Workflow systems
Some trends in Information Systems [W. Aalst]

- From programming to assembling
- From data orientation to process orientation
- From design to redesign and organic growth
A **WorkFlow** is defined as the fundamental *path* that a unit of work (object) can take from the entry point into a process flow to the point of completion or exit from the flow.
- Conditions and events can also cause the object to be removed from the WorkFlow entirely.

A **WorkFlow** can have logical decision points that determine which branch of the flow an object will take in the event of alternative paths;
- every alternate path within the flow is identified and controlled through a bounded set of logical decision points.

An instantiation of a WorkFlow to support an object (unit of work) includes all possible paths from beginning to end.
Workflow system - definitions

- The automation of a business process in whole or in part, during which documents, information, or tasks are passed from one participant to another for action, according to a set of procedural rules. [(WfMC)]
  - first, the work was passed from one participant (worker) to another;
  - next, delivery was automated;
  - now, process itself is automated.

(Any condition that can be expressed mathematically can be managed by a WS => a new branch of calculus)
Workflow management  [W. Aalst]

• **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
  – 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 [R. Allen]

WMS definition:

• A system that defines, creates, and manages the execution of workflows through the use of software, running on one or more workflow engines, which is able to
  – interpret the process definition,
  – interact with workflow participants and,
  – where required, invoke the use of IT tools and applications.

• WMS can
  – create or interpret a workflow definition (which can be produced separately),
  – manage triggers, alarms and
  – interoperate with external systems.

• It is not just the use of simple relational database systems and e-mail systems with programmable delivery mechanisms.
Process orientation

- **WS are process oriented**

- **A process** definition is created – a representation of what should happen!
- Typically a process comprises some sub-processes.
- Ex. business process - grant a new loan
  sub-processes:
  - reviewing application for completeness and accuracy,
  - executing a credit check,
  - creating a new loan contract,
  - sending it to the client,
  - checking the form on its return,
  - set-up of payment schedule, and
  - issuing the check.

- **An activity** is a single logical step in the process; ex. Making a payment

- Process definition describes all the activities, but WS executes the automated ones.
Example – Application for loans
The Manual Process—Before Workflow
The Automated Process
WS - Tangible Benefits

• Reduced Operating Costs
  – Unit costs/transaction are reduced

• Improved Productivity
  – Routine and repetitive tasks can be automated
  – Work can be processed 24 hours a day

• Faster Processing times
  – Parallel processing is supported
WS - Intangible Benefits

• Improved Services
  – The time is reduced

• Improved Conditions for Employees
  – Liberate people of repetitive work

• Improved Change Management
  – Organizations could define, automate, and continuously redefine its business process

• Quality
  – Fewer mistakes from automation

• Improved Communications
  – Between people and across enterprises

• Decision Support

• Improved Planning Capability

• Improved Deployment Capability

• Inter-Organization Communications
  – Shared processes
Example: Insurance company deals with a claim

1. recording the receipt of the claim;
2. establishing the type of claim (for example, fire, motor vehicle, travel, professional);
3. checking the client's policy, to confirm that it does in principle cover what has been claimed for;
4. checking the premium, to confirm that payments are up to date;
5. rejection, if task 3 or 4 has a negative result;
6. producing a rejection letter;
7. estimating the amount to be paid, based upon the claim details;
8. appointment of an assessor to research the circumstances of the damage and to establish its value;
9. consideration of emergency measures to limit further damage or relieve distress;
10. provision of emergency measures if approved as part of task 8;
11. establishment or revision of amount to be paid and offer to client;
12. recording of client's reaction: acceptance or objection;
13. assessment of objection and decision to revise (task 11) or to take legal proceedings (task 14);
14. legal proceedings;
15. payment of claim; and
16. closure of claim: filing.
Ex. : Job Requisition Flow
Windows WF

JobReqSequential Implementation
How the information systems were and are developed (history)

1. 1965-1975: decompose applications

2. 1975-1985: database management – “take data management out of the applications” (DBMS = database management systems)

3. 1985-1995: user-interface-management “take the user interface out of the applications” (UIMS = user-interface-management systems)

4. 1995-: workflow management – “take the business processes out of the applications”
   - if the management wants to change an administrative procedure this could have far-reaching consequences for the software
   - WS solve these problems
     - processes are extracted from the applications
   - WS requires users linked to a network
   - WS can be compared with an operating system: it controls the workflows between the various resources
Relevance of workflow management systems

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

Trend

1965-1975

1975-1985

1985-1995

1995-2005
• separation of processes, resources and applications

• focus on the logistics of work processes, not on the contents of individual tasks
"classical" workflow management systems...

Four types of "workflow-like" systems:

- Information systems with **hard-coded** workflows (process & organization specific).

- **Custom-made** information systems with **generic** workflow support (organization specific).

- **Generic software with embedded workflow** functionality (e.g., the workflow components of ERP, CRM, PDM, etc. systems).

- **Generic software focusing on workflow** functionality (e.g., Staffware, MQSeries Workflow, FLOWer, COSA, Oracle BPEL, Filenet, etc.).
Workflow perspectives:

- **Process perspective**
  (tasks and the routing of cases)

- **Resource perspective**
  (workers, roles, 4-eyes principle, etc.)

- **Case/data perspective**
  (process instances and their attributes)

- **Operation/application perspective**
  (forms, application integration, etc.)

- ...
BPM: The next step
- business process management
Business Process Management (BPM) [van der Aalst]

- “True Business Process Management is an amalgam of
  - traditional workflow and
  - the 'new' BPM technology.
- It then follows that as BPM is a natural extension of
  - and not a separate technology to – Workflow
- BPM is in fact the merging of process technology covering 3 process categories interactions between:
  - (i) people-to-people;
  - (ii) systems-to-systems and
  - (iii) systems-to-people –
  all from a process-centric perspective.” [Jon Pyke, CTO Staffware]
- “…a blending of
  - process management/workflow with
  - application integration.” [David McCoy, Gartner Group]
evolution…

human oriented

system oriented

groupware

workflow

transaction processing

P2P =
Person To Person

A2P =
Application To Person

A2A =
Application To Application
WS <-> BPM  [Charlie Plesums]

• The key issue is the *business process*, and how that process works for the business users, partners, suppliers, and customers.

• *BPM and Workflow* are both technologies that manage
  – the definition,
  – implementation, and
  – operation
  of the business processes.

• They come from a different origin, and thus have different strengths.

• The key is to look beyond the product name, and find the functions that will best serve the business.
• BPM originally focused on computer transactions— the large number of rapid business processes most often handled entirely by machine.

• Workflow originally focused on content that required human judgment or processing, often distributed among large numbers of people, with each process taking a relatively long time, thus being subject to interruption.

• BPM is focused on defining the overall business process, and managing and tracking that process wherever it goes, often through multiple organizations, different computer systems, multiple locations, and even different enterprises.
  
  – BPM is optimized for processes that are automatic, not involving human interaction.

• Workflow is focused on managing the process also, but often has components of uncertainty and delay such as those associated with people.
  
  – There may be many (even hundreds) of different processors (people or systems) that could handle that particular piece of work, and any one processor may be able to process many different types of work (but not the same combination as the next processor).
  
  – The workflow is often modified as the person seeks additional information (such as a lab analysis or a legal opinion) for this particular case.
Workflow/Business Process Management (BPM) Service Pattern:
BPM tools can be used to implement business processes through the orchestration of activities between people and systems.

a conclusion…

1. Workflow process modeling;
2. Business process improvement;
3. Application development.

Now …. these three are inseparable!
Relationships to other domains

ERP,

BPR, CPI, Office logistics
Enterprise resource planning (ERP)

- **ERP** is a *cross-functional enterprise system*
  - driven by an integrated suite of software modules
  - these modules supports the basic internal business processes of a company.
- **ERP** gives a company an **integrated real-time** view of its core business processes such as:
  - production,
  - order processing, and
  - inventory management,
  tied by
  - ERP applications software and
  - a common database (database management system)
ERP Components

- Transactional database
- Management portal/dashboard
- Business intelligence system
- Customizable reporting
- Simple resource planning - Who Is Doing What and When?
- Analysing the product
- External access via technology such as web services
- Search
- Document management
- Messaging/chat/wiki

- Workflow management
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".
Definitions of BPR

• What is: “... the fundamental rethinking and radical redesign of business processes

• Goal: to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service, and speed.“

• BPR "encompasses the envisioning of new work strategies, the actual process design activity, and the implementation of the change in all its complex technological, human, and organizational dimensions.“

• "Business Process Reengineering [...] seeks radical rather than merely continuous improvement.

• BPR concentrates on core business processes..."
**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.
Workflows for scientific application

- A scientific workflow system is a specialized form of a workflow management system designed specifically
  - to compose and
  - to execute
  a series of computational or data manipulation steps, or workflow, in a scientific application.

Exemple:
- Discovery Net, Apache Taverna and Kepler
Differences between traditional and scientific workflows

- providing an easy-to-use environment for individual application scientists themselves to create their own workflows
- providing interactive tools for the scientists enabling them to execute their workflows and view their results in real-time
- simplifying the process of sharing and reusing workflows between the scientists.
- enabling scientists to track the provenance of the workflow execution results and the workflow creation steps.
References

- *Stephen A. White*, Introduction to BPMN - *IBM May 2004*
Useful sites…

- Java based WS
  http://java-source.net/open-source/workflow-engines
- A review of Open Source Workflow Engines that are written in Java
  https://wiki.duraspace.org/plugins/viewsource/viewpagesrc.action?pageId=19006054
- WF4 - Windows Workflow Foundation (.NET 4)
- SharePoint
- Google
  http://www.google.com/enterprise/marketplace/categoryHome?categoryId=9
- KiSSFLOW
  http://www.google.com/enterprise/marketplace/viewListing?productListingId=7788+694467781731208008&hp=recentlyAdded
- ProcessMaker
  http://code.google.com/p/processmaker/
- Bonita
  http://www.bonitasoft.com/
- Taverna
  http://www.taverna.org.uk/