Introduction to Workflow

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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?
  - Why is workflow important to business?
    - Workflow and Groupware
    - Workflow system architecture
    - Workflow modeling

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.
Some trends

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

- generic applications
- domain specific applications
- tailor-made applications

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.
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.

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.
Relevance of workflow management systems

Trend:

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

Workflow Management System

The basic idea:

- separation of processes, resources and applications
- focus on the logistics of work processes, not on the contents of individual tasks
What is Workflow (traditional)

What is Workflow (automated)
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
  - 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.
Loan Request Workflow

Client credit worthiness

- Enter Loan request
- Risk evaluation
- Risk exception
- Risk update
- Record Decision
- Risk update compensation

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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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.
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".

Processes and the organization
Continuous Process Improvement (CPI)

- Instead 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.

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
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

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
Benefit 3: Intangible – Cash value not known

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

### WORKFLOW APPLICATIONS TO DIFFERENT AREAS

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<th>Functional Area</th>
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<td>Marketing and Sales</td>
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<td>- Default Development</td>
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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
Groupware Examples

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

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
Distinction between workflow systems and groupware

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

Spectrum
Aspects of workflow and groupware

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

- Operation: Enactment of workflow processes and gathering management information
- Diagnosis: Analysis of existing and future situation, e.g., evaluating KPI's of existing process or simulation of anticipated future situation.
- (Re)design: Configuration of workflow management system
- (Re)construction: Modeling of new situation
Architecture of a workflow management system

Reference model of the Workflow Management Coalition
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).

We need a conceptual model for WFM!
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
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.

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
Transition systems

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

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
Discrete dynamic systems

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

Example: elevator

- Graphical representation of a transition system

(Abstraction from time!)
A possible path

Example: elevator

- A possible path represented by a state/time diagram
Other Examples

- red
- yellow
- green

- spring
- winter
- summer
- autumn

Other Examples (2)

- on
- off
- error

- start_course
- follow_lecture
- exercise
- do_exam
- pass
- drop_out
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.

Problem: informal!
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

Readings

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