Title	Modeling and Verification of Workflows for e-Society
Author(s)	Hiraishi, Kunihiko
Citation	
Issue Date	2005-03-11
Type	Presentation
Text version	publisher
URL	http://hdl.handle.net/10119/8270
Rights	
Description	JAIST 21 COE 2005 = JAIST 21st Century COE Symposium 2005 "Verifiable and Evolvable e-Society", 2005 3 10 11 , , Technical session 1 <Logic and Verification>

Modeling and Verification of Workflows for e-Society

Kunihiko Hiraishi
School of Information Science
Japan Advanced Institute of Science and Technology

Process Oriented Approach in Business
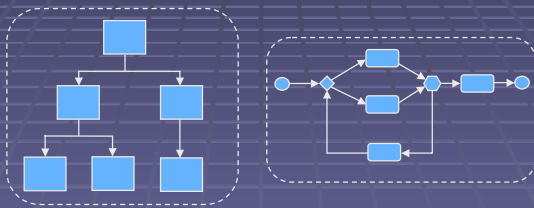
1990   1995   2000   2005

Business Process Reengineering

Enterprise Resource Planning

Workflow Management

Enterprise Application Integration

Business Process Modeling
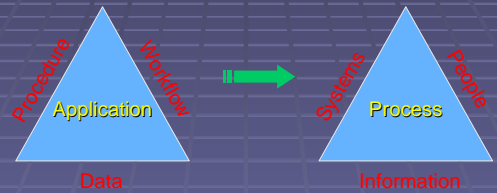

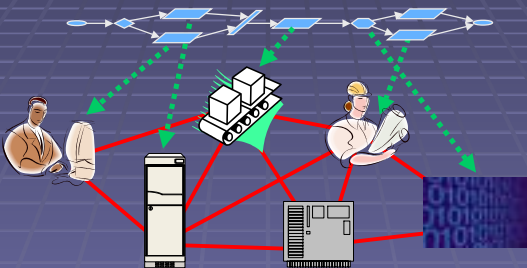## Process Oriented Approach in Business

Organization View   ➡   Process View
+ Optimal Resource Assignment

Process Oriented Approach in Business

Procedure / Workflow / Application / Data

Systems / People / Process / Information

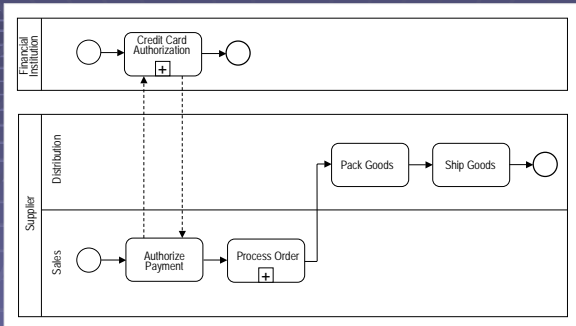by Howard Smith, CTO of Computer Science Corporation

---

Workflows Integrate People, Systems and Information

Business Process Modeling Languages
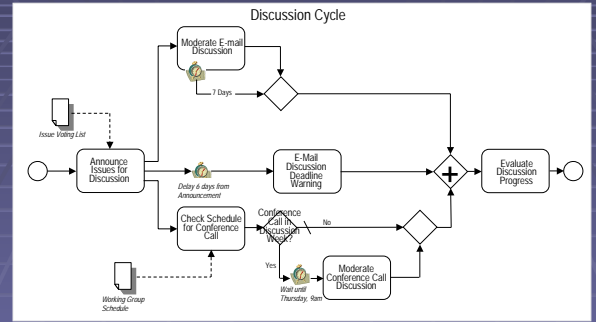
- IDEF (Integrated Definition Method)
- BPMI   Business Process Management Initiative
  - BPML   Business Process Modeling Language
  - BPMN (Business Process Modeling Notation)
  - BPQL (Business Process Query Language)
- WfMC   Workflow Management Coalition
  - Wf-XML
- ebXML (Electronic Business XML)
- UML (Unified Modeling Language) Activity Diagram
- …

Slide 7

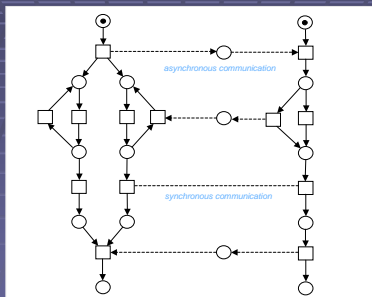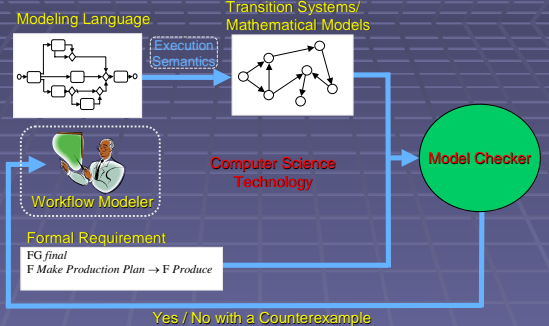### Example: BPMN

Slide 8

Example: BPMN

Discussion Cycle

Slide 9

Background Mathematical Formalism

asynchronous communication

synchronous communication

A Petri-net-based model for interorganizational workflows

Slide 10

Formal Verification of Workflow

Modeling Language

Transition Systems/
Mathematical Models

Execution Semantics

Workflow Modeler

Computer Science Technology

Model Checker

Formal Requirement

FG *final*
F *Make Production Plan* → F *Produce*

Yes / No with a Counterexample

Slide 11

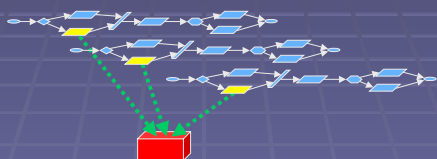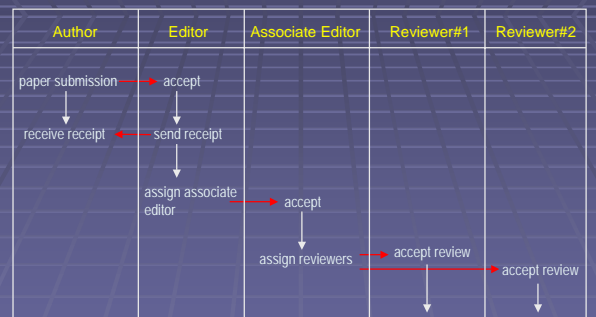### Performance Evaluation of Workflow

- Each workflow is a template of a business process.
- Many instances of workflows are running in the information system.
- Optimal resource (people, machines, companies, ...) assignment is necessary.

Slide 12

Example:
Review Process of an Academic Journal

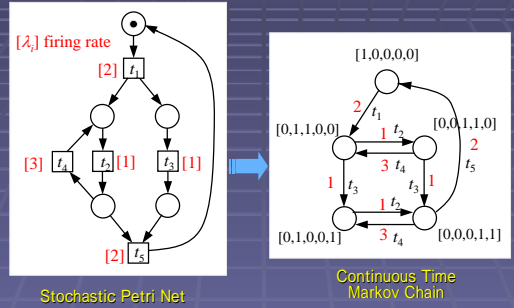| Author	Editor	Associate Editor	Reviewer#1	Reviewer#2
paper submission	accept			
receive receipt	send receipt			
		assign associate editor	accept	
		assign reviewers	accept review	accept review

Example: Review Process of an Academic Journal

Given:
- Workflow
- Statistical data on paper submission
- Upper bound of the number of papers each associate editor can handle

Find:
- Optimal number of associate editors in each research fields
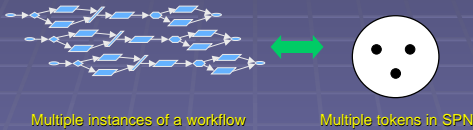
Method:
- Stochastic Petri net

Example: Review Process of an Academic Journal

$[\lambda_i]$ firing rate

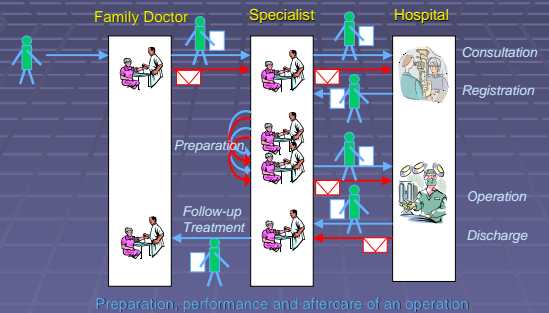Stochastic Petri Net

Continuous Time Markov Chain

Example: Review Process of an Academic Journal

Statistical data:
- Average number of paper submissions per month
- Average length of review periods

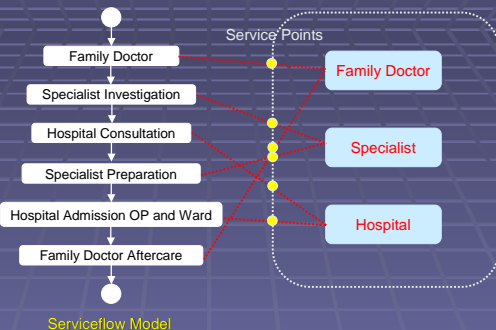Using SPN, we can know the number of papers each associate editor must handles on average.

Multiple instances of a workflow

Multiple tokens in SPN

Concept of Serviceflow

Family Doctor   Specialist   Hospital

Consultation

Registration

Preparation

Follow-up Treatment

Operation

Discharge

Preparation, performance and aftercare of an operation

"Serviceflow Beyond Workflow? Concepts and Architectures for Supporting Inter-Organizational Service Processes" by I. Wetzel and R. Klischewski

---

Concept of Serviceflow

Service Points

Family Doctor
Specialist Investigation
Hospital Consultation
Specialist Preparation
Hospital Admission OP and Ward
Family Doctor Aftercare

Family Doctor
Specialist
Hospital

Serviceflow Model

Concept of Serviceflow

- Serviceflow should have priority over other subprocesses.
- Designing functions available at each service point is important.
- Using concept of serviceflow, we can evaluate the quality of workflows from the customer's point of view.

Summary

- Process oriented approach in business
- Business process modeling languages
- Background mathematical formalism
- Formal verification of workflow
- Performance evaluation of workflow
- Concept of serviceflow

19