Modeling Workflows

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Workflow management

- **WFM = Administrative Logistics**
- **Getting**
  - the right information (documents)
  - at the right time
  - to the right person
- **Emphasis**
  - on structure of work processes (workflows)
  - not on contents of work processes (AIS!)
Workflow management aspects

- Routing of information/documents
- Allocation of tasks to actors
- Scheduling of tasks in time
- Scheduling of scarce resources
- Monitoring flow of work
- Handling exceptional situations
- Providing management information
Overview

- Workflow management systems
  - what is the system context?
- Workflow concepts
  - what are we talking about?
- Workflow process modeling
  - how do we model this?
- Advanced workflow aspects
  - how do we deal with complex aspects?
- Conclusions
Workflow Management Systems
WFMS as Infrastructure
WfMC WFMS architecture

- Workflow API and Interchange Formats
- Workflow Enactment Service
- Workflow Engine(s)
- Process Definition Tools
- Administration & Mngmnt Tools
- Invoked Applications
- Workflow Client Applications
- Other WF Enactment Service(s)

Interfaces:
- IF1
- IF2
- IF3
- IF4
- IF5
Mercurius WFMS architecture

- UIS
- WF Design
- WF Clients
- WF Server
- DBMS
- AS/OS
- CS
- data stores
- AS/OS/DBMS
- WF Server
Mercurius design module architecture

- **Extension Module**
- **UIS Interface**
- **WF Design Engine**
- **DBMS Interface**
- **AS Interface**

Software bus connects to the extension module. Data flows between various components as follows:

- **organ. data**
- **def. data**
- **proc. data**
- **appl. data**
Mercurius design engine architecture

- Organisat. Design
  - organ. data
  - Global Design
    - def. data
  - Detail Design
  - Tuning

- Product Design
  - proc. data
  - appl. data
Mercurius enactment module architecture
Mercurius enactment engine architecture

- **WFC Interface**
- **Event Receptor**
- **Event Analyzer**
- **Action Synthesizer**
- **Action Executor**
- **Clock Module**
- **CS Interface**
- **AS Interface**
- **OS Interface**
- **proc. data**
- **def. data**
- **appl. data**

Software bus
Workflow Client
Workflow Concepts
Workflow concepts

workflow

c.o.

seq.

workflow element

c.o.

role

dyn.

sup.

agent

c.o.

actor

repl.

group

activity

stat.

uses

link

information element

c.o.

form

document

dossier
Workflow process concepts

Diagram:
- **workflow**
  - **c.o.**
    - **seq.**
    - **workflow element**
      - **c.o.**
        - **connector**
        - **activity**
        - **subflow**
Workflow organization concepts

Diagram:

- sup. (supervisor)
- agent
- actor
- c.o. (coordinator)
- group
- repl. (replacement)
Workflow information concepts

- **link**
- **info element**
- **c.o.**

- **form**
- **document**
- **dossier**
Workflow concepts (summarized)
Specification vs instantiation

- WF Spec
- Task Spec
- Role
- WF Instance
- Task Instance
- Agent
Workflow life cycle

Inactive → assign → Waiting → Running → complete → Completed
Running → modify → Running
Running → reject → Rejected
Rejected → assign → Rejected
Running → cancel → Canceled
Workflow Process Modelling
Workflow design approach

- Organisation design
  - Global process design
    - Detailed process design
      - Introduction
      - Process enactment
    - Process simulation
  - Information design
    - Process enactment
    - Process adjustment
Process specification techniques

- data flow based?
- activity order based?
- document based?
- communication based?
GTI process in Petri Net

1. select accomm.
2. select transport
3. calc. costs
4. book trip
5a. cancel acc.
5b. cancel transport
6. send ackn.
7. prep. invoice
8. prepare docs.
9. send invoice
10. send docs.
11. chk pay.
12. send docs.
13. send remind.
GTI process in document chart

- accomm. form
- transport form
- trip dossier
- ackn. letter
- travel docs
- customer invoice
- payment reminder
Speech act process models

- all processes are based on speech acts
- all elementary processes are communication loops between 'consumer' and 'producer'
- with 4 fases:
  - preparation
  - negociation
  - execution
  - acceptance
- elementary loops are connected
GTI process in BPM

- sell trip
- select accom.
- select transp.
- calc. costs
- new trip
- prepare invoice
- prepare ackn.
- book trip
The perfect choice

- Choice depends on
  - nature of workflow
  - level of detail
  - intended audience

- Combination of techniques for
  - different abstraction levels
  - different aspects

- Consistency with WFS environment
  - ‘independent’ modeling tools
  - WFMS-specific tools and details
GTI process in WFPD

START

select accomm.
select transport
calculate costs

book trip
send acknowl.
prepare documents
send invoice
send invoice
check payment
send reminder

cancel accomm.
cancel transport
send documents
prepare documents

STOP
Workflow designer
GTI proces level 1

START

select trip

book trip

cancel trip

send acknowl.

prepare documents

handle invoice

handle payment

STOP

send documents
GTI proces level 2

START -> select accomm. -> select transport -> calculate costs -> STOP

START -> cancel accomm. -> cancel transport -> STOP

START -> prepare invoice -> send invoice -> STOP

START -> check payment -> send reminder -> STOP
WF process specification language

OR-JOIN StartJoin,
    START, CalculateCosts;
SEQUENCE SelectAccommodation,
    SelectTransport;
SEQUENCE SelectTransport,
    CalculateCosts;
SEQUENCE CalculateCosts,
    BookSplit;
OR-SPLIT BookSplit
    CASE CustomerDecision
    change : StartJoin,
    cancel : CancelAccommodation,
    book   : BookTrip;
ACTIVITY SendAcknowledgment
DESCRIPTION
"Preparation of booking acknowledgment letter for customer in MS-Word, printing and sending it."
INPUT = TripBookForm
OUTPUT = TripBookAckLetter
APPLICATION = MS-Word
ROLE = General
AVGTIME = 5
MAXTIME = 15
GTI process (UML activity diagram)

1. Select accommodation
2. Select transport
3. Calculate costs
4. OK?
   - [CHANGE]
   - [NO]
5. Cancel accommodation
6. Cancel transport
7. Book trip
8. Send acknowledgment
9. Prepare invoice
10. Prepare documents
11. Send invoice
12. Check payment
13. Send reminder
14. OK?
   - [NO]
   - [YES]
15. Send documents
Advanced Workflow Aspects
Advanced workflow modeling aspects

- Transactional workflows
- Exceptions in workflows
- Explicit data flow in workflows
- Cross-organizational workflows
Transactional workflows

START

select
accomm.

select
transport

calculate
costs

book
trip

prepare
invoice

send
invoice

send
acknowl.

prepare
documents

check
payment

prepare
invoice

send
reminder

cancel
transport

send
documents

cancel
accomm.

STOP

send
documents

send
reminder
Exceptions in workflows

START

select accomm.
select transport
calculate costs

book trip
send acknowl.
prepare documents
check payment
send reminder
send invoice
prepare invoice

cancel accomm.
cancel transport

inform customer
replan booking
STOP
Explicit data flow in workflows
Cross-organizational workflows

START

- select accomm.
- select transport
- calculate costs

START

- book trip
- send acknowl.
- prepare documents
- send documents

START

- prepare invoice
- send invoice
- check payment
- send reminder

STOP

STOP

cancel accomm.
cancel transport

STOP

STOP
Conclusions
Workflow modeling

- Many approaches to workflow modeling
- Practice often based on petri net variants
- Integration (and consistency) of organization, information, and process model
- Multi-level and/or multi-aspect modeling required for complex applications
- Advanced functionality required for complex applications, but not yet adopted by practice
Workflow applicability

- Processes
  - Highly structured
  - Moderately complex
  - Information-intensive
  - Frequently repeating

- Organization
  - Mid-sized to large
  - Highly structured (machine bureaucracy)
  - Open to (IT) innovations