Process modeling

• A process model is a description of a process. Process models are often associated with business processes.

• A business process is a collection of related, structured activities that produce a service or product that meet the needs of a client.
• **Business Process Modeling** (BPM) is the activity of representing processes of an enterprise, so that the current ("as is") process may be analyzed and improved in future ("to be").

• BPM is typically performed by business analysts and managers who are seeking to improve process efficiency and quality.
Business Process
What is intended to happen

Process Definition
Representation of what is intended to happen
is defined in a

Workflow Management System (BPMS)
Controls the automated Aspects of the process.
is managed by a

Process Instance
Representation of what is actually happening
composed of
includes one or more

Activities
which may be
composed of

Manual Activities
Automated Activities

Activity Instances
during execution are represented by

Work Items
Tasks allocated to a Workflow Participant.

Invoked Applications
Services called as part of process

http://www.xpdl.org/tdocs/200809_KMWorld/200809_SJ03_BPM Arch.ppt
BPM questions

• How do we **design** and **communicate** this process?
• How do we **perform** this process **well**?
• How do we **manage** this process **well**?
• How do we maintain **compliance** to rules and regulations?
• How should **technology** support this process?

http://www.xpdl.org/tdocs/200809_KMWorld/200809_SJ03_BPMArch.ppt
Evolution of Workflow and Business Process Modeling

http://www.xpdl.org/tdocs/200809_KMWorld/200809_SJ03_BPMArch.ppt
1990 → Workflow in the Brain

UI “Screens”

Application Logic in Monolithic Program

- Background Check
- Conformance Rules

Enterprise Application “Account Management”

- List Accts
- New Acct
- Mod Acct
- Del Acct

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1993 → Workflow Assist in Sequence

Human BPM/Workflow

- background check
- check guidelines
- create account

Launches UI
User accesses original UI directly

UI “Screens”

Application Logic in Monolithic Program

Background Check
Conformance Rules

Enterprise Application “Account Management”

List Accts
New Acct
Mod Acct
Del Acct

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1996 → Distribute Work

- Background Check
- Check Guidelines
- Create Account

Launches

UI “Screens”

Application Logic in Monolithic Program

Enterprise Application “Account Management”

- List Accts
- New Acct
- Mod Acct
- Del Acct
2002 → Service Oriented Architecture

UI connects user to process engine, not the back-end applications

Exposed Web Services

Application Logic Service Oriented Architecture

Enterprise Application “Account Management”
2005 → Composite Services = IT Agility

Composite Services

Application Logic
Exposed Web Services

ESB / BPEL

Background
New Rules
List Accts
New Actt
Mod Acct
Del Acct
Human Activities Have Three Phases

- **Review**
  - Automated phase before to prepare for the task
  - Wait phase for human to do the work, includes timers and escalation logic
  - Automated phase after to take care of results of the task

**User Interface** (while waiting)

*Note: this notation is not standard!*
2008 → Simplify as “Human Steps”

Composite Services

ESB / BPEL

Application Logic
Exposed Web Services

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Separation of Responsibility

Business Retains Control of
- Assignment of Responsibility
- Groups, Roles, Skills
- Deadlines
- Alerts, Reminders, Escalations
- Order of Tasks
- Addition of Manual Tasks
- User Interface

IT Retains Control of
- Computational Logic
- Data Representations
- Scalability / Performance
- Interoperability
- Master Data Management
Separate Development

Business Retains Control of
- Assignment of Responsibility
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- User Interface

Changes on daily basis
Organizational Culture
Optimize for each team
Respond to market or legislation
Related to Training, Experience

IT Retains Control of
- Computational Logic
- Data Representations
- Scalability / Performance
- Interoperability
- Master Data Management

Very low or no dependence upon the organizational culture
Requires expensive technical capabilities
Knowledge of infrastructure
Standards

http://www.xpdl.org/tdocs/200809_KMWorld/200809_SJ03_BPMArch.ppt
BPM Standards foster convergence

- **BPMN** – Business Process Modelling Notation widely accepted as standard for the *look* of a process
- **XPDL** – XML Process Definition Language promotes the exchange of processes between vendors and tools:
  - Modelling and Simulation
  - Process Design and Implementation
  - Process Deployment
  - BAM and Historical Reporting
- **BPEL** – Business Process Execution Language includes only the executable aspects of a process
  - Oriented toward orchestration of Web Services
- **Wf-XML** - Inter Engine Collaboration provides runtime integration between process services
- **BPAF** - Business Process Analytics Format provides standard event format for Process Intelligence Tools
Workflow / BPM Reference Model

Source: Workflow Management Coalition
BPMN: Business Process Modeling Notation

- Defines the way the process LOOKS
- Provides a dictionary of standard shapes with particular meanings
- Consistent use of shape/meaning benefits everyone
  - reduces the learning curve,
  - training on shapes is useful for multiple products
BPMN: Flow Elements

• Activities ~ work that is performed within a business process (represented by a rounded rectangle).

• Events ~ something that happens during the course of a business process which affects the sequence or timing of activities of a process (represented as small circles with different boundaries to distinguish start events (thin black line), intermediate events (double line) and end events (thick black line)).
BPMN: Flow Elements (II)

- Gateways ~ control how sequence flows converge and diverge within a process. Gateways can represent decisions, where one or more paths are disallowed, or they can represent concurrent forks.
- Sequence flows. A sequence flow is used to show the order in which activities are performed within a process. A sequence flow is represented by a line with a solid arrowhead.

http://www.sparxsystems.com/business_process_model.htm
BPMN: Flow Elements (III)

• Message flows. A message flow is used to show the flow of messages between two entities, where pools are used to represent entities. A message flow is represented by a dashed line with a light-colored circle at the source and arrowhead at the target.

• Associations. An association is used to associate information and artifacts with flow objects. An association is represented by a dashed line which may or may not have a line arrowhead at the target end if there is a reason to show directionality.
BPMN: Swimlanes / Partitions

- Pools. A pool represents a participant in a process, where a participant may be a business entity or role. It is represented as a partition of the process.
- Lanes. A lane is a sub-division of a pool and is used to organize and categorize activities within the pool.
BPMN: Artifacts

- Data objects. A data object does not have a direct affect on a process but does provide information relevant to the process. It is represented as a rectangle with the top corner folded over.

- Groups. A group is an informal means for grouping elements of a process. It is represented as a rectangle with a dashed line border.

- Annotations. An annotation is a mechanism for the BPMN modeler to provide additional information to the audience of a BPMN diagram. It is represented by an open rectangle containing the annotation text.
Examples

http://www.sparxsystems.com/business_process_model.html
Examples (II)

http://www.sparxsystems.com/business_process_model.html
Examples (III)

http://www.sparxsystems.com/business_process_model.html
**XPDL: XML Process Definition Language**

- The FILE FORMAT for a process definition
- Exchange process definitions between
  - Different BPM/Workflow Products
  - Process Modelling/ Simulation tools and BPM/Workflow Products
  - Supported by more than 70 commercial BPA/ BPM products and interoperability demonstrated; use of tools that support the standard ensures that you are not locked in to any particular vendor
- Full support for BPMN
BPEL: Business Process Execution Language

- Powerful programming language for Web service orchestration and XML manipulation
- Oriented toward building composite applications, not necessarily BPM
- Inflated expectations in media to be universal process language; now disillusioned
- No support for human activities
  - Look to BPEL4People effort to add this
- No sub-processes
  - Look to BPEL Subprocess effort to add this
- No on-the-fly process modifications
Process Design Ecosystem

User needs

<table>
<thead>
<tr>
<th>Risk/Control</th>
<th>Ownership/Issue</th>
<th>Resources/Time</th>
<th>Goals/Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor A: BPMN</td>
<td>Vendor B: BPMN</td>
<td>Vendor C: BPMN</td>
<td>Vendor D: BPMN</td>
</tr>
<tr>
<td>Process Risk Mgmt</td>
<td>Process Modeling</td>
<td>Process Simulation</td>
<td>Process Optimization</td>
</tr>
</tbody>
</table>

Tool-specific capabilities

Process structure is shared by all tools

Execution environments have different strengths, no model exchange at this level

Limited Portability

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**Wf-XML: Runtime Integration**

- **Sales Process on Server A**

  ![Diagram showing sales process flow]

  - Draft → Approve → Legal Review → Close

  Standard Protocol between process engines allows one process to reuse another across technologies.

- **Legal Review Process on Server B**

  ![Diagram showing legal review process flow]

  - Contract Specialist → Tort Specialist → Exec Analyst

  **Wf-XML based on SOAP or REST**
BPAF: Business Process Analytics Format

- Standardized Event Format
  - XML Syntax
  - Defined Attribute Semantics
- Process State Model
- Activity State Model
Business Level Agility

http://www.xpdl.org/tdocs/200809_KMWorld/200809_SJ03_BPMArch.ppt
Agility = Business Driven Change w/o Programming

News Flash!

Some other bank sued!
Need to respond quickly to avoid risk!

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Agility = Business Driven Change w/o Programming

Immediate Response:
Handle the problem manually with a specialist team -- the next day.
Agility = Business Driven Change w/o Programming

Eventually:
Automate the step with a service, and eliminate the manual review team a few weeks or months later.

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UML and Business Process Modeling

http://www.sparxsystems.com/resources/uml2_tutorial/index.html
• UML emerged in the areas of software engineering and systems design.
• It can also be used at the analysis and modeling of business processes.
• UML 2.x provides behavioral diagrams which can capture information about processes and activities critical to every business.
Behavior diagrams

- Behavior diagrams are about the interaction and the states of a model over time.
- They are intended to be used to capture information about how a system will act in a real-world environment, and about the effects and outcomes of particular operations executed within the system.

- **Activity diagrams** represent the business and operational workflows of components in a system.
- **State Machine diagrams** describe the states of a model during its execution.
- **Sequence diagrams** show the sequence of messages passed between objects using a vertical timeline.
Activity diagrams
Activity diagrams (II)

- **Activity diagrams**
  - Activity
  - Action
  - Conditions
  - Activity Edge
  - Activity Final
  - Flow Final
  - Decision or Merge
  - Fork and Join
State machine diagrams
State machine diagrams (II)

- **sm State**
  - Idle

- **sm Initial and Final**
  - Alive
    - Create → Destroy
  - Initial
  - Final

- **sm Transition**
  - Source State
  - Trigger [Guard] / Effect
  - Target State

- **sm Entry and Exit**
  - Receiving
    - + On Entry / pickup
    - + On Exit / disconnect

- **sm Self Transition**
  - after 2 seconds / poll input
    - Waiting

- **sm Compound**
  - Check PIN
    - Enter PIN
      - valid
      - invalid
        - [pin invalid]
  - Search Network
    - network found
      - Power off
    - network not found
      - Power off
  - Ready
    - Power off
  - Off
Sequence diagrams

Collaboration "Rent item", scenario "unavailable"

http://www.tracemodeller.com/articles/a_quick_introduction_to_uuml_sequence_diagrams/images/a_typical_sequence_diagram.png
Summary

• Process modeling and business process modeling

• BPMN and other standard.

• UML behavior diagrams.
Further reading