Research in Business Process Management

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IS/IE/TUE
Overview

- Introduction
  - The research field
- BP design
  - Contexts, techniques, approaches
- BP enactment
  - Architectures, systems, technologies
- An example project
  - CrossWork
- Final thoughts
  - A control systems view
  - A fast moving field
Introduction
**Business Process Management**

- **BPM = Information 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 activities (biz functions)
- **BPM ~ WFM**
BPM 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
- Within and between organizations
Example BP: GTI

START

select accomm.

select transport

calculate costs

book trip

prepare invoice

send invoice

prepare documents

send documents

check payment

send reminder

cancel accomm.

cancel transport

cancel accomm.

cancel transport

STOP

send acknowledgment
BPM Concepts (Summarized)

- **Role**
  - **Dynamic**
    - Agent
      - Organizational model
  - **Static**
    - Activity
      - Process model
      - Uses
        - Information element
      - Information model
BPM Concepts

- process
  - c.o.
  - seq.
  - process element
    - c.o.
  - connector
  - activity
  - subprocess
    - c.o.

- role
  - dyn.
  - sup.
  - agent
    - stat.
    - uses
      - information element
        - link
        - form
        - document
        - dossier

- actor
  - c.o.
  - group
  - repl.
Two faces

- BP (re)design
  - Design methods, approaches, heuristics
  - Modeling techniques, languages, tools
  - Practice-oriented or mathematics-oriented
  - Starting to be well-accepted in broad practice

- BP enactment
  - Model execution
  - Dealing with concurrency & distribution
  - Architecture- and technology-oriented
  - Still in infancy in broad practice
    - Standardization lags miles behind data management
BP design

specifying processes
Process specification techniques

- data flow based?
- token based?
- event 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.
select accomm. 
select. transport 
calc. costs 

[OK?]
[CHANGE]
[NO]
[YES]

book trip 

send acknowl. 
prepare documents 

prepare invoice 
send invoice 
check payment 

[OK?]
[NO]
[YES]

send documents 

[YES]
[NO]

send reminder 

cancel accomm. 
cancel transport 

send documents
GTI in Document Transformation Chart

- accomm. form
- transport form
- trip dossier
- ackn. letter
- travel docs
- customer invoice
- payment reminder
GTI process in Business Process Map

select accom.

select transp.

calc. costs

new trip

sell trip

book trip

prepare ackn.

prepare invoice
The ‘perfect’ choice?

- Choice depends on
  - nature of business process
  - level of detail
  - intended audience

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

- Consistency with BPMS environment
  - ‘independent’ modeling tools
  - BPMS-specific tools and details
BP design

design approaches
Business process reengineering

- Analysis tools
- Design tools
- BPM engine
- Specif. tools
Process patterns

- Analysis tools
- Design tools
- BPM engine
- BPM engine
BP enactment
Business process enactment

- Analysis tools
- Design tools
- BPM engine
- Specif. tools
BPM Concepts (Summarized)

- Role
  - Dynamic (dyn.)
  - Agent
    - Organizational model
  - Static (stat.)
  - Activity
    - Process model
  - Uses
  - Information element
    - Information model
WfMC reference architecture

Process Definition Tools

WF API & Interchange Formats

Workflow Engine(s)

WF Enactment Service

Workflow Client Applications

Invoked Applications

Administration & Mngmnt Tools

Workflow Engine(s)

Other WF Enactment Service(s)

IF1

IF2

IF3

IF4

IF5
Inter-organizational BPM

organiz. model

agent

perfs

activity

uses

info element

info model

organiz. model

process model

info model

agent

perfs

activity

uses

info element
IBPM Aspects (1)

- **Distribution**
  - distributed process definition
  - distributed process enactment
  - consistent execution (transactions)

- **Heterogeneity**
  - different process/data standards
  - different software/hardware platforms

- **Autonomy**
  - local decisions w.r.t. process enactment
  - contracted QoS for enactment
Encapsulation (abstraction)
  ◦ hiding of private details (competition)
  ◦ hiding of uninteresting details (service)

Standardization
  ◦ process structures
  ◦ data structures
  ◦ interaction protocols
  ◦ abstraction for right level
  ◦ bilateral or market segments
Three-Level Framework

Electronic contracting

External Process

Conceptual Process

map

Internal Process

Process Initiator

Project

Conceptual Process

map

Internal Process

Process Responder
BPMS design cycle (1)

- Requirements analysis
- System design
- Prototype use
- System implement
• Often weak
• Hard 2B realistic
• Techn. push
• Limited funct.
An example project
Profactor
UMIST
TU/e
Uni. Växjö
Uni. Linz
Magna Intier
MAN
AC
Atos Origin
Exodus
XW Consortium
Automotive supply pyramid (1)
Automotive supply pyramid (2)

OEM

1st Tier Suppliers

2nd Tier Suppliers
The start

Prod. Spec.

NoAE

Design/Production

XW

OEM
Dynamic supply network
Business Process in IVE
The start

Prod. Spec.

NoAE

XW

Design/Production

OEM

NA E OEM XW NOAE Design/Production
The start
Separation of concerns

What  Who  How  With
The three-level framework

- **What**
- **Who**
- **How**
- **With**

**external level**

**conceptual & internal levels**
Modularity of functionality

Product
- Goal Decomp.
- Team Format.
- Team

Process
- Process Compos.
- Process Verificat.
- Process Prototyp.

Infrastructure
- Global Enactm.
- Local Enactm.
- Legacy Integrat.
Team Formation

RoleBasedTeams
- Best scorecard suppliers; SI = best logistics scorecard
- Best scorecard suppliers; SI = best scorecard

Members:
- Producing_ALKOHOL
- Producing_DICHTRING
- Producing_DICHTRING_F_EINFUELPROHR
- Producing_HIRW_NACH_NUEPRAKOLL
- Producing_MONT_FUER_FUELLENUNG_VS_VW
- Producing_RUECKSLAGVENTIL
- Producing_SCHEIBENWASCH_PUMPE_M_GEB
- Producing_SCHAUCH_XLI
- Producing_SCHAUCH_XLI
- Producing_TUELLE
- Producing_TUELLE_F_SRA_PUMPE
- Producing_TUELLE_M_FILTER_F_SWA_PU
- Producing_VEREINIGUNGSTOPFEN
- Producing_VERSCHLUSSSTOPFEN
- Producing_VERSCHLUSSSTOPFEN_DNMB
- Producing_WASSERBEHAELTER
- Producing_WASSERBEHAELTER_LR10_LI
- Producing_WASSERBEHAELTER_LR10_RE
- System_Integrator

Details

JSupplierFacility
- DistanceMunich: 280
- DistanceSteyr: 80

Identifiers

JIS
- JIT
- deliveryNR: 98000658

MaterialGroupCapability: Beleuchtung, Batterien

Name: LICHTSYSTEME GMBH
OrderNr: 832228
PartnerNr: 19970

VMI
Example process: truck water system

- Preparation
- Tank body
- Dispenser
- Sealing ring
- Assembly
Enactment topology

A: preparation, tank body, assembly
B: motor pump
C: grommet
D: dispenser
E: sealing ring
XW design cycle

- Field reqs.
- Reqs. & Arch.
- Sand box
- Techn. Integr.
Summary CrossWork

- Electronic supplier networks (Networks of Automotive Excellence)
- Semi-automatic (pre)selection of project members based on product specification and member capabilities
- Semi-automatic generation of network processes based on local processes
- Mapping of network processes to local infrastructure & control of execution
- Engineering-oriented, partly technology push
Final thoughts

a control systems view
Integration (1)

Environment

Control system

Information system

data

Transformation system

strategic

tactical

operational
Integration (2)
Integration (3)
Integration (4)

Environment

Information and control system

actions → decisions → information → data

actions → decisions → information → data

transformation → transformation
Integration (5)

Environment

Information and control system

Data

Decisions

Transformation

Actions
Very final thoughts

a fast moving field
Moving targets
Publication strategy for research

- Importance of conferences
  - Fast publication turn-around
  - Research synchronization events
  - Some very high quality journals

- Journals
  - May be slow w.r.t. turn-around
  - Develop content-wise slower than conferences
  - Important for establishment of SotA
Chopping through the Publishing Jungle
Good conference?

What is good?
- scientific topic fit
- acceptance rate
- audience target
- proceedings visibility
Conference attributes (1)

- **Name**
  - but topic may have evolved (ER towards IS)
- **Main or satellite or cluster or virtual**
- **Location** (*be aware*)
- **Organizing**
  - IEEE, ACM, IFIP
- **Proceedings publisher**
  - IEEE, ACM, Springer
- **Sponsors**
  - business, prof.org.
Conference attributes (2)

- People involved
  - organizing committee
  - program committee
  - keynote speakers

- Type of invitation / CfP

- Acceptance rate