Introduction to Workflow

SISTEMI INFORMATICI SUPPORTO ALLE DECISIONI

AA 2006 - 2007

Libro di testo: Wil van der Aalst and Kees van Hee. Workflow Management: Models, Methods, and Systems. The MIT Press, paperback edition, 2004.

Objectives

- What is workflow management?
- Why is workflow important to business?
- Workflow vs. Groupware
- Workflow system architecture
- Process modeling

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- What is workflow management?
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Process

- A process consists of a number of tasks that need to be carried out and a set of conditions that determine the order of the task.
- Task is a logical unit of work that is carried out as a single whole by one resource.

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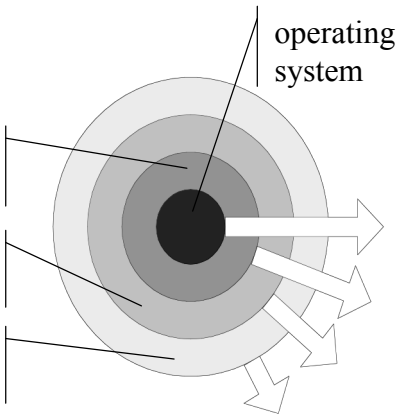
Some trends

1. From programming to assembling
2. From data orientation to process orientation
3. From design to redesign



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Definition of Workflow

In 1996, the Workflow Management Coalition (WFMC) published a glossary of all useful terms related to workflow. It defines workflow as:

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 (activities), according to a set of procedural rules.

A **participant** may be

- person or an automated process (computer system)
- local or in a separate remote organization.

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Workflow management

Goal

To manage the flow of work such that the work is done at the right time by the proper person.

Definitions

- A **workflow management system** (WFMS) is a software package that can be used to support the definition, management and execution of workflow processes.
- A **workflow system** (WFS) is a system based on a WFMS that supports a specific set of business processes through the execution of computerized process definitions

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Workflow Management

- By supporting integration of existing applications, workflow systems ensure **global integration** of people and programs in the framework of a business process.
- During business processing reengineering exercise, business processes are **analyzed** and **streamlined**.

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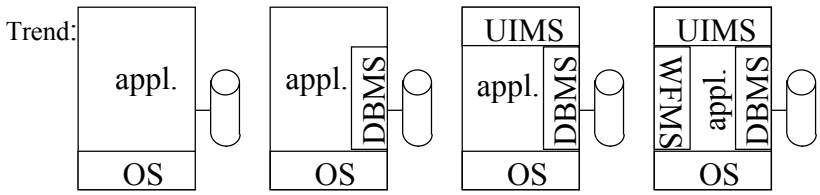
Relevance of workflow management systems



Processes:

- are becoming more important (BPR)
- are subject to frequent changes
- are becoming more complex
- are increasing in number

Workflow Management System

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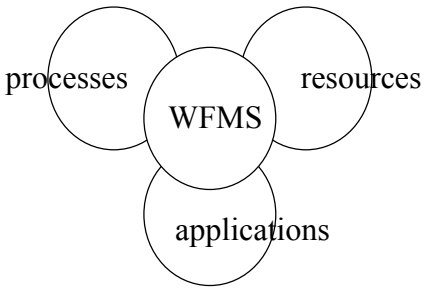
The basic idea:



- separation of processes, resources and applications
- focus on the **logistics** of work processes, **not** on the contents of individual tasks

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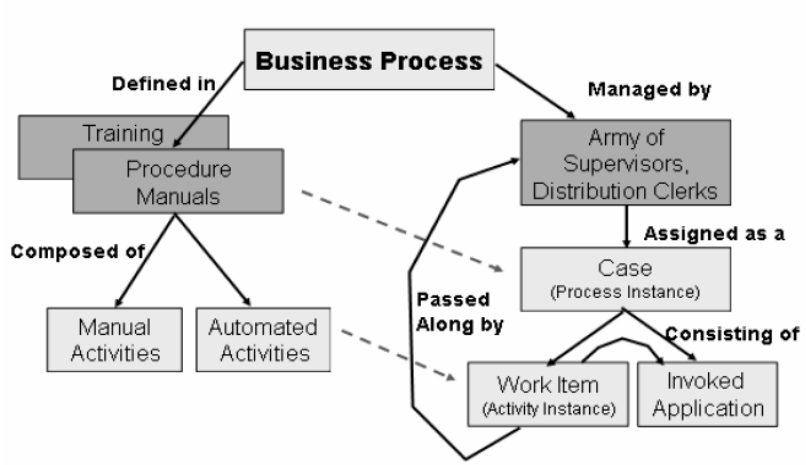
What is Workflow (traditional)



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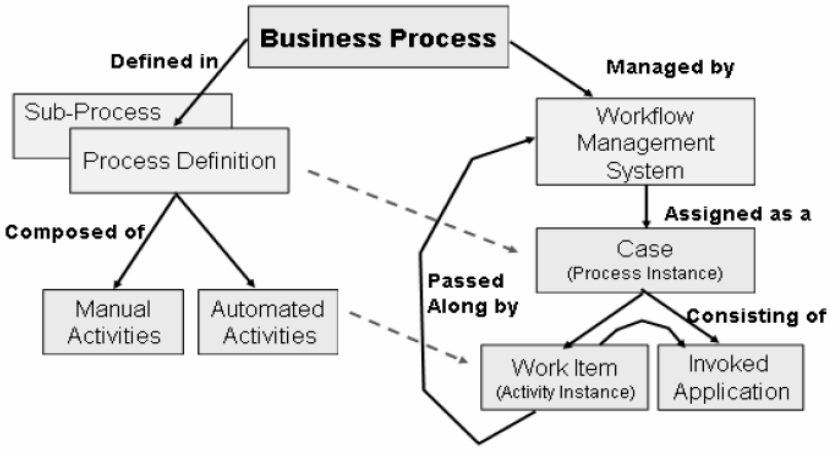
What is Workflow (automated)



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Workflow Management Systems

- Manual (100 years of experience)
  - Army of managers and clerks
    - Expediters to recover from errors
- Automated (15 years of experience)
  - Control of procedures
  - Automatic distribution and tracking
    - Best person *or machine* does the work
    - Most important work done first
    - Parallel (concurrent) processes
    - Management focus on staff and business issues
  - Improved customer service

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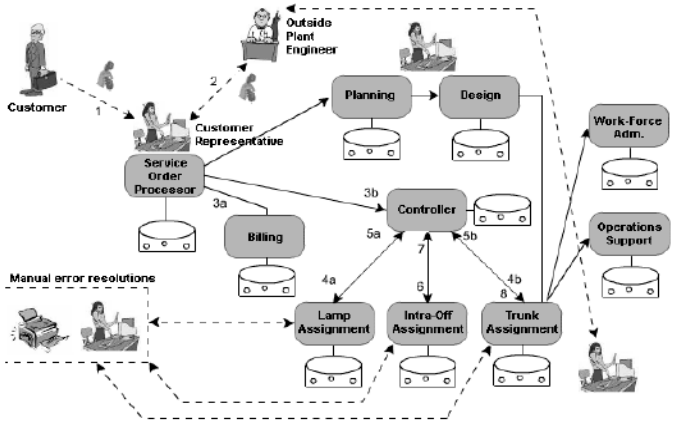
Provisioning a Telephone Service



It is difficult in a manual system to find out the status of a customer application or request

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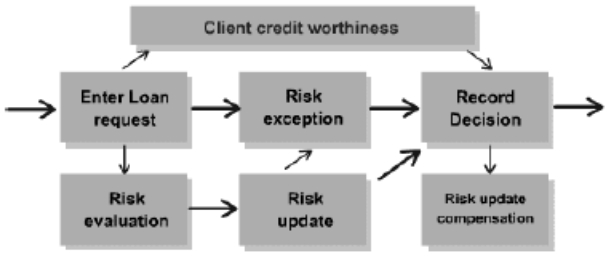
Loan Request Workflow



Workflow may involve both user and application tasks, as well as different types of application tasks. Some tasks can be compensated.

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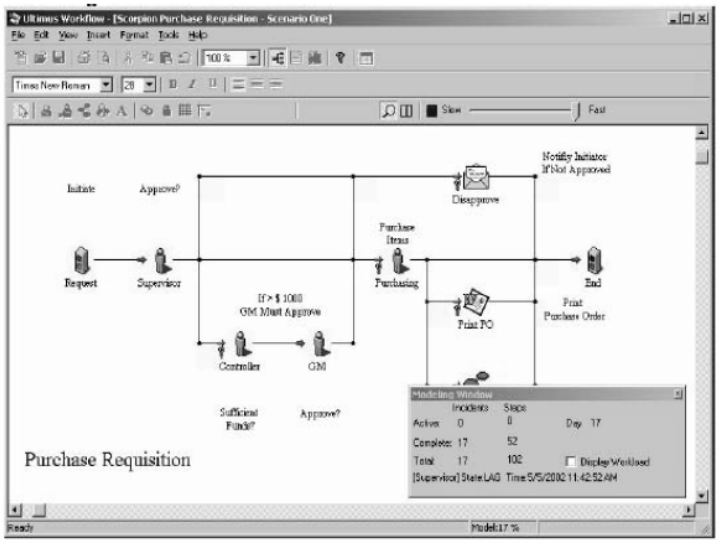

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Motivation

- Processes are important:
  - Business Process Reengineering (BPR)
  - Continuous Process Improvement (CPI)
  - Business Process Management
  - Workflow Management (WFM)
  - Logistics Management (LM)
- There are many modeling techniques and tools
  - DFD, ISAC, SADT, PN, HLPN, PA, FC, UML, ...
  - Simulation tools, design tools, CASE tools, WFMS, ...
- In this course we focus on the essential concepts by using a generic process modeling technique (Petri nets).
- We focus on workflow processes.

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Business Process Reengineering (BPR)
(Business Process Redesign)

- Hammer and Champy: "Reengineering the corporation" (1993)
- Keywords:
  - fundamental
  - radical
  - dramatic
  - process
- The "organize before automate"-principle is replaced by "process thinking".

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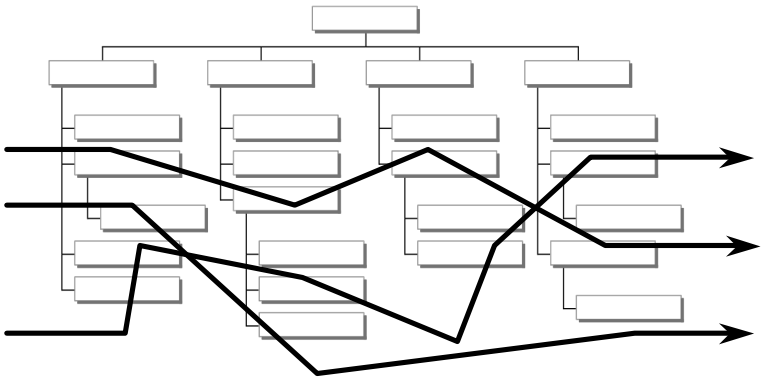
Processes and the organization



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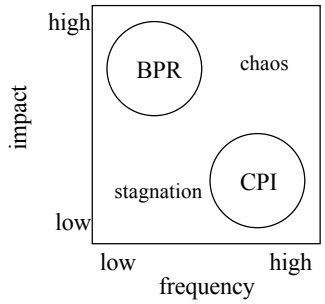
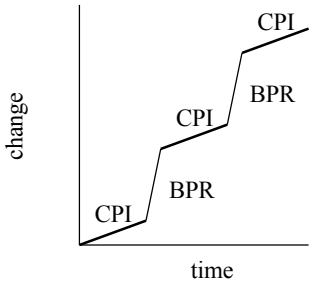
Continuous Process Improvement (CPI)

- Instead of of seeking a radical breakthrough, optimizing the process by continuous, incremental improvements.
- Part of the Total Quality Management (TQM) approach ("doing it right the first time", "eliminate waste", ...)





BPR and CPI are both **process centric** and can be supported by a WFMS.

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Benefits of Workflow Management

- Directed Cost Savings
  - Savings that are readily measured
- Hidden Savings
  - Hard to measure, but real
- Intangible Benefits
  - Case value cannot be identified
  - Valuable to the business

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Benefit 1: Direct Cost Savings

- Better use of staff (or reduction of staff)
  - Sorting, delivery, assignment
  - Logging and tracking
  - Reporting
  - Expediters to recover from problems

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Benefit 2: Hidden Savings – Cash value hard to measure

- Better control of work
  - Best person handles each item
  - Urgent work first, hard cases can't get buried
- Management
  - Assignment automated
  - Status, analysis, quality
- Professional productivity
  - Often 50% or more with improved workflow
  - Tool for process improvement

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Benefit 3: Intangible – Cash value not known

- Improved service
- Employee satisfaction
- Better decisions
- Organization al options
  - Decentralization
  - Cross-department assistance
- Security
  - No misplaced work; priority enforced
  - Audit trail
- Privacy
  - Access control

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WORKFLOW APPLICATIONS TO DIFFERENT AREAS

Functional Area	Processes
Financial	•Compliance (Sarbance/Oxley) •Invoice Processing •Loan Processing •Claims Processing •Forecasting •Purchase Requisitions
Manufacturing	•ISO9000 •Engineering Change Requests •Change Order Management •Parts Management •Return Authorization
Internal/Administrative	•Compliance •Help Desk •Expense Reports •Surveys
Human Resources	•Personnel Actions •Performance Reviews •Leave Requests •Travel Requests •New Hire Processes
Marketing and Sales	•New Account Setup •Lead Management •Proposal Generation •Order Processing •Customer Care •Custom Quote Requests
Product Development	•New Product Introduction •Product Enhancement Requests •New Product Ideas •Defect Reporting

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Groupware Functions and Applications

- Software for enabling collaboration within and between companies
  - Promote team work and improve efficiency through
  - Increased information sharing
  - Reducing communications overheads
  - Providing coordination

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Groupware Examples

- CSCW (computer supported cooperative work)
- Workgroup systems (WGS) – Gartner Group
- Big indsutry – 40 million groupware users

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Groupware Function

- E-mail
- Group discussions
- Document sharing for joint authoring of reports
- Electronic meetings software such as video-conferencing
- Group decision support
- Group coordination software for time management and scheduling

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Distinction between workflow systems and groupware

- Both used for collaboration
- Considered as separate types of product since groupware is usally used in an ad-hoc way while workflow imposes a more strict, structured way of working

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Spectrum

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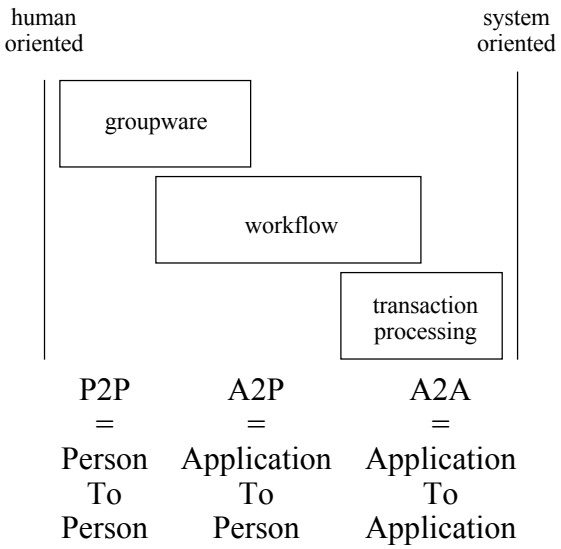

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Aspects of workflow and groupware

- process awareness (WFM)
  (tasks, routing, roles, ...)
- management instrument (WFM)
  (measurements, control, ...)
- allocating work to resources (WFM)
  (scheduling, priorities, ...)
- documents (GW)
  (imaging, sharing, transport)
- collaboration (GW)
  (interaction, cooperation, ...)
- systems integration (WFM,GW)
  (integrating applications, legacy software, ...)
- distribution (WFM,GW)
  (network, transparency, robustness)

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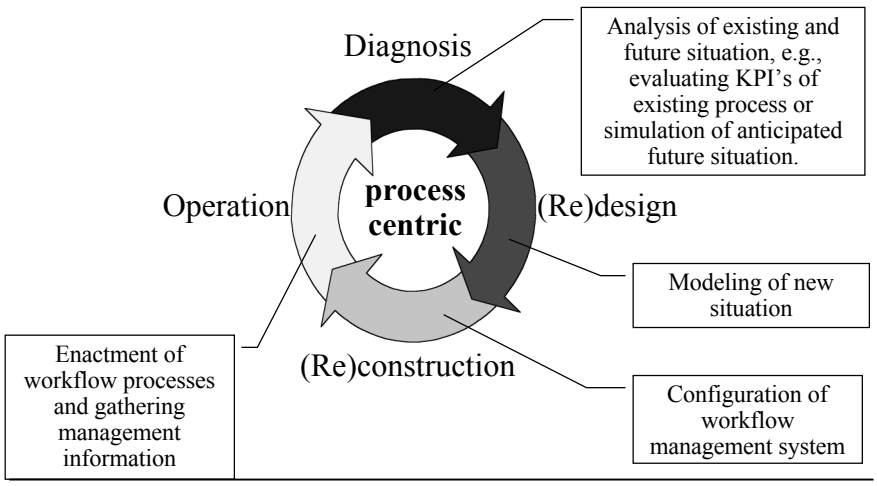
Business process management defined



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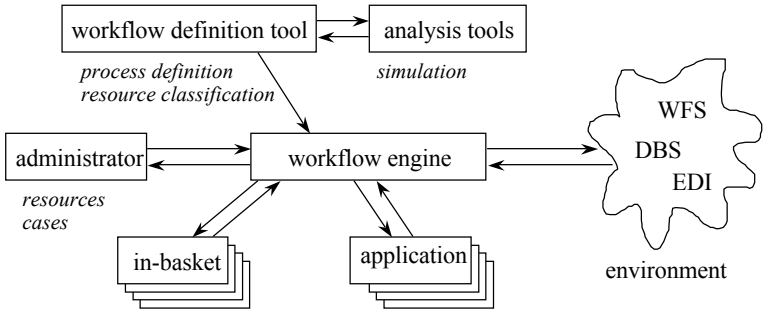
Architecture of a workflow management system



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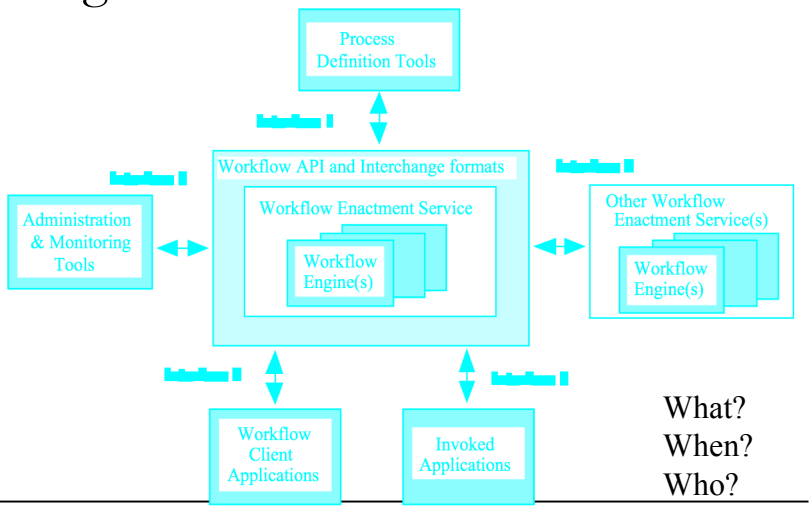
Reference model of the Workflow Management Coalition



What?
When?
Who?

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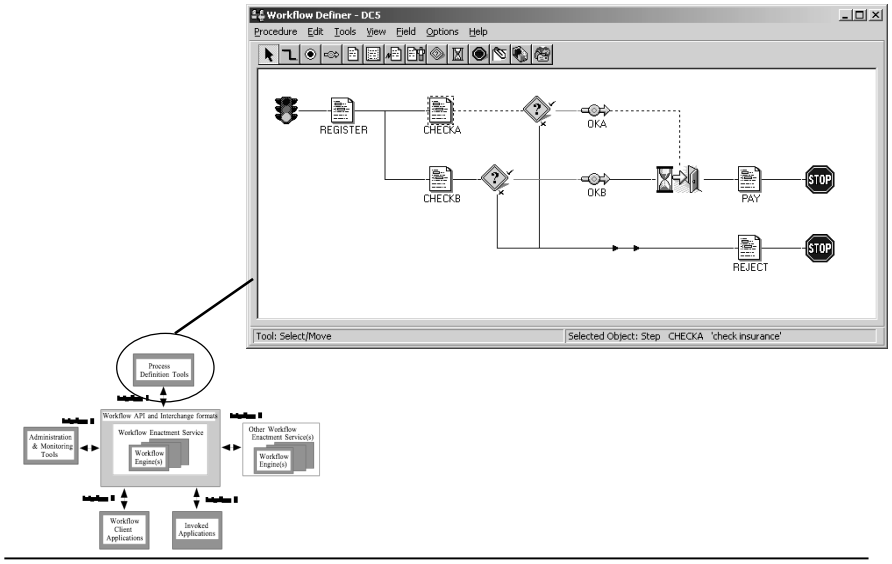
Workflow Definer - DC5
Procedure Edit Tools View Field Options Help
REGISTER
CHECKA
OKA
CHECKB
OKB
PAY
STOP
REJECT
Tool: Select/Move
Selected Object: Step CHECKA 'check insurance'
Process Definition Tools
Workflow API and Interchange formats
Administration & Monitoring Tools
Workflow Enactment Service
Workflow Engine(s)
Other Workflow Enactment Service(s)
Workflow Client Applications
Invoked Applications

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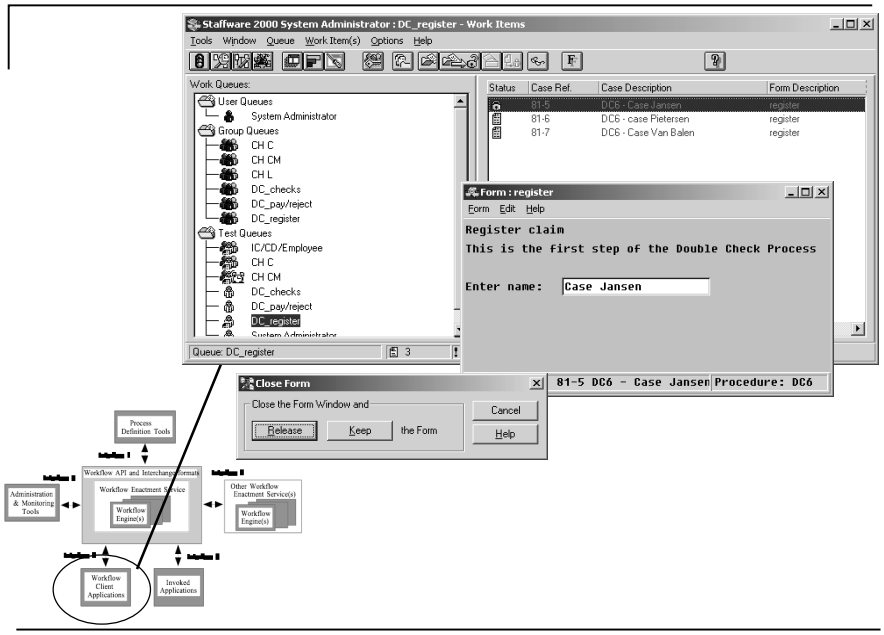
Staffware 2000 System Administrator : DC_register - Work Items
Tools Window Queue Work Item(s) Options Help
Work Queues:
User Queues
System Administrator
Group Queues
CH C
CH CM
CH L
DC_checks
DC_pay/reject
DC_register
Test Queues
IC/CD/Employee
CH C
CH CM
DC_checks
DC_pay/reject
DC_register
Queue: DC_register
Status Case Ref. Case Description Form Description
81-5 DC6 - Case Jansen register
81-6 DC6 - case Pietersen register
81-7 DC6 - Case Van Balen register
Form : register
Form Edit Help
Register claim
This is the first step of the Double Check Process
Enter name: Case Jansen
Close Form
Close the Form Window and
Release Keep the Form
Cancel
Help
81-5 DC6 - Case Jansen Procedure: DC6
Process Definition Tools
Workflow API and Interchange formats
Administration & Monitoring Tools
Workflow Enactment Service
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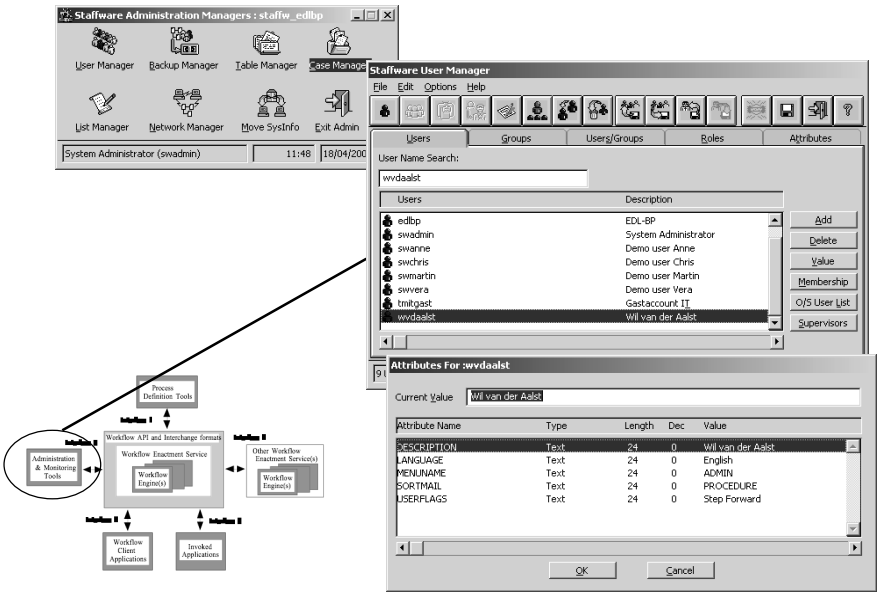

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Today's situation

- Estimate: more than 200 software producers are active in this domain.
- Relatively, a limited number of actual sites where pure WF-technology is being used. However, absorbed in many other software packages.
- Despite the efforts of the Workflow Management Coalition (WFMC) standardization is lacking.
- Situation is comparable to the early seventies in 'database-land' (ER-model by Chen 76, Relational model by Codd 70).

Þ **We need a conceptual model for WFM !**

Þ **A unifying process modeling technique!**

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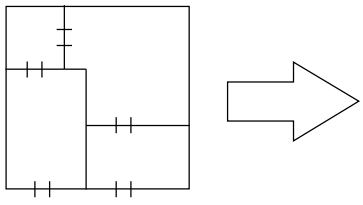
Process modeling techniques

- Process modeling techniques are used in many application domains (production/office logistics, information systems, technical systems).
- Purpose: compare with building a house.



Purpose:
(1) insight
(2) analysis
(3) building

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Overview of process modeling techniques

- Flowcharts
- Dataflow diagrams (DFD, ISAC, SADT, IDEF)
- Unified Modeling Technique
- Transition systems, state transition diagrams (extensions: e.g. state charts)
- Queueing networks and Markov chains
- Process algebra's (ACP, CCS, CSP)
- (High-level) Petri nets
- Vendor specific diagramming techniques used in WFMS's, simulation tools and CASE tools.

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Requirements

- Formal semantics
- Graphical
- Easy to use
- Easy to learn
- High expressive power
- Supported by tools
- Not vendor specific
- Explicit representation of states and events

We will use high-level Petri nets!

We use transition systems/dataflow diagrams to illustrate this choice

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Transition systems

- "mother of all process models"
- low-level
- easy to learn
- difficult to apply
- basic concepts:
  - state
  - state space
  - event

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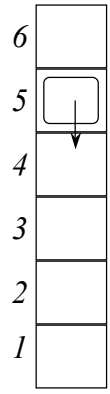
Basic concepts (static)

- **State**
  - e.g. state of an elevator (5,-1)
  - snapshot of the process/system
- **State space**
  - set of all possible states and directions



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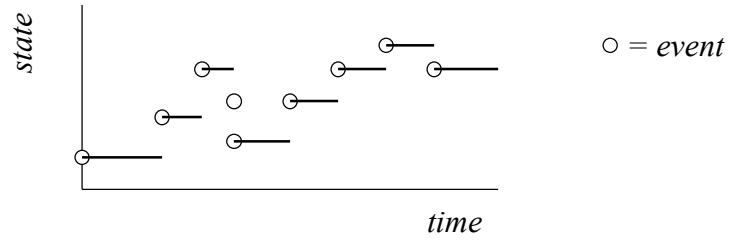
Discrete dynamic systems

- We focus on discrete processes, i.e. state changes are caused by **events**



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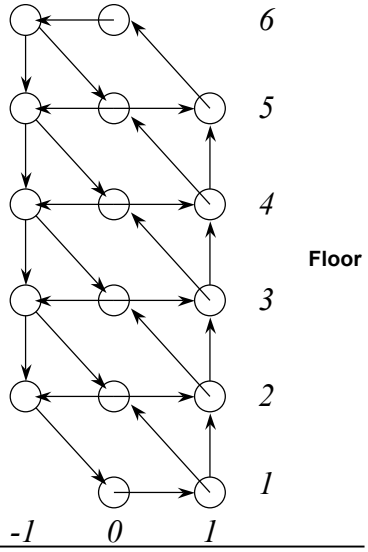
Example: elevator

- Graphical representation of a transition system

(Abstraction from time!)



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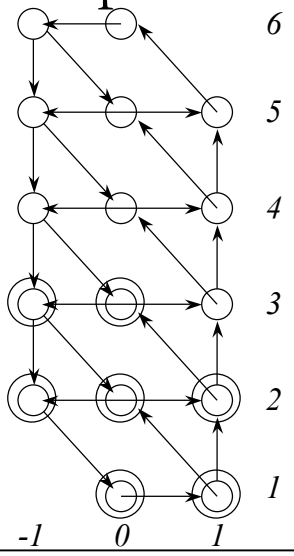
A possible path



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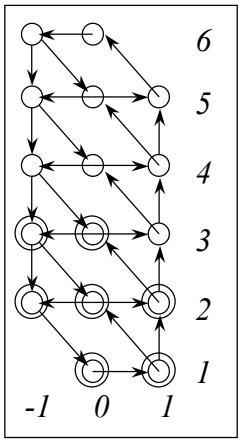
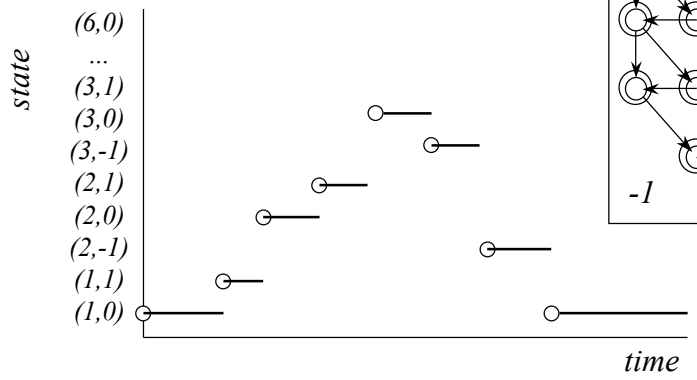
Example: elevator

- A **possible path** represented by a **state/time diagram**





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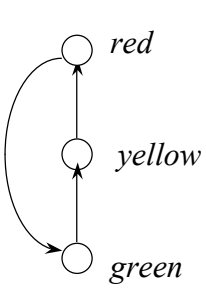
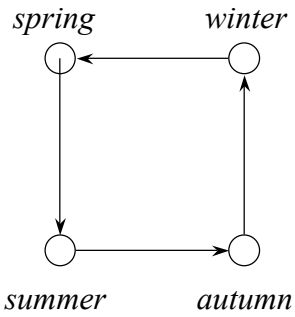
Other Examples





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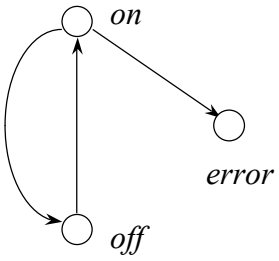
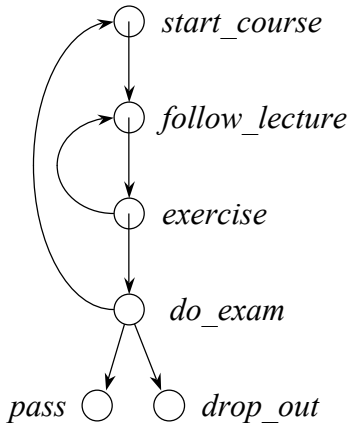
Other Examples (2)





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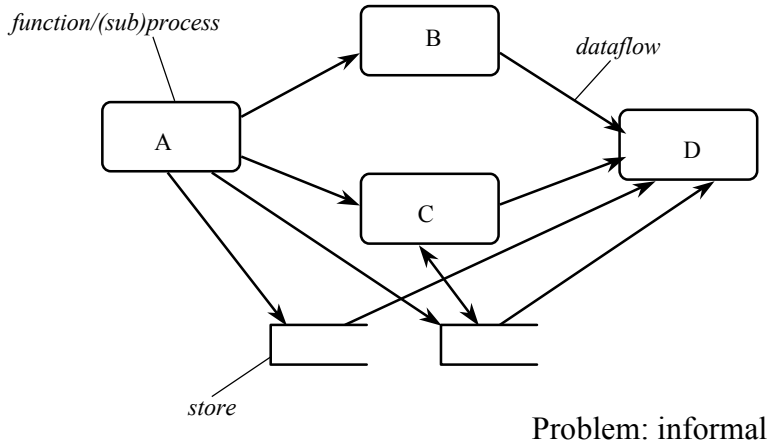
Dataflow diagrams



Problem: informal!

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Next…

- We study Petri-nets, a formal model for capturing state transition and flow among processes
- Allow formal analysis, including logical correctness and performance measures
- Forms the basis of process definitions for commercial software systems

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Conclusions

- A WFMS “extracts” processes from system development
- Allow manager to focus on process and resource allocation without worrying about the actual content of a task
- Important for business process re-engineering
- Compare with other collaboration technologies e.g., groupware
- Use in Internet for collaborative commerce

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Readings

- Chapter 1, textbook
- Article: An Introduction to Workflow
  - http://www.wfmc.org/information/introduction_to_workflow02.pdf
- Go to www.wfmc.org and try to have an understanding of the mission of such organization;
- Download and read some articles as listed below:
- http://www.e-workflow.org/White_Papers/index.htm

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