Business Process Modeling
Information Systems in Industry (372-1-4207)

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The material of this presentation is adopted from various people including:
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Iris Reinhartz-Berger
Outline

• Business Process Management (BPM)
• The notion of business process modeling
• Business Process Modeling Notation (BPMN)
• The notion of reference models
• Application-based DOmain Modeling (ADOM) - BPMN
Business Process Management (BPM)
BPM an Overview (1)
BPM an Overview (2)

Design
• Process design encompasses both the identifying of existing processes and designing the "to-be" process. Areas of focus include: representation of the process flow, the actors within it, alerts and notifications, escalations, procedures, Service Level Agreements, and task hand-over mechanisms.

Modeling
• Modeling takes the theoretical design and introduces combinations of variables, for instance changes in the cost of materials or increased rent to determine how the process might operate under different circumstances.
• It also involves running "what-if analysis" on the processes: What if I have 75% of resources to do the same task? What if I want to do the same job for 80% of the current cost?
BPM an Overview (3)

Execution
• One way to automate processes is to develop or purchase an application that executes the required steps of the process.

Monitoring
• Monitoring encompasses the tracking of individual processes so that information on their state can be easily seen and statistics on the performance of one or more processes provided.
• The degree of monitoring depends on what information the business wants to evaluate and analyze and how business wants it to be monitored, in real-time or ad-hoc. Here, business activity monitoring (BAM) extends and expands the monitoring tools in generally provided by BPMS.
BPM an Overview (4)

Optimization

• Process optimization includes retrieving process performance information from modeling or monitoring phase and identifying the potential or actual bottlenecks and potential rooms for cost savings or other improvements and then applying those enhancements in the design of the process thus continuing the value cycle of business process management.
The notion of business process modeling
Why we model?

- Describing a process
- Analyzing a process
- Enact a process
What to model of a business process?

• Tasks
• Coordination between tasks
  – synchronization
  – decisions
  – parallel work
  – repetition
  – ...
• Organizational responsibilities
• Required resources
• Information
Modeling languages

- Traditional process modeling languages: these languages mostly come from the MIS tradition of information engineering and from work on business process engineering.
  - IDEF
  - Petri Nets
  - Event Process Chains (EPC)
  - Role Activity Diagrams
  - Resource-Event-Agent (REA)
  - Business Process Modeling Notation (BPMN).
- Workflow modeling languages: a workflow management system is a computer system that manages a business process by assigning activities of the process to the right resources, by “moving” work items (e.g., documents, orders, etc.) from one processing step to the next, and by tracking the progress of the process. These languages are, for the most part, formal and executable.
### Business Process Modeling Tools

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<thead>
<tr>
<th>Challengers</th>
<th>Leaders</th>
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<tr>
<td>Sybase</td>
<td>Microsoft</td>
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<td>Scitor/Sciforma</td>
<td>IBM*</td>
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<td>Computer Associates</td>
<td>IDS Scheer*</td>
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<td>Rockwell</td>
<td>FileNet</td>
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<td>Corel/iGrafx*</td>
<td>Popkin</td>
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<td>ILOG*</td>
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<td>CommerceQuest</td>
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<td>High*</td>
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<td>Nimbus Partners*</td>
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<td>Gryphon*</td>
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<td>QPR</td>
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<td>IntelliCorp</td>
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<th>Niche Players</th>
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Business Process Modeling Languages

Event-driven Process Chains (EPC)

Petri Nets

Business Process Modeling Notation (BPMN)

UML Activity Diagrams
Business Process Modeling Notation (BPMN)
BPMN Map

Audiences:
- Strategy Consultants
- Business Analysts
- Process Designers
- System Architects
- Software Engineers

Business Environment

Purposes:
- Modeling
- Execution

Technology Implementation

Focus ► BP ► Scope

BPMN

BPEL
Notation

• Business Process Diagram Elements
  – Core Set of Diagram Elements
  – Complete Set of Diagram Elements

• Business Process Diagram Samples
  – Normal Flow
  – B2B Modeling
  – Exception Handling
  – Compensation Handling
The core set of modeling elements enable the easy development simple Business Process Diagrams that will look familiar to most Business Analysts (a flowchart diagram)
Complete Set of Diagram Elements, Events

An Event is something that “happens” during the course of a business process. These Events affect the flow of the Process and usually have a trigger or a result. They can start, interrupt, or end the flow.

<table>
<thead>
<tr>
<th>Events</th>
<th>Start</th>
<th>Intermediate</th>
<th>End</th>
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<tbody>
<tr>
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<td>💌</td>
<td>🔵</td>
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An activity is work that is performed within a business process. An activity can be atomic or non-atomic (compound). The types of activities that are a part of a Process Model are: Process, Sub-Process, and Task.
Complete Set of Diagram Elements, Activities, Cont.

A Sub-Process can be in an expanded form that shows the process details of a lower-level set of activities.
A Sequence Flow is used to show the order that activities will be performed in a Process.

A Message Flow is used to show the flow of messages between two entities that are prepared to send and receive them.

An Association is used to associate information and artifacts with flow objects.
Complete Set of Diagram Elements, Gateways

Gateways are modeling elements that are used to control how Sequence Flows interact as they converge and diverge within a Process. If the flow does not need to be controlled, then a Gateway is not needed.
A Pool is a “swimlane” and a graphical container for partitioning a set of activities from other Pools, usually in the context of B2B situations.

A Lane is a sub-partition within a Pool and will extend the entire length of the Pool, either vertically or horizontally.
Complete Set of Diagram Elements, Artifacts

Data Objects are not flow objects (i.e., connected through Sequence Flow), but they do provide information about how documents, data, and other objects are used and updated within a Process.

TextAnnotations are a mechanism for a modeler to provide additional information for the reader of a BPMN diagram.

Groups provide a mechanism to visually organize activities
Normal Flow

[Diagram showing a process flow with steps: Receive Order, Accept or Reject, Fill Order, Ship Order, Send Invoice, Make Payment, Accept Payment, Close Order, and a decision point for rejection.]
B2B Modeling

Enhancements are being considered for BPMN 1.x
Exception Handling

Intermediate Events attached to the boundary of an activity represent triggers that can interrupt the activity. All work within the activity will be stopped and flow will proceed from the Event Timer. Exceptions, Messages, etc. can be Triggers.
A Complex Process
The notion of reference models
Guidelines of Modeling (GoM)

1. Correctness:
   relates to the mapping, capture attributes of the original correctly
2. Relevance:
   abstract from those aspects that are not relevant
3. Economic Efficiency:
   Keep an eye on the purpose of modeling task
4. Clarity:
   the model should be intuitive to understand for involved stakeholders
5. Comparability:
   Use a similar mapping for similar aspects
6. Systematic Design:
   define interfaces to related models

What is a Reference Model

Reference models of business processes aim to provide generic knowledge in order to assist process design in specific enterprises.
Reuse processes in reference models: Reuse by adoption

- A detailed model to be adopted as is.
- **Strengths:**
  - Simple reuse process.
- **Weaknesses:**
  - Lack of flexibility.
  - Modifications of the model are not supported.
  - Optionality specification.
Reuse processes in reference models: Reuse by assembly

- A set of detailed model parts to be consolidated.

- Strengths:
  - Moderately simple reuse process.
  - Some flexibility due to choice of model parts.

- Weaknesses:
  - Modifications of the model parts are not supported.
  - Consolidation verification support is required.
Reuse processes in reference models: Reuse by specialization

• Model at a high abstraction level as a basis for creating a specific detailed model.

• Strengths:
  – Flexibility – The reuse process does not impose a detailed solution.
  – Enables reuse by analogy across domains.

• Weaknesses:
  – The reuse process is not structured nor supported.
Reuse processes in reference models: Reuse by customization

• A detailed model explicitly specifying configuration possibilities and dependencies. This specification guides the selection of possible options.

• Strengths:
  – Flexibility.
  – Reuse process guided and supported by the model.

• Weaknesses:
  – Mainly applicable if attached to a specific enterprise system, which constrains the configuration possibilities.
Application-based DOmain Modeling (ADOM) - BPMN
Application-based Domain Modeling (ADOM)

- Three layered architecture: application, domain, and language.
  - Application layer – models of particular enterprises
  - Domain layer – reference model
  - Language layer – meta-models of modeling languages (UML, EPC, BPMN…)

- Language independent.
- Constraints enforced between the layers:
  - Domain → application
  - Language → domain, application
Utilizing ADOM for reference models

Language Layer

BPMN

Domain Layer

Sell Products
Buy Raw Materials

Chocolate Manufacturer
Computer Store
Software Development

Application Layer
The reference (domain) model of the Purchase Requisition process
The library Purchase Requisition process

1. **Automatically generated purchase requisition**
   - Periodical journal requisition

2. **Manual purchase requisition**
   - Request for a library product

3. **Identify category**
   - Identify whether for research or teaching

4. **Check purchase requisition**
   - Check product availability in library
     - Product not available → X
     - Product available → Y

5. **Check purchase requisition**
   - Check library budget
     - Enough budget → Y
     - Not enough budget → X

6. **Check purchase requisition**
   - Check researcher budget
     - Enough budget → Y
     - Not enough budget → X

7. **Identify the necessity of the purchase of an available product**
   - Required → Y
   - Not required → X

8. **Approve purchase requisition**
   - Library manager approval
     - Approved → Y
     - Rejected → X

9. **Determine number of copies according to course size**

10. **Determine from who to purchase (according to existing contracts)**

11. **Create purchase order**
    - Create purchase order for the publisher
    - Create purchase order for an agency
    - Create purchase order for the MALMAD

12. **Send purchase order**
    - Send order to the publisher
    - Send order to the agency
    - Send order to the MALMAD

MalMAD is the Israel Center for Digital Information Services.
Validation (1)

The validation in ADOM-EPC is performed in three stages:

- Reduction
- Unification
- Matching
Validation (2)

The verifiable model of the library Purchase Requisition process