



# Business Process Management: Basics

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# Generalities

- Business Process Management (BPM) perceived internationally as top business priority
- BPM views processes as central in an organization
- Significant business benefits can be derived from its (correct) application
  - **Potential for substantial cost & time savings**

## Process Automation: Benefits - 1

- Process automation (a.k.a workflow management)
- Process models should serve as the blueprint for subsequent automated support
- Explicit representation of control-flow
- Process model changes do not require low-level coding efforts

## Process Automation: Benefits - 2

- Explicit representation of resource involvement
  - **Work can directly be routed to the right resources**
  - **Aspects such as workload and work history can be taken into account in work assignment**
- Coupling of processes and data assists with data accuracy
- Monitoring support
- Identification and resolution of bottlenecks
- Post-execution analysis (Process Mining)
  - **Identification of opportunities for process improvement**



# Terminology - 1

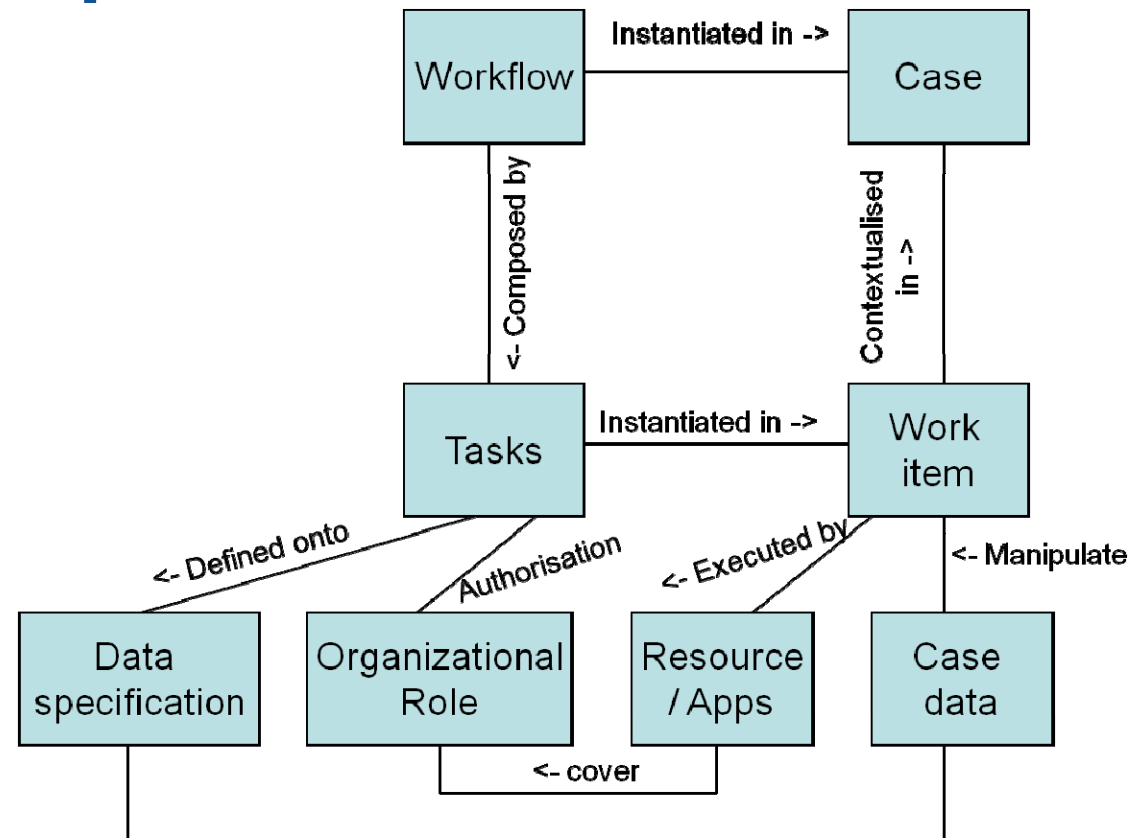
- Workflow
  - *“The automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action according to a set of procedural rules.”*  
*WfMC, Terminology & Glossary, WfMC-TC-1011 3.0, February 1999*
- Workflow Management System (WfMS) a.k.a. Business Process Management Systems (BPMS)
  - *“A system that completely defines, manages and executes workflows through the execution of software whose order of execution is driven by a computer representation of the workflow logic.”*  
*WfMC, Terminology & Glossary, WfMC-TC-1011 3.0, February 1999*

## Terminology - 2

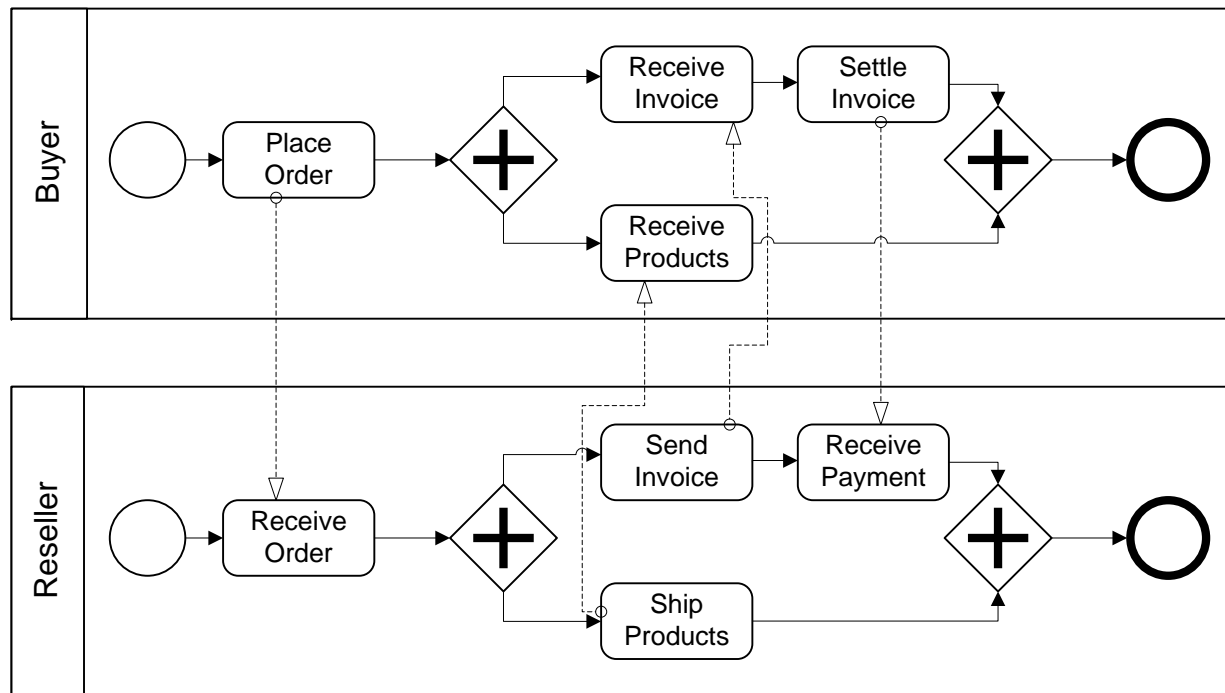
- An alternative definition of WfMS:
  - **“A software system that manages and executes operational processes involving people, applications, and/or resources on the bases of process models.”**
  - *M. Dumas, W. van der Aalst, A. ter Hofstede, Process-Aware Information Systems: Bridging People and Software through Process Technology, John Wiley & Sons, 2005*

# Workflow Concepts

- A process specification is not directly executed
  - **It denotes a class of possible workflow executions**
- Process specifications are concretely instantiated to create so-called **cases**
- A task is the elementary piece of a process execution
  - **A work item is the instance of a task inside a case**



# Process Example - 1

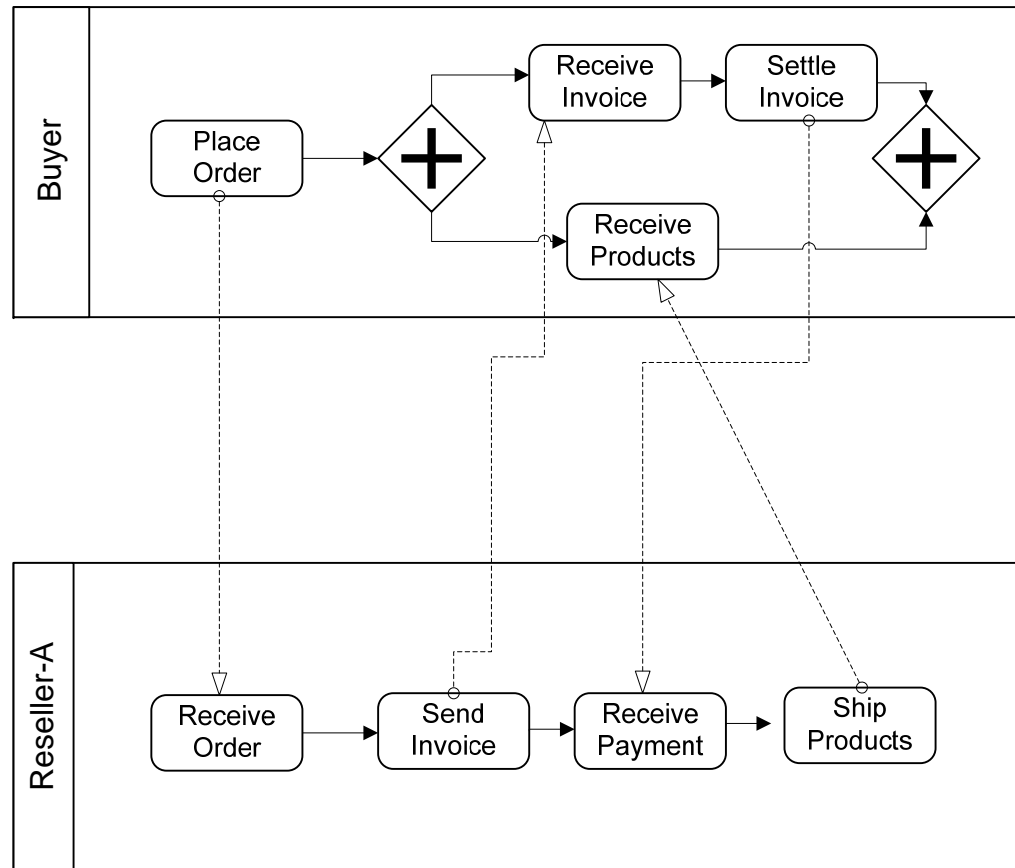


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**Fig 1.3.** Interacting business processes form process choreography



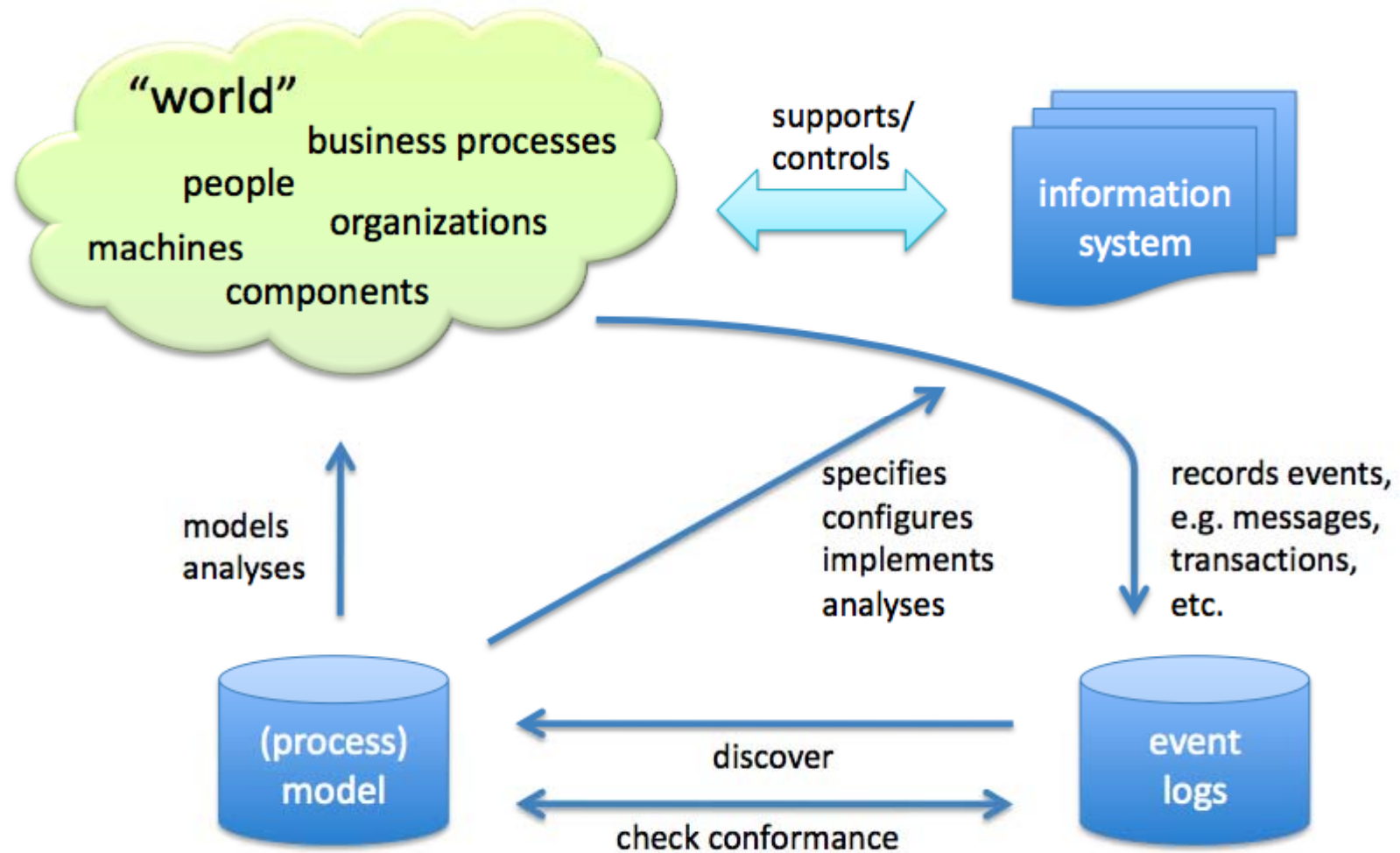
# Process Example - 2



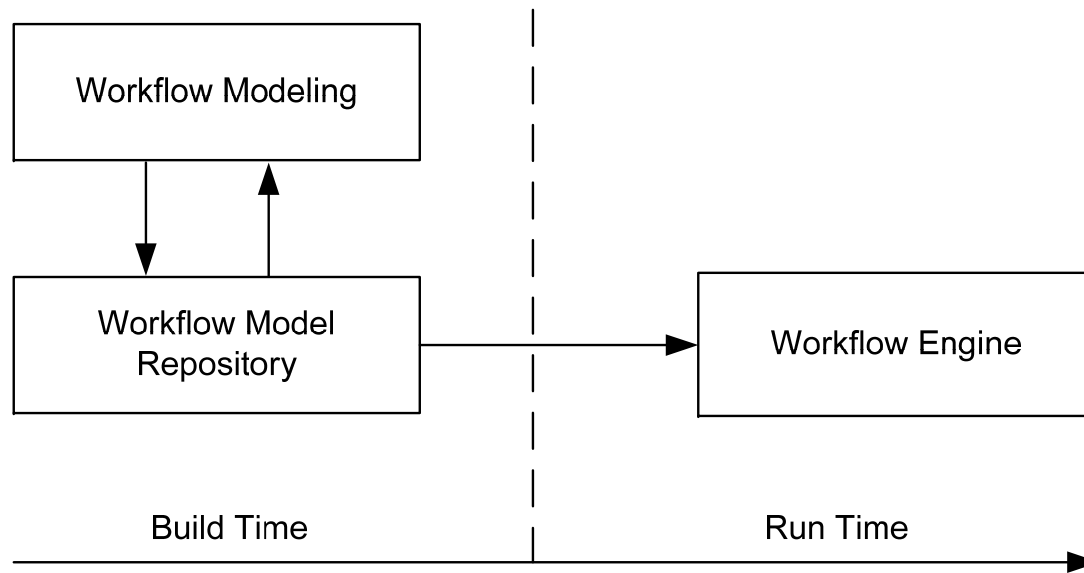
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**Fig 1.4.** Variant of reseller process with interacting business process

# Process Modeling



# Run-time vs. design-time



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**Fig 7.1.** Build time versus run time of a workflow

# Need of different perspectives - 1

- Control-Flow
  - **Which tasks need to be executed and in what order**
- Data
  - **What data elements exist, to whom are they visible, how are they passed on**
- Resources
  - **Who is authorised to execute certain tasks, are tasked assigned by the system or can participants volunteer for their execution, on what basis is work assigned**

## Need of different perspectives - 2

- Sometimes these perspectives are explained in terms of *Who (Resource)*, *What (Data)* and *When (Control-flow)*
- S. Jablonski and C. Bussler's classification
  - **Workflow Management: Modeling Concepts, Architecture, and Implementation. International Thomson Computer Press, 1996**

# Process Modeling - 1

- No consensus has been reached to describe executable processes
- Several alternatives have been proposed, but none has become a standard commonly recognised
- Type 1 languages: Some process modelling languages are based on a formal unambiguous semantics that can be input for BPMS
  - **Explicit representation of control flow dependencies and resourcing strategies**
  - **A formal background is required by process designers**

## Process Modeling - 2

- Type 2 languages: Some languages are high level and intended for non-expert users
  - **They came with nice graphical representations that are vague but useful for an initial insight**
- Example type 1 Language: BPEL
- Example type 2 language: BPMN



# BPEL

- Merger of IBM's WSFL and Microsoft's XLANG
- Largely, though not fully, block-structured
- More powerful than predecessors
- No support for involvement of human resources
- No graphical representation (rather XML is used)



# BPMN

- Graphical front-end
- Not executable directly, transformation required
- Graph-structured rather than block-structured
- Mapping to BPEL not straightforward
- Fairly strong support for specification of control-flow dependencies
- Lacking sufficient support for involvement of human resources
- Not formally defined

# Business Process Management Systems

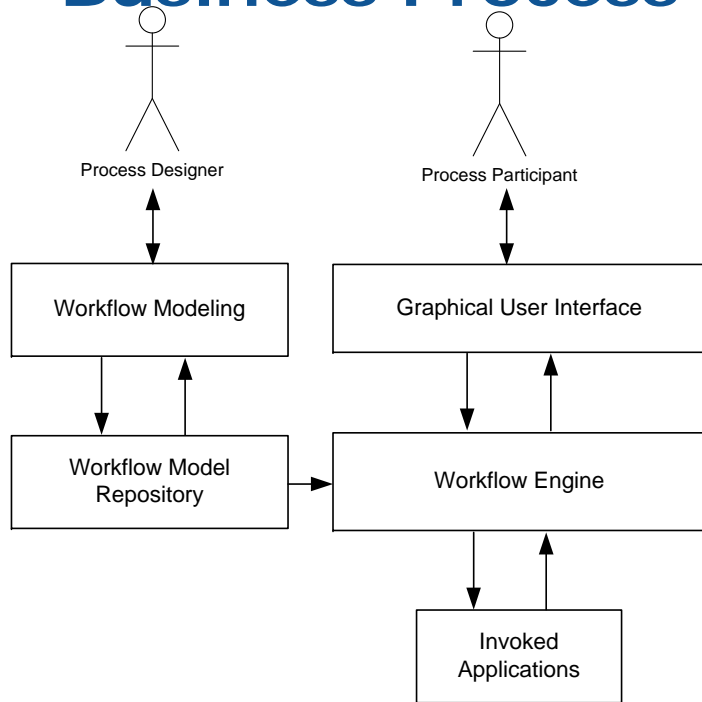


Fig 7.2. Workflow management systems architecture

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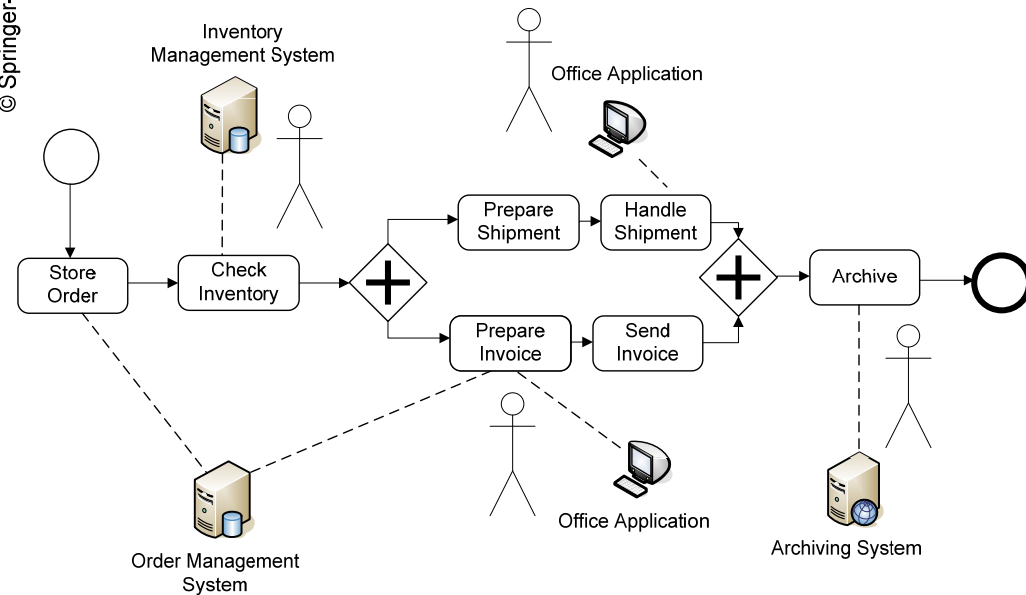
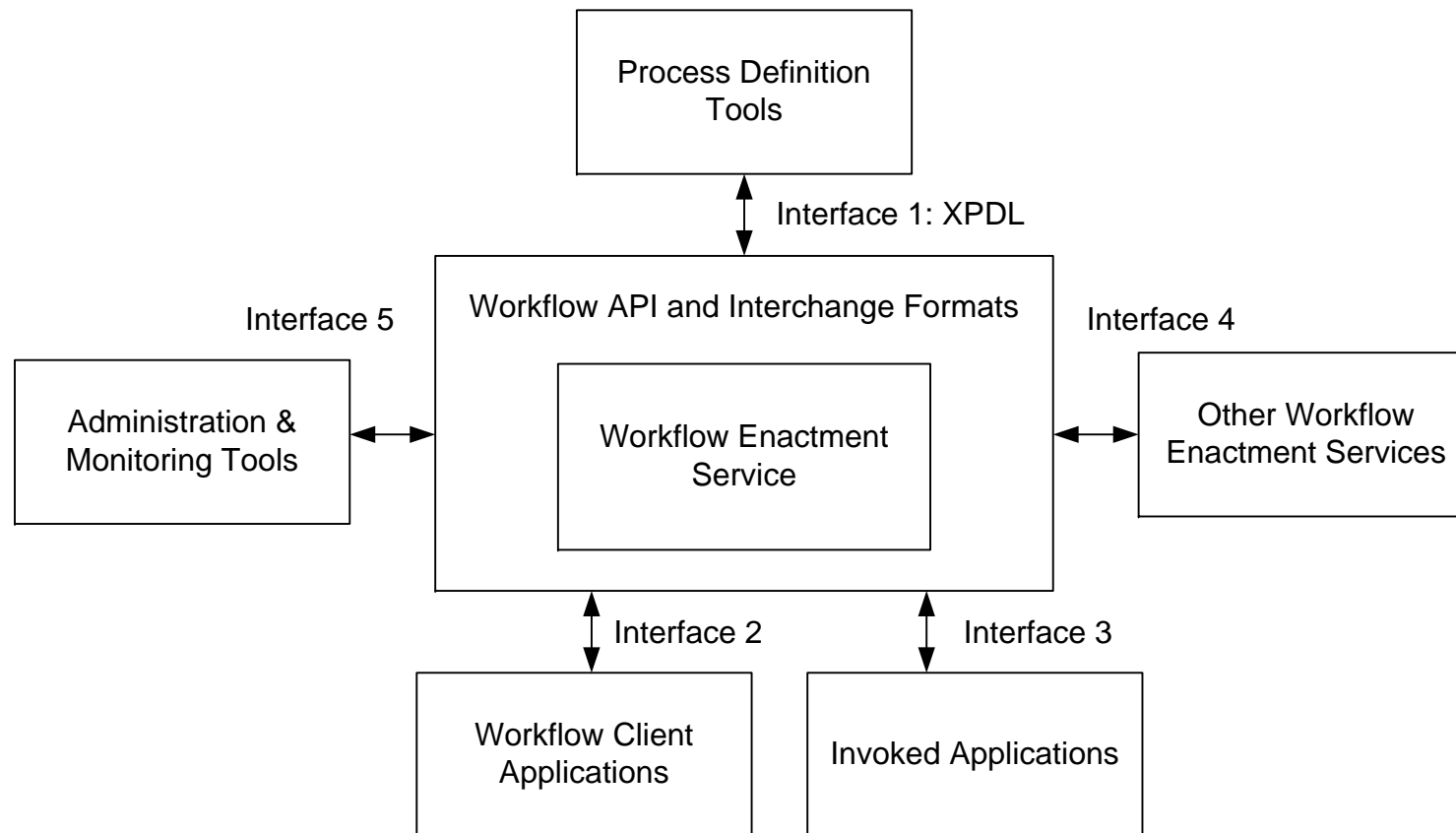


Fig 2.20. Sample human interaction workflow

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# The WfMC (Workflow Management Coalition) reference architecture





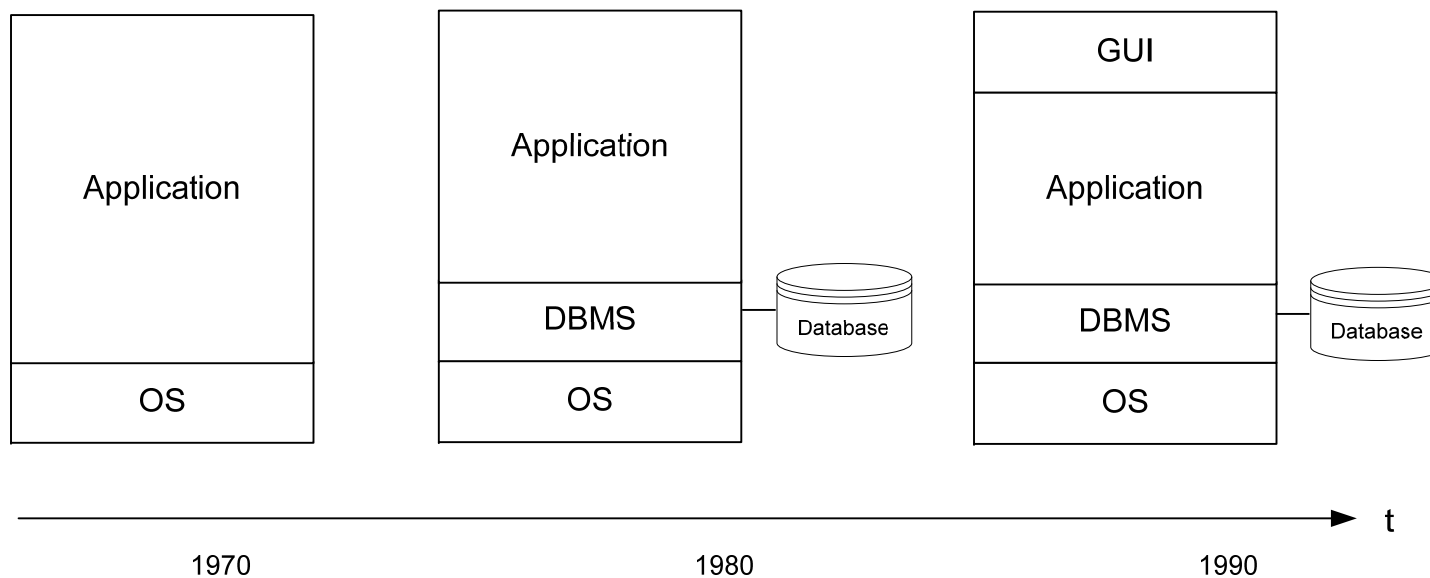
# Components of a BPMS - 1

- A modelling tool
  - **It provides a Graphic User Interface to design process specifications to be given as input to a BPMS Engine**
- A Business Process Management System Engine
  - **It stores and interprets process specifications, creates and manages cases as they are instantiated, and controls their interaction with workflow participants and applications**
  - **Typically, BPMS offers work items to all resources that qualify**

## Components of a BPMS - 2

- A work-list handler
  - **It allows administrators to create, manage and monitor cases**
  - **Process participants may access to the queues of work items assigned, running, etc. letting them continuing with their execution**
- Analysis tools
  - **They are intended to mine the log of past executions to find recurrent patterns, deviations from the expected behaviour, etc.**

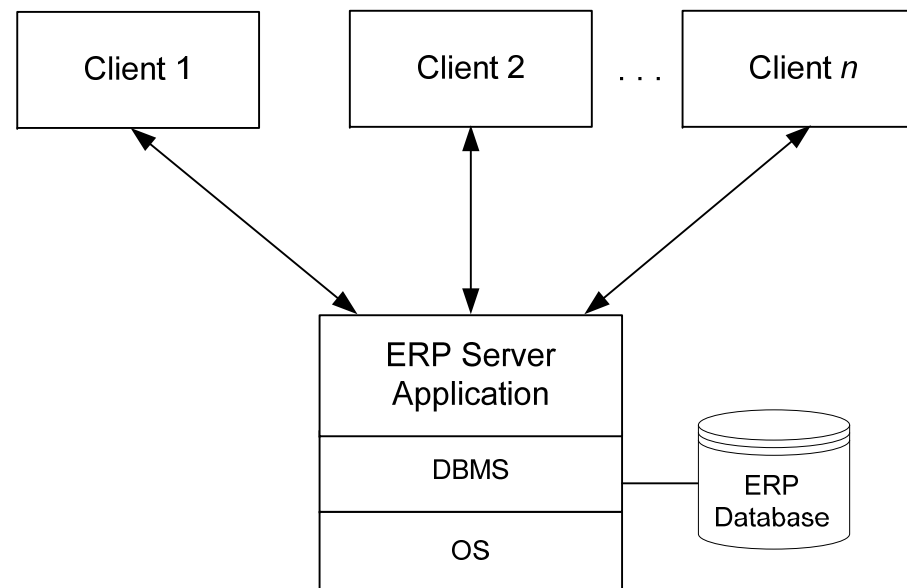
# Evolution of architectures and technologies supporting enterprises / businesses



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**Fig 2.1.** Early systems architectures

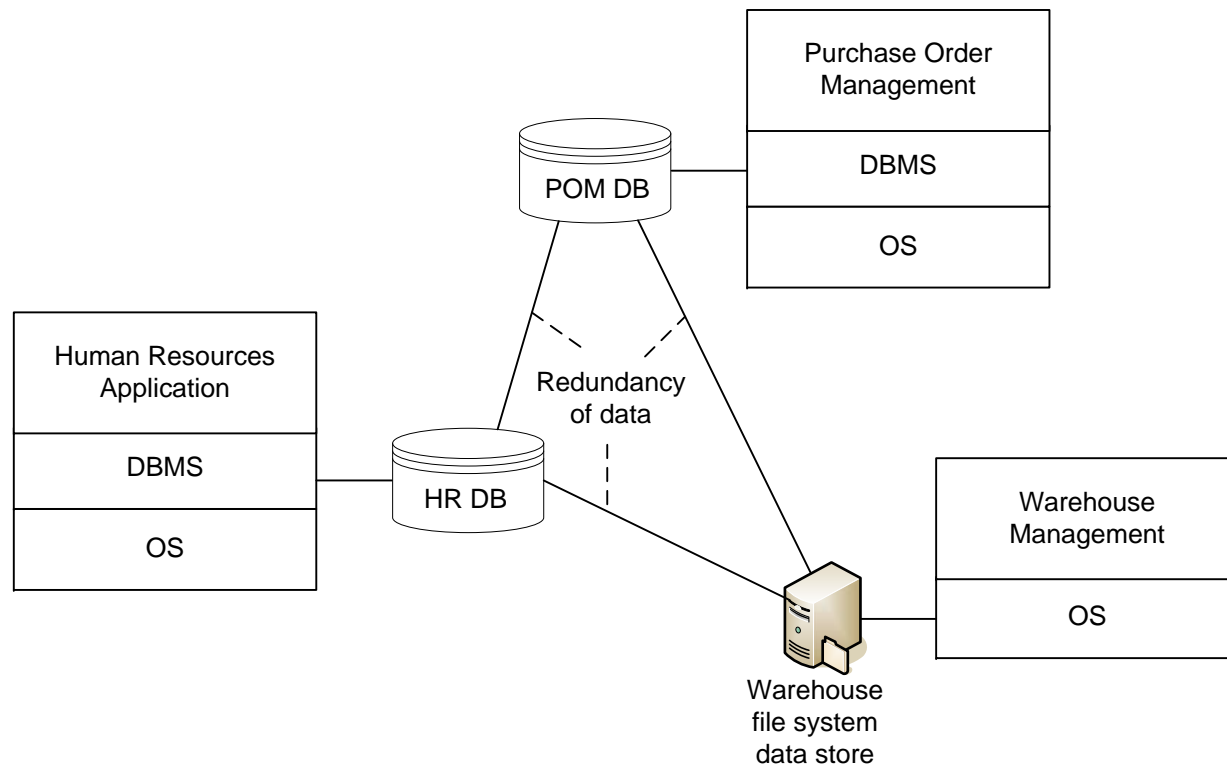
# The emergence of ERP (Enterprise Resource Planning) systems



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Fig 2.3. Two-tier client-server architecture

# The need of integration ...

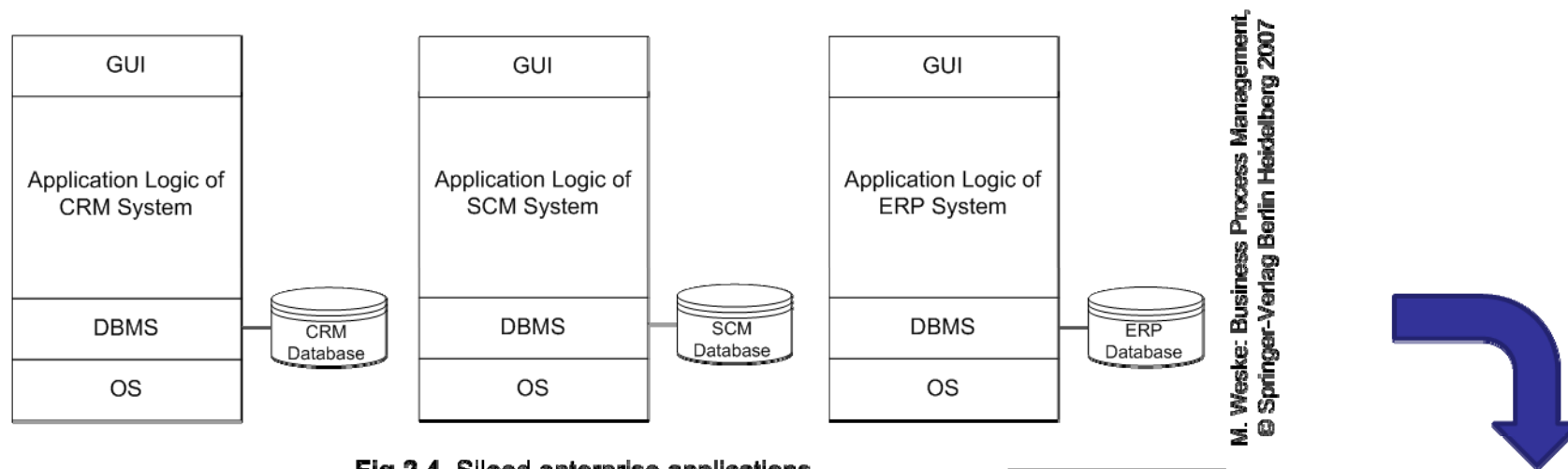


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**Fig 2.2.** Enterprise applications with **redundant** data and data dependencies



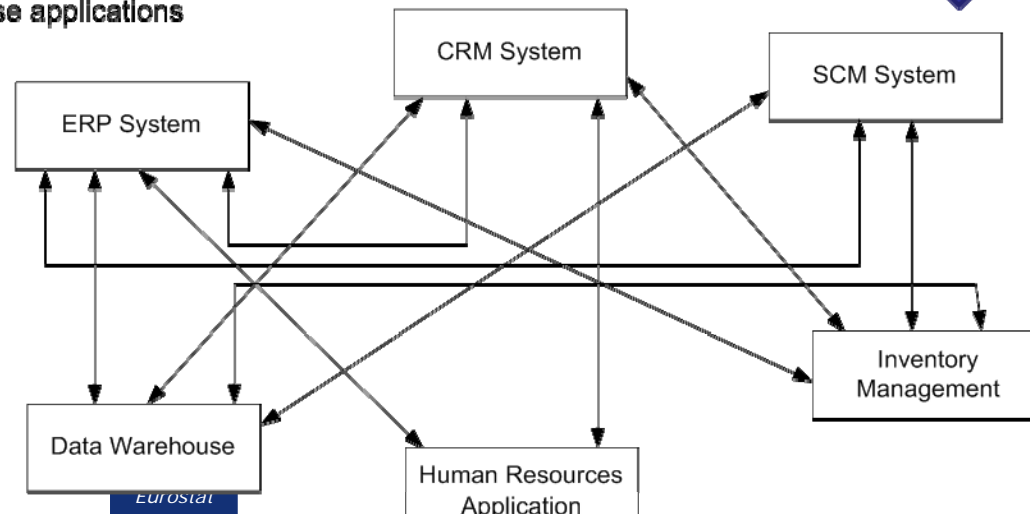
# ... in a siloed multi-system scenario



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Fig 2.4. Siloed enterprise applications

Early EAI - hard-writing of application systems results in  $N \times N$  problem



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European Commission

# Why not using a BPMS as integration layer ?

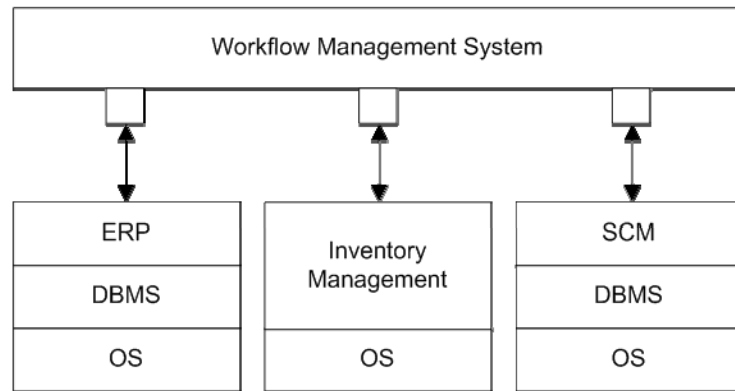
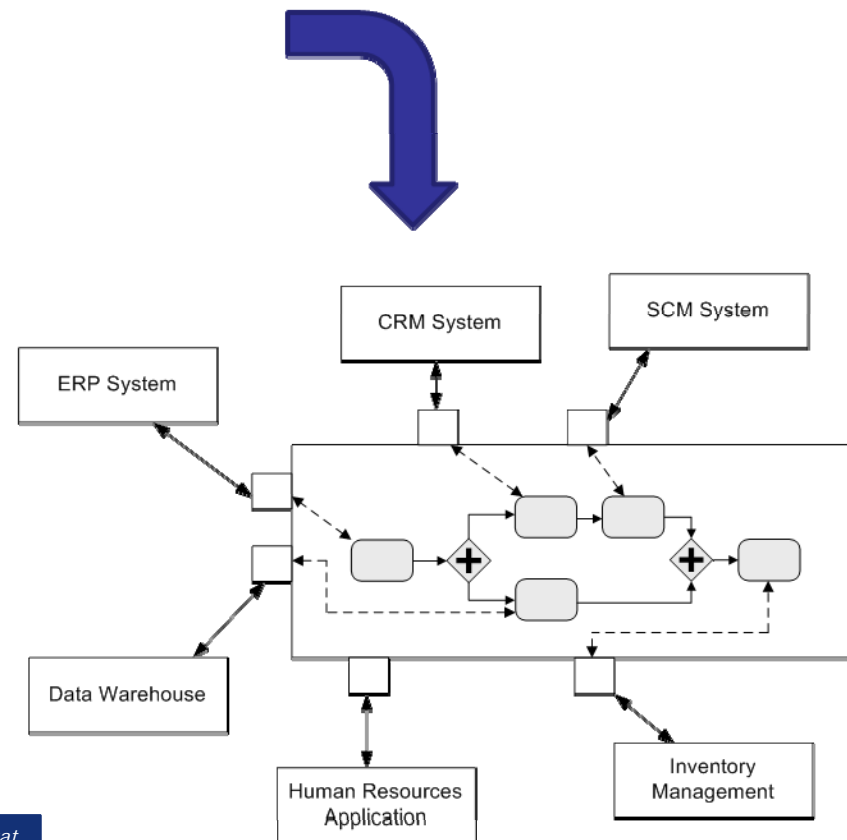


Fig 2.18. Multiple-application workflow systems architecture

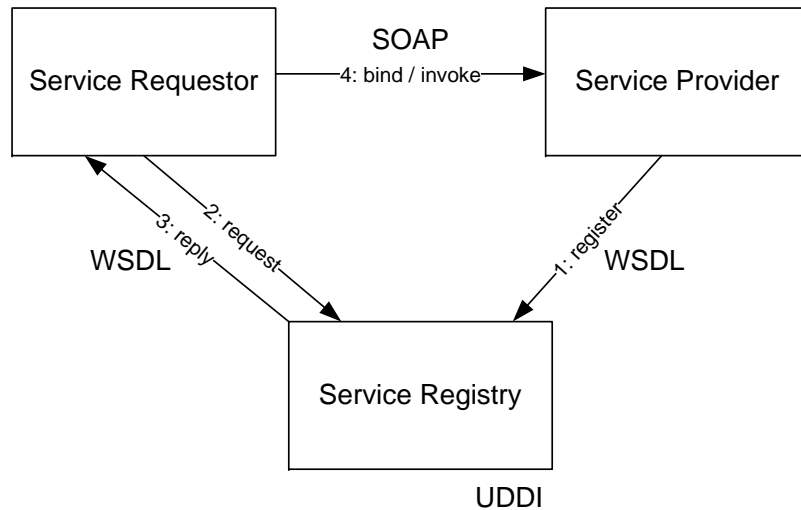
A process model defines if and when enterprise applications are involved

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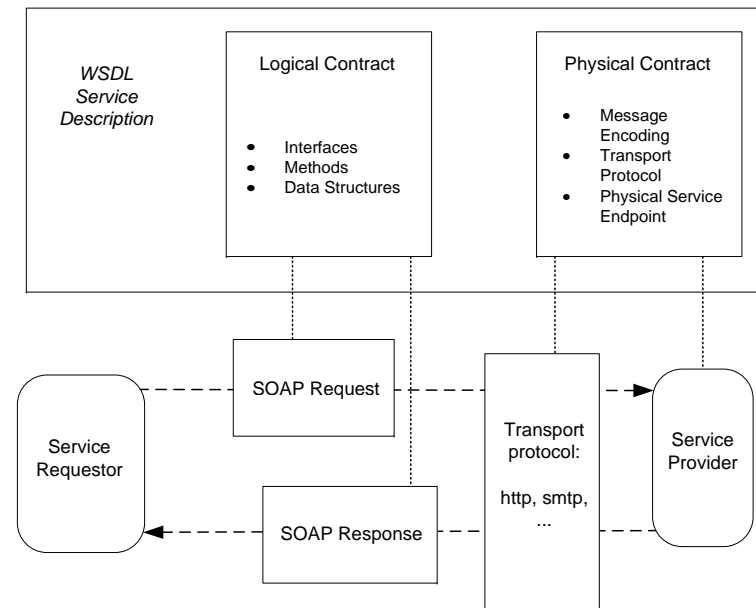
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# Web services ...



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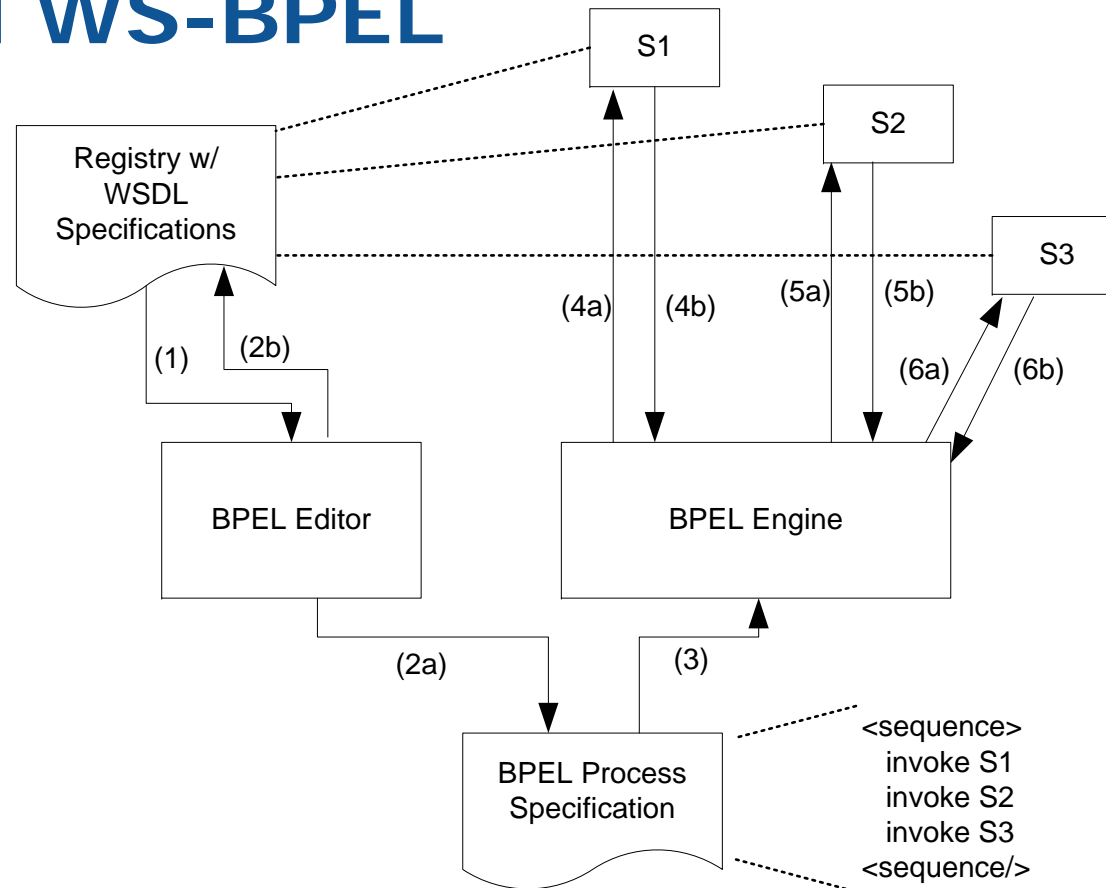
**Fig 7.9.** Main World Wide Web Consortium Web services recommendations



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**Fig 7.10.** Role of WSDL in Web service invocation

# ... and WS-BPEL



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**Fig 7.15.** Composed service design and enactment using Business Process Execution Language

# Silos expose services and processes coordinates them

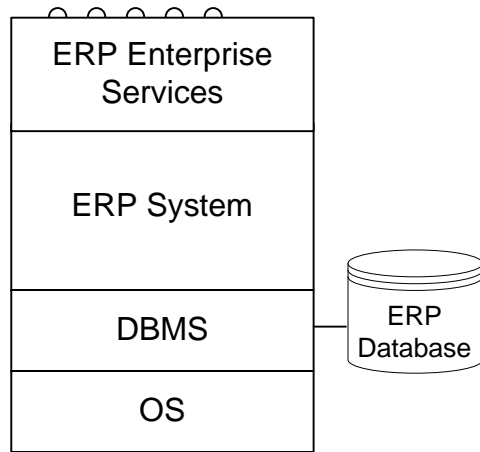
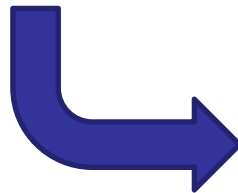
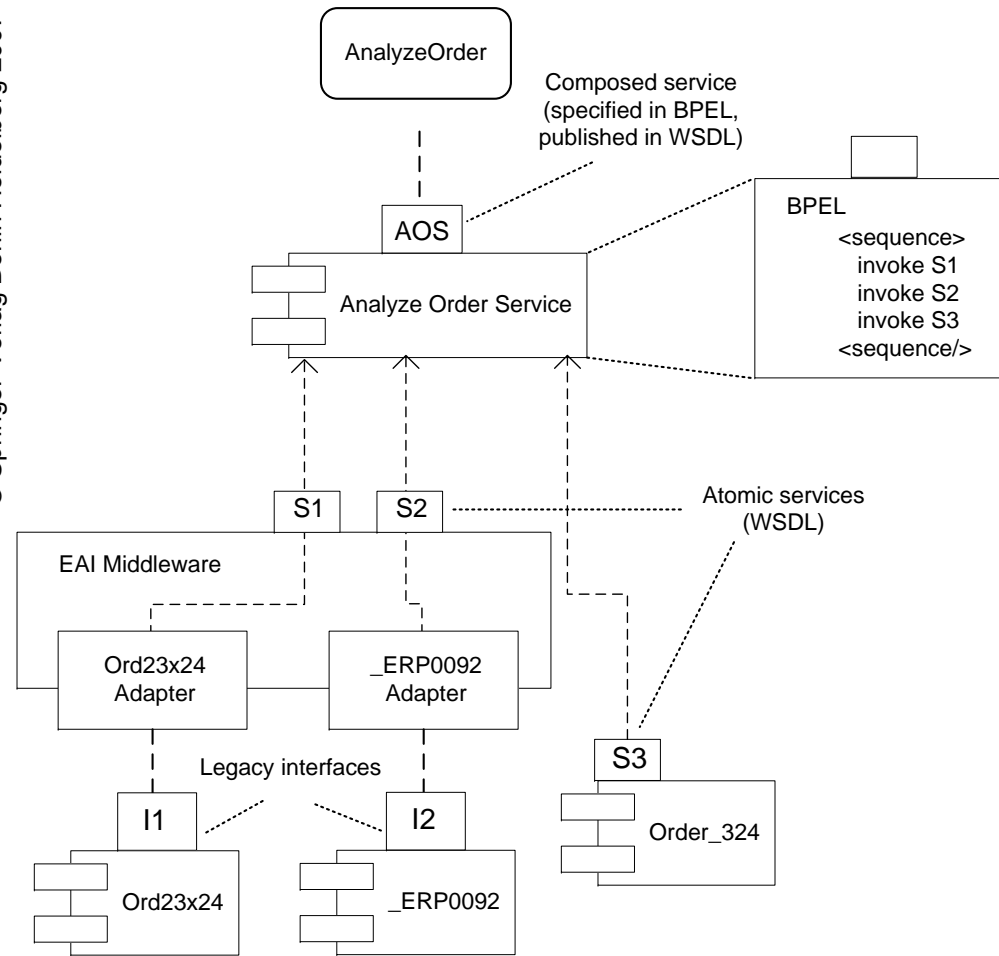


Fig 2.22. Service-enabled application system



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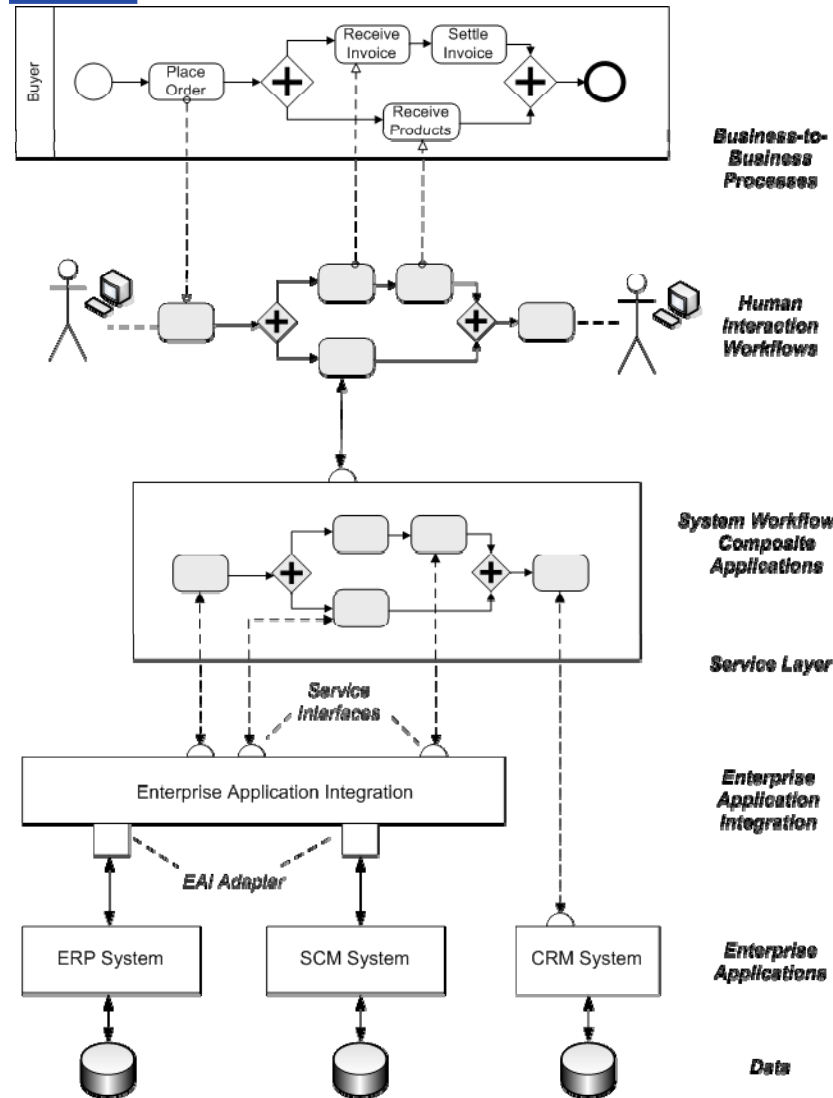
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Fig 7.14. Web services standards in service-enabling



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# BPMS today



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Fig 2.26. Business process management landscape



# Workflow Engine Selection Process in CORE

- Need to understand the requirements for a National Statistical Institute
- CORE workpackage (WP4) led by INSEE



# Evaluation grid - 1

- Criterion : General criterion used to evaluate a tool
  - **Each criterion can be divided into sub-criteria**
- Description : A short description of each sub-criterion
- Score : For each sub-criterion, a score is given to the tool
  - **Varies between 0 and 2, 2 being the best score. The final score of a general criterion is the weighted mean of its sub-criteria**



## Evaluation grid - 2

- Weight : Weight of a criterion (resp. a sub-criterion) used for the final score (resp. the general criterion score).
  - **Weights have been initialized according to NSIs requirement analysis**

# Criteria and Subcriteria - 1

- Modeling :
  - Graphical user modeling interface : presence and quality of the process modeling tool
  - Model translation : ease of model translation into executable process
- Integration :
  - Communication technology : support of multiple technologies for communication
  - Use of standards : use of standard languages or import/export standards capability
  - User management : presence of an internal mechanism or integration capability to manage user roles and permissions

## Criteria and Subcriteria - 2

- Integration :
  - Versioning : process versioning capability
  - Process repository : presence of an internal repository or integration capability
  - Event driven work-flow : possibility to integrate events in processes
  - Rules engine : presence of an internal rules engine or integration capability

## Criteria and Subcriteria - 3

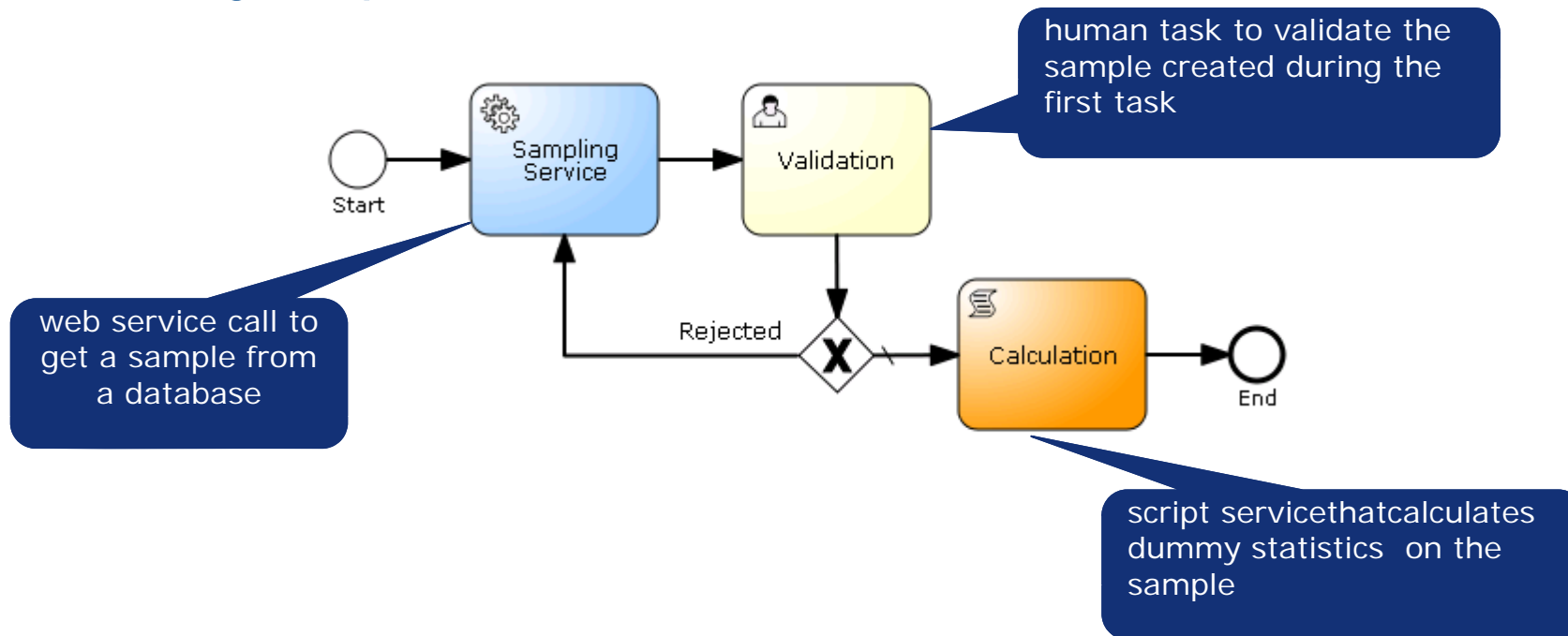
- Execution :
  - Monitoring : quality of information available to monitor processes execution
  - Traceability : capability of saving variables state during a process execution
- General :
  - Usability : general ease of use of the tool, maturity, community activity, etc.
  - Manual steps : manual steps integration, end-user interfaces customization capability, etc.

## Criteria and Subcriteria - 4

- General :
  - Automatic steps : automatic steps integration, with different interaction types
  - Long running transaction : tool must support long transaction since some process can last several months

# Evaluation Method

- Not «cold» evaluation
- Easy implementation scenario



## BPMS - 1

- Business Process Management Systems:
  - Bonita (<http://www.bonitasoft.com/>)
  - Activiti (<http://www.Activiti.org/>)
  - ActiveVOS (<http://www.activevos.com/>)
- Tools have been selected according to:
  - **their popularity**
  - **their features**
  - **partners experience with BPM tools (limited time slot)**

## BPMS - 2

- Bonita:
  - Open-source BPM suite
  - Created in 2001 by the French company Bull. Since 2009, supported by BonitaSoft
  - "Subscription pack", a more complete version wrt open solution
- Activiti:
  - Open-source process engine sponsored by Alfresco
  - The project was born in 2010 after some developers quit JBoss, disappointed by the abandonment of jBPM 4 and lack of support for BPMN 2.0 by jBPM

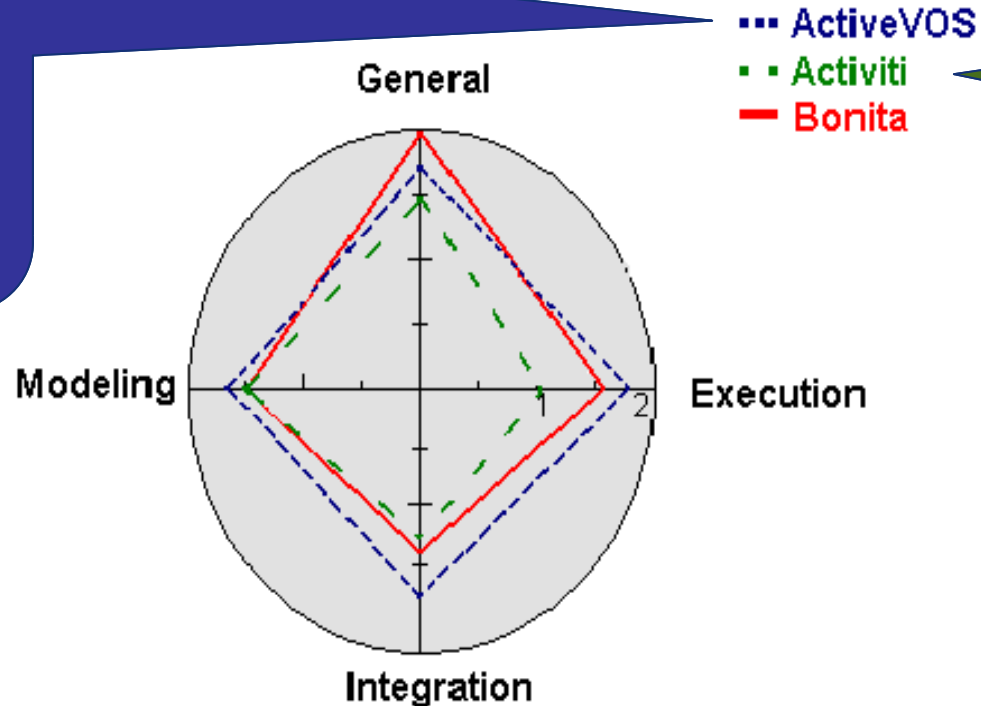


## BPMS - 3

- ActiveVOS:
  - It is a proprietary solution developed by ActiveEndpoint, an American company founded in 2003
  - Used by ABS (Australian Bureau of Statistics )

# Workflow Engine Selection Process

Excellent tool based on open standards. It requires some XML/WSDL skills but allows to implement processes quite easily. Its production features are the most advanced ones among these three tools, but its price can be a barrier



Good Java solution, supported by a very active community. Not mature enough and the current version is not usable for production yet

Unlike the other two solutions, it allows to start creating process without (complex) development.

# Process Engine

- CORE process engine envisions two layers ...

WF ENGINE

Complex control flows

- ✓ Synchronizing constructs, cycles, conditions, etc.
- ✓ E.g.: Interactive multi-user editing imputation

DATA FLOW  
CONTROL SYSTEM

Simple control flows

- ✓ Sequence of tasks is composed by connecting the output of one task to the input of another
- ✓ Data intensive operations



# References

- **Mathias Weske: Business Process Management: Concepts, Languages, Architecture**  
[www.bpm-book.com/](http://www.bpm-book.com/)
- **Wil van der Aalst and Kees van Hee: Workflow Management. Models, Methods, and Systems**  
[www.workflowcourse.com](http://www.workflowcourse.com)
- **M. Mecella, C. Di ciccio, A.Marrella, A. Russo: Business Process Modeling and Management - Elective in Software and Services for the Information Society, SAPIENZA- Università di Roma**