If there are problems with the claim the representative mails it back to the client for necessary corrections.

5. When the client receives the check she can go to the local glass vendor and replace the glass.
New Recommended Design

- Client
  - Call in claim
    - Notify
    - Pay
  - Schedule repair
    - Approved glass vendor
      - Claims processing center
Procedural changes to the new process

- The Claims representative is given final authority to approve the claim.
- Long term relationships with a limited number of glass vendors enables the insurance company to leverage its purchase power to pre-negotiate low prices.
  ⇒ Clients no longer have to collect estimates.
  ⇒ Vendors are certified for quality, price, reliability, etc.
- The Client now contacts the claims representative directly instead of going via a local agent.
Structural changes to the new process

• A new 24 hour hotline enables the client to speak directly to a claims representative at the regional processing center.
• The claims representative gathers data over the phone, enters the data into the computer and resolves any issues on the spot. He tells the client to expect a phone call from a certain glass vendor to arrange the replacement.
• The claims information is immediately available for the accounting department and they can start processing the check and send it to the vendor.
Benefits of redesigned process

• The client can have the glass replaced within 24 hours
  – As opposed to 10 days
• The client has less work to do
  – Only one phone call, no need for a cost estimate
• Problems handled immediately when the claim is filed
• Lost or mishandled claims virtually disappear
• Less people involved in the process ⇒ lower op. costs
• Long term relationships with glass vendors
  ⇒ Savings of 30-40% on paid claims due to discounts
  ⇒ More consistent and reliable service
• Claims representative feels ownership of the process
• Question: Is this change CPI or BPR?
A key step in process re-design is classifying of the process activities

- Crucial in identifying waste and inefficiencies in existing processes

Two basic classification approaches:

- **Value-Adding**
  - Non-Value Adding
    - Handoff
    - Delay
    - Rework
  - Business Value Adding
    - Control
    - Policy compliance

- **Value-Adding**
  - Non-Value Adding
    - Handoff
    - Delay
    - Rework
  - Control
  - Policy compliance
Activity Classification

• Customer value-adding activities
  – Essential in order to meet customer expectations
  – Activities the customer would be willing to pay for
  – Involves doing the right things right
    – Performing the right activities
    – Doing them correctly, with high efficiency

• Business value adding activities
  – Control activities
  – Do not directly add customer value but are essential to conducting business

• Non-value adding activities
  – Activities the customer is not willing to pay for
Elimination of non-value adding activities is a key first step in redesigning business processes
  – Often achieved through task or activity consolidation

Task and activity consolidation reduces
  – Hand-offs
  – Need for control activities
  – Process complexity
Process Re-Design and Performance Metrics

• Another key step in process re-design is determining what to improve
  – Performance must be measured against the stated objectives

Profit maximizing firms

Overarching objective is usually to maximize long term shareholder value

Maximize revenues and minimize costs

Satisfying customer needs in an efficient way

Well designed business processes

Non-profit organizations

A common objective is survival and growth while satisfying customer needs

Must use resources efficiently while understanding customer needs

Satisfying customer needs in an efficient way

Well designed business processes
Let’s get our hands to work…

- June 2009 exam, question 5(b)
Part II

Introduction to Business Process Modeling
Your Modelling Experience

• Who is familiar
  – with data modelling?
  – with object-oriented modelling?
  – with process modelling?
  – other modelling?
What is a Model?
Purposes of Process Modeling

- Process Improvement
- Compliance / Risk Management
- Knowledge Management
- Process Cost Analysis/Simulation
- Enterprise Architecture
- Software Evaluation/Selection
- Document Management
- Workflow Management
- Enterprise Systems
- Process Documentation

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Popular Process Modelling Purposes

Recker et al. (2005)
Process Modeling Languages

• For business analysts
  – Business Process Modelling Notation (BPMN)
  – Event-driven Process Chains (EPC)
  – IDEF0, IDEF3
  – Flowcharts, data-flow diagrams (system analysis)
  – UML Activity Diagrams (system analysis)

• For business programmers
  – Business Process Execution Language (BPEL)
  – Yet Another Workflow Language (YAWL)
  – State machines and variants

And many, many more…
Purposes of Process Modeling

**Abstract Models**
EPC, BPMN
Communication, simulation, activity-based costing...

**Detailed Models**
BPEL, State Machines...
Data types, conditions, data mappings, fault handling...
Integration, testing, deployment...

- Organizational Analysis
  - “AS IS” Process Models
- Process Analysis & Design
  - “TO BE” Process Models
- Process Evaluation
- Process Implementation
- Process Enactment & Monitoring
- Measures for Improvement
  - Target Values
- Executable Process Models
  - Process Metrics
BPMN

- Business Process Modeling Notation
- Originally developed by Business Process Management Initiative (BPMI)
- Handed over to Object Management Group (OMG) in 2005
- Inspired by cross-functional flowcharts
- Supported by many tools:
  - IBM Websphere Business Modeler
  - ARIS, Oracle BPA
  - Telelogic System Architect (now IBM)
  - ITP Commerce Process Modeler for Visio
  - Oryx (http://bpt.hpi.uni-potsdam.de/Oryx)
  - Savvion, Lombardi, BizAgi, ...
BPMN from 10 000 miles…

- A process model in BPMN is called a Business Process Diagram (BPD)
- A BPD is essentially a graph consisting of four types of elements (among others):
Example

An Order Management process is triggered by the reception of a purchase order from a customer. The purchase order has to be checked against the stock to determine the availability of the product(s) requested. Depending on stock availability the purchase order may be confirmed or rejected. If the purchase order is confirmed, the goods requested are shipped and an invoice is sent to the customer.
Order Management Process in BPMN

- Check stock availability
- Confirm order
- Reject order
- Send invoice
- Ship goods
A little bit more on gateways ...

- **Exclusive Decision / Merge**
  - Indicates locations within a business process where the sequence flow can take two or more alternative paths.
  - **Only one** of the paths can be taken.
  - Depicted by a diamond shape that *may* contain a marker that is shaped like an “X”.

- **Parallel Fork / Join**
  - Provide a mechanism to synchronize parallel flow and to create parallel flow.
  - Depicted by a diamond shape that *must* contain a marker that is shaped like a plus sign.
Revised Order Management Process

1. Check stock availability
   - Reject order
   - Confirm order
     - Send invoice
     - Ship goods

BPMN Exercise 1:
Claims Notification process at a car insurer

When a claim is received, it is first checked whether the claimant is insured by the organization. If not, the claimant is informed that the claim must be rejected. Otherwise, the severity of the claim is evaluated. Based on the outcome (simple or complex claims), relevant forms are sent to the claimant. Once the forms are returned, they are checked for completeness. If the forms provide all relevant details, the claim is registered in the Claims Management system, which ends the Claims Notification process. Otherwise, the claimant is informed to update the forms. Upon reception of the updated forms, they are checked again.
Process Modelling Viewpoints

Organization

Who?

When?

Process

Which?

Data / Service / Product

What? Function
Process Modelling Viewpoints

*Functional perspective*
  What tasks/function are happening in the process?

*Control-flow perspective*
  In what order do they occur?

*Resource perspective (also called organisational perspective)*
  Who performs which activity?

*Data perspective*
  What data are created/produced by the process?
Organisational Elements in Process Models

Basic abstractions:

- **Resource** (participant, actor, user, agent)
  A resource can execute certain tasks for certain cases. Human and/or non-human (e.g. printer).

- **Resource class**: Set of resources with similar characteristics
  A resource class is typically either a:
  - **Role** (skill, competence, qualification)
    Classification based on what a resource can do or is expected to do
  - **Group** (department, team, office, organizational unit)
    Classification based on the organization.
Roles vs. Groups

Eindhoven
Purchase

Sales

Amsterdam

groups

roles

Kees
Mies
 Koos
Pim
Truus
Sjaak
Ivone
Ad
Jan
Anita
Frank

Secretary
Manager
Sales_clerk
Office_worker

© Wil van der Aalst
Resource Modelling in BPMN

• In BPMN, resource classes are captured using:
  – Pools – independent organisations or organizational units
  – Lanes – tightly connected roles or groups
BPMN Elements – *Pools*

- *Pools* represent business process participants. They are used to partition a set of activities.
  - Can be a business *entity* or a business *role*.

- Sequence flows cannot cross the boundaries of a Pool.

- Interaction between Pools are captured through *Message Flows*. 
BPMN Elements – Message Flows

- **Message Flow**
  - Depicted by a dashed line with an open arrowhead.
  - Represent the flow of messages between two separate process participants.

- A Message Flow can cross the boundaries of Pools.

- A Message Flow can connect directly to the boundary of a Pool.
Order Management example (ctd.)

• The Order Management process now includes the customer as a process participant...

The Order Management process is started when a customer places a purchase order. The purchase order has to be checked against the stock re the availability of the product(s). Depending on stock availability the purchase order may be confirmed or rejected. If the purchase order is confirmed, the goods requested are shipped and an invoice is sent to the customer. The customer makes then makes the payment.
Order Management BPD with Swimlanes

Customer

1. Place purchase order
2. Make payment
3. Invoice

Supplier

1. Purchase order
2. Check stock availability
3. Confirm order
4. Send invoice
5. Ship goods
6. Reject order

Order Rejection Notification

Shipment notification
BPMN Elements – *Swimlanes*

- *Lanes* represent sub-partitions *within* a pool. They are used to organize and categorize activities.
  - Horizontal vs. vertical
  - Meaning is not specified by BPMN, Lanes are often used for internal roles (e.g., Manager, Associate), systems (e.g., an enterprise application), an internal department (e.g., shipping, finance), etc.
- Both Sequences Flow and Message Flow can cross the boundaries of Lanes.
- Lanes can be nested:
  - E.g., an outer set of Lanes for company departments and then an inner set of Lanes for roles within each department.
Order Management example (ctd.)

- The process now includes two departments within the supplier organization...

  The purchase order received by the Sales & Distribution department has to be checked against the stock. The order details are sent to the Warehouse department that returns an availability notification. If the purchase order is confirmed, the Warehouse department collects the shipping details from the customer and ships the goods. The Sales & Distribution department sends an invoice to the customer who then makes the payment.
Corresponding BPD
BPMN Exercise 2: Lanes, Pools

• Claims Handling process at a car insurer
  A customer submits a claim by sending in relevant documentation. The Notification department checks the documents for completeness and registers the claim. The Handling department picks up the claim and checks the insurance. Then, an assessment is performed. If the assessment is positive, a garage is phoned to authorise the repairs and the payment is scheduled (in this order). In any case (whether the outcome is positive or negative), a letter is sent to the customer and the process is considered to be complete.
BPMN Artifacts

- **Data Objects** are a mechanism to show how data is required or produced by activities.
  - Represent input and output of a process activity.

- **Annotations** are a mechanism for the modeller to provide additional text information to the diagram reader.
  - Text annotations do not affect the flow of the process.

- **Groups** are a visual mechanism to logically group diagram elements informally.
BPMN Connections

• **Associations** are used to link artifacts such as text or data objects with flow objects.
  – Are depicted by a dotted line.
  – Can be directed or undirected.
• They can be used to show inputs and outputs of activities.
Order Management example (ctd.)

• Let’s have a look at some artifacts...

  The Purchase Order document serves as an input to the stock availability check. Based on the outcome of this check, the status of document is updated, either to “approved” or “rejected”.

  Include the relevant documents in the process model. Also, for visualization purposes, all parts of the processes that use or update the purchase order should be highlighted.
Order Processing Model with Artifacts
BPMN Exercise 3: Artifacts

The report related to the car accident is searched within the Police Report database and put in a file together with the claim documentation. This file serves as input to a claims handler who calculates an initial claim estimate. Then, an action plan is created based on a checklist available in the Document Management system. Based on the action plan, a claims manager tries to negotiate a settlement on the claim estimate. The claimant is informed of the outcome, which ends the process.

Please depict all relevant documents in the model. Also visualize activities that are performed by the claims handler.
Homework

- BPMN Modeling Exercises (see course web site)
- To be returned to Vambola Leping during the next session
- Reading: M. Hammer’s Don’t Automate, Obliterate! (check course’s web site for details)
Readings and Resources

• Reference book

• Other course material, readings & resources available at: