Digitalization of Business Processes
Business Process Categories

Business Processes

- Human-intensive processes
  - People-intensive processes
  - Decision-intensive processes
  - Document-intensive processes
- Integration-intensive processes

Source: Forrester
“Types of BPM”

- **Human-centric BPM**
  - require people to get work done by relying on and interacting extensively with business applications, databases, documents, and other people (via collaboration tools).
  - require human intuition or judgment for decision-making during individual steps in the business process.

- **Integration-centric BPM**
  - manages the interactions between packaged applications, custom applications, external applications, and occasionally, the people that use them.

Source: Forrester
System-/integration intensive processes

These business processes involve

♦ high volume of transactions
♦ need to integrate with other systems
♦ high degree of straight-through processing
♦ very limited human interaction

Source: The Forrester Wave™: Human-Centric BPM for Microsoft Platforms, Q4 2007
People-intensive processes

- These involve a high level of interaction among individuals for routing, approving, and fulfilling requests.
  - high degree of human interaction
  - need for human intuition or judgment
  - high rate of exception handling.

Source: The Forrester Wave™: Human-Centric BPM for Microsoft Platforms, Q4 2007
Decision-intensive processes

- These complex processes involve
  - gathering information
  - automatic and manual scoring
  - mission-critical decision-making.

- Insurance and financial services companies that have high-value processes with important decisions should make this process type their highest priority.

Source: The Forrester Wave™: Human-Centric BPM for Microsoft Platforms, Q4 2007
Document-intensive processes

- These processes require users to
  - review documents for approval
  - enter data from documents into a back-office system
  - make decisions.

- Action is driven by information
  - found in scanned images or electronic forms or
  - electronic documents created in office tools or applications

Source: The Forrester Wave™: Human-Centric BPM for Microsoft Platforms, Q4 2007
# Business Process Categories

## Types of business processes

<table>
<thead>
<tr>
<th>Integration-intensive</th>
<th>People-intensive</th>
<th>Decision-intensive</th>
<th>Document-intensive</th>
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### Characteristics

- **Integration-intensive**
  - Strong focus on automating processes that integrate systems and applications
  - Typically involves few exceptions and limited human participation
  - Can handle high transaction rates
  - Often used for externally focused processes linking two or more enterprises

- **People-intensive**
  - Strong focus on automating people-intensive activities like servicing customers, operating call centers, managing sales operations, supporting field-based agents, routing internal requests by employee

- **Decision-intensive**
  - Strong focus on processes that require employees to make mission-critical decisions using information and business rules
  - Processes in which the decision criteria and process rules change frequently

- **Document-intensive**
  - Strong focus on processes that involve extensive use of scanned images for back-office processes
  - Focus on processes that require people to use documents extensively (not just author documents)

Source: The Forrester Wave™: Human-Centric BPM for Microsoft Platforms, Q4 2007
Drivers for Digital Revolution

The availability of digital data, the automation of production processes, the interconnection of value chains and the creation of digital customer interfaces is transforming business models and reorganizing entire industries.
Four Levers of Transformation

- **DIGITAL DATA.** Capturing, processing and analyzing digital data allows better predictions and decisions to be made. Structured data instead of documents.

- **AUTOMATION.** Combining traditional technologies with artificial intelligence is increasingly giving rise to systems that work autonomously and organize themselves. This reduces error rates, adds speed and cuts operating costs.

- **CONNECTIVITY.** Interconnecting the entire value chain via mobile or fixed-line high-bandwidth telecom networks synchronizes supply chains and shortens both production lead times and innovation cycles.

- **DIGITAL CUSTOMER ACCESS.** The (mobile) internet gives new intermediaries direct access to customers to whom they can offer full transparency and new kinds of services.
Drivers of Digitization

Consequences of Digital Transformation for Business Processes

- Integration intensive
- Decision intensive
- People intensive
- Document intensive
Standard model for the BPM life cycle

Design

Optimize

Implement

Monitor

Execute
Standard model for the BPM life cycle

■ Model
  ♦ Designing/Modelling the process (build time)

■ Implement
  ♦ Selecting the „right“ IT-solution

■ Execute
  ♦ Running the process instance (run time)

■ Monitor
  ♦ Gathering data from the running processes

■ Optimise
  ♦ Analysing the data for further improvement

Focus of this module
Elements of a BPM suite

- **Process**
  - Model
  - Execute
  - Rules

- **Analytics**
  - Monitor
  - Optimize
  - Reporting

- **Content**
  - Documents
  - Search
  - Versioning

- **Collaboration**
  - Forums
  - Portal
  - Personalization
Elements of a BPM suite

- **Process Engine**
  - a robust platform for modeling and executing process-based applications, including business rules

- **Business Analytics**
  - enable managers to identify business issues, trends, and opportunities with reports and dashboards and react accordingly

- **Content Management**
  - provides a system for storing and securing electronic documents, images, and other files

- **Collaboration Tools**
  - remove intra- and interdepartmental communication barriers through discussion forums, dynamic workspaces, and message boards

What is Business Process Automation (BPA)?

- Implementing, deploying and executing business processes
- BPA dimensions
  - Organisational aspects
  - Data aspects
  - Technical aspects
- Benefits
  - Increase in efficiency (e.g. cost reduction by automation)
  - Increase in speed and accuracy
  - Enabling an adequate monitoring of process instances
  - Enabling new business models
  - Gathering necessary data for business process optimization
Orchestration vs. Choreography

- In *orchestration*, a central process (which can be a workflow engine or another service) takes control of the involved (Web) services and coordinates the execution of different operations.
Orchestration vs. Choreography

- **Choreography** does not rely on a central coordinator. Rather, each (Web) service involved in the choreography knows exactly when to execute its operations and with whom to interact.

- Choreography is a collaborative effort focusing on the exchange of messages in (public) business processes.
Synchronous vs. asynchronous communication

- Synchronous operation
  - An operation defined with both an input and an output message (acts like a “function”)
  - Whenever it is invoked, a synchronous operation is guaranteed to return a value (or a fault) to the caller. The calling entity must, therefore, suspend its execution until that return value arrives.
  - Request and response are «coupled».

- Asynchronous operation
  - An operation defined with only an input message (one-way, acts like a “method”)
  - An entity invoking such an operation need not suspend execution after the invocation.
  - Communication with the sender through «callback operations».
  - Request and response are «decoupled» (“fire and forget” mode).

Workflow and Workflow Management System

- **Business Process**
  A set of one or more linked procedures or activities which collectively realise a business objective or policy goal, normally within the context of an organisational structure defining functional roles and relationships.

- **Workflow**
  The automation of a business process, in whole or 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 System (WfMS)**
  A 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 Management

Manual Steps + Automated Steps

Generate PDF
Check order state in SAP
Book flight through webservice

Select helpdesk ticket
HR needs to approve the expense
Joey needs to call the customer
Workflow Management

- A WfMS
  - automates data-centric, decision-centric tasks
  - manages human tasks
  - coordinates automated tasks with physical resources
Principle of Workflow Management System

- **Workflow Management Components**
- **Invocation Components**
- **Activity-oriented Components**

**A) Manual Activities**
- Worklist Handler
- Invokable Tool

**B) Partly Automated Activities**
- Worklist Handler
- Invokable Application

**C) Fully Automated Activities**
- Object Wrapper
- Invokable Legacy Application

**D) Integrating Legacy Systems**
Definitions

■ Worklist:
  ♦ List of tasks assigned to a person or role

■ Worklist Handler
  ♦ Management of the worklists of the workers

■ Legacy Systems
  ♦ “old” non-standard application program that is still in use

■ Workflow Engine
  ♦ Run-time engine which controls the execution
How to implement a Business Process

■ Sequential Approach
  ♦ Model the process from business perspective
  ♦ Transform the process model to a workflow model
  ♦ \(\rightarrow\) Two models for process and workflow

■ Integrated Approach:
  ♦ Add execution information to the business process model
  ♦ \(\rightarrow\) one model,
  ♦ Problem: different aspects for business and execution in one model

■ Isolated Approach:
  ♦ Directly create workflow model without business process model
How to create a Workflow Model

Step 1: Identify the various business activities based on business process modelling

How to create a Workflow Model (2)

Identify services for activities of the business process. A direct correlation between business activities and the identified services within the application is not likely at the outset.
How to create a Workflow Model (3)

Refine the process model to include more activities in order to achieve a one-one mapping between activity and service.
From Business Process Model to Workflow Model

- Business process model:
  - *What* has to be done

- Workflow model:
  - *How* is it implemented
  - Add technical details:
    - applications
    - data
  - Changes in process structure
    - split activities
    - integrate activities by automation
From Business Process Model to Workfow Model

Splitting Activities

A single activity in a business process model can be split, if it invokes several applications

a) sequential

b) parallel

c) alternative
From Business Process Model to Workflow Model

It is possible that a single application automates several activities.
Workflow Management Systems

**Modelling**

- Process Definition
  - (a representation of what is intended to happen)
  - is defined in a Workflow Management System
  - controls automated aspects of the business process

- Activities
  - composed of
  - or
  - Manual Activities
    - (which are not part of the Workflow Systems)
  - Automated Activities

- Sub-Processes
  - which may be

**Execution**

- Process Instances
  - (a representation of what is actually happening)
  - during execution
  - are represented by Activity Instances
  - which include
    - Work Items
      - (tasks allocated to a workflow participant)
    - Invoked Applications
      - (computer tools/applications used to support an activity)

- Workflow Management System
  - used to create & manage
  - via

- Business Process
  - (i.e. what is intended to happen)
  - is managed by a Workflow Management System

- Manual Activities
  - Activities
  - which may be

- Automated Activities
Data in Workflow Management

- Application Data
  - Data, which are processed by application components/programs

- Workflow-relevant Data
  - Application data, which determine the control flow
  - Are accessible by the workflow engine

- Workflow Control Data
  - Internal data, which the workflow engines use (e.g. process ID, start/end time of activities, worker)
Components of WfMS and their Interaction

**Build Time**
- Process Design & Definition

**Run Time**
- Process Instanciation & Control

**Business Process Analysis, Modelling & Definition Tools**

**Process Definition**
- Process changes

**Workflow Enactment Service**

**Run Time**
- Interaction with Users & Application Tools

**Workflow Control Data**

**Workflow Relevant Data**

**Application Data**

*Quelle: WfMC 1996*
Workflow Execution

■ Control Flow
  ♦ Determines next activities
  ♦ Evaluation of conditions in gateways
  ♦ Start of applications for automated tasks
  ♦ Add manual activities into worklist of responsible people
  ♦ Start activities selected by worker
  ♦ Maintain worklist: Notification of deadlines etc.

■ Data flow
  ♦ Dataflow between activities
  ♦ Data flow from/to applications and external databases
**Run-Time: Creation and Control of Workflows**

- Create instances of workflow models
- Execute workflow instances
- Maintain status execution of workflow instances
- Assign tasks to workers subject to role descriptions (role resolution)
- Management of worklists

<table>
<thead>
<tr>
<th>Process Definition</th>
<th>Process Instance</th>
<th>Worklist</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Process Definition A" /></td>
<td>1st Process Instance</td>
<td><img src="image" alt="Work List 1" /></td>
</tr>
<tr>
<td><img src="image" alt="Process Definition B" /></td>
<td>2nd Process Instance</td>
<td><img src="image" alt="Work List 2" /></td>
</tr>
<tr>
<td><img src="image" alt="Process Definition B" /></td>
<td>3rd Process Instance</td>
<td><img src="image" alt="Work List 2" /></td>
</tr>
</tbody>
</table>

- Work List 1:
  - Work Item 1
  - Work Item 2
  - Work Item 3
  - Work Item 4
  - Work Item N

- Work List 2:
  - Work Item 20
  - Work Item 21
  - Work Item 22
  - Work Item N
Generic Architecture

**Workflow Modelling Tool**
- Data structures
- Application registrations
- Workflow Definitions (Control flow and data flow)
- Organisation (departments, people, roles)

**Workflow Runtime System**
- Database with
  - Workflow Instances
  - Context Data
- Workflow Engine (Server)

**Tools for dynamic changes of workflows**

**Administration and Monitoring tools**

**Workflow Client Applications + Worklists**

**Application server**

Design time

Run time
Interface Reference Modell of the WfMC