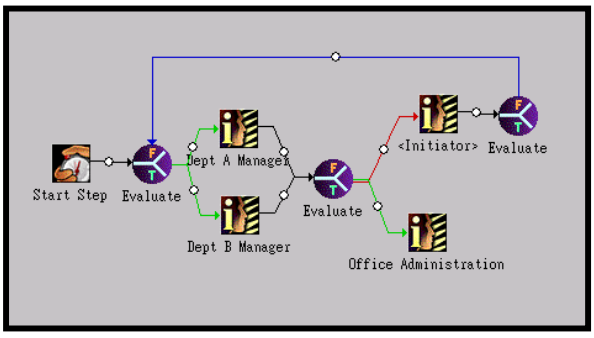
TEAM 4

Electronic Workflow Management Systems



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Management Overview (Summary)

An electronic workflow management systems ("WMS" or "workflow system") automates business processes: Documents, information or tasks are passed from one participant (whether a human or machine resource) to another for action, according to a set of pre-defined procedural rules. The introduction of a WMS in a company is often accompanied by Business Process Re-engineering.

A WMS creates business value by:

- Increasing productivity by optimizing allocation of resources to work.
- Reducing queues and transportation times
- Utilizing a client-server architecture, thereby eliminating the need for locally installed software and reducing maintenance times
- Utilizing a browser- and web-based interface, allowing for anywhere, anytime access
- Increasing security and confidentiality
- Permitting the real-time monitoring of procedures, thereby enabling quick responses to problems and the identification of opportunities for improvement
- Reducing paper waste
- Improving speed and quality of service, resulting in increased customer satisfaction and loyalty.

Before implementation, work procedures and roles of staff members, teams and departments must be documented in detail. This information is then fed into the system.

Workflow systems vary in the degree of pre-definition and throughput. The greater the pre-definition and throughput, the less flexibility is possible, and vice versa. When choosing software from among the approximately hundred products on the market, the company should consider the nature of its work procedures in terms of volume, the possibility of pre-definition (standardization) and the need for flexibility. The ability of a WMS to integrate with a company's legacy systems is another key criteria. As with any IT investment, scalability must be considered.

The typical WMS runs on a central server accessible from the computers of the users, either over local networks or via the Internet. But hardware and software costs represent only a portion of the total cost of ownership: Significant expenditure is required for integration with existing systems, documenting the work procedures and roles of the staff involved, coding of information into the workflow system, training of staff members, and digitalizing incoming paper documents.

Risks of implementation include problems stemming from flawed documentation of the work steps and roles of staff members, low acceptance of employees who are not familiar with computers, and legal problems in European countries because of the individual performance control concerns. The failure of legacy system integration poses another risk. Productivity may decrease during implementation, but will quickly improve once the system is running smoothly. Perhaps the most important consideration is that the introduction of a WMS may entail a radical reorganization of work procedures and therefore may require a complete revision of the organizational structure.

This report focuses on problems of work organization that many business students will face when they become managers. Our intent is to provide appropriate background information that will assist future decision-makers in finding optimal solutions.

What is the problem?

The process of manufacturing a product or rendering a service consists of a series of single steps. In manufacturing industries, these steps are usually performed simultaneously. Parts are produced at the same time, then transported to a central location for assembly into the final product. In contrast, a transaction-oriented organization, such as an insurance company or a public agency, executes the different steps of a service consecutively, which leads to long overall processing times. In these types of businesses, however, customers require a high degree of reliability and punctuality.

Today, many transaction-oriented organizations still work in the following Kafkaesque way:

- Supervisors assign work and monitor performance.
- Clerks move paper files from station to station. If some of the steps must be performed in another building, another city or another country, transportation of the paper files can take days or weeks.
- Tracking the work and measuring productivity is done using manually created lists and schedules.
- If a file gets lost, time passes before the loss is noticed; additional time is required to locate the missing file.
- If something goes wrong, identifying and analyzing the problem requires time-consuming “detective” work.
- Because the workflow is paper-based, parallel processing of a file by different employees is very difficult, if not impossible, to organize.
- If a customer wants to change or cancel an order that is currently in process, it may be difficult to identify the employee who is actually working on the file and to forward the request to him.
- When an employee is absent, the files in his inbox may remain there until her return.
- Offices and archives are overloaded with tons of paper, resulting in high storage and retrieval costs.

The consequences of these problems are readily apparent: Unhappy clients (or, in the case of public agencies, citizens), unhappy employees and unhappy shareholders. The reality is that “[c]ustomers’ expectations in terms of service delivery times, as required in this era of working at Internet speed, far exceed current product offerings”[1]. In a competitive environment, customers can move their business to more efficient, customer service-oriented companies and businesses can relocate to regions with more efficient public administration. Thus, the forward-looking firm or organization should examine and adopt some form of computer-based workflow system. Many already have.

[1] Martin Ader, Workflow Comparative Study, 2001 edition

Workflow systems are used in industry (e.g. for streamlining the supply chain), as well as in transaction-oriented organizations (such as the aforementioned insurance companies and public agencies). Hereinafter, we shall focus on the latter type of organization.

What is Workflow and Workflow Management?

Workflow is concerned with "the automation of a business process in whole or part, during which documents, information or tasks are passed from one participant (=human or machine resource) to another for action, according to a set of procedural rules".[2]

> "Workflow is often associated with Business Process Re-engineering, … the assessment, analysis, modeling, definition and subsequent operational implementation of the core business processes of an organization …. Workflow technology is often an appropriate solution as it provides separation of the business procedure logic and its IT operational support, enabling subsequent changes to be incorporated into the procedural rules defining the business process."[3]

A WMS typically combines three aspects:

1. For each type of product or service, a description of each work step that has to be carried out for the specific work item, the processing time foreseen for each step, and the person or unit to whom the step will be assigned.

2. The sequence of individuals or units through which a specific item must pass.

3. The content of the work item that must be checked, approved, or transformed (e.g. a data set or document).

Categorizing workflow types is a somewhat difficult endeavor. Nonetheless, workflows are usually classified as follows:

The *Ad Hoc Workflow* is characterized by a low level of pre-definition. Thus, it permits deviation from the established work sequence. In some cases, this deviation can occur at any point in the sequence; in others, deviation is permitted only at certain points.

The *Productive Workflow* or *Enterprise Mission-Critical Production Workflow* is completely pre-defined, capable of handling high "throughput" levels, and highly scalable. Large insurance companies use this type of workflow.

The *Administrative Workflow* or *Enterprise General-Purpose Workflow* is a hybrid of the Ad Hoc and Productive Workflow. It is pre-defined, but allows for some deviation.

The *Collaborative Workflow* is usually integrated into systems designed for collaborative work. It allows a significant number of users to modify the process definition, which means that users are permitted to change some of the rules.

The greater the pre-definition built into a WMS, the higher the volume or "throughput" it can handle, but the lower the degree of flexibility. Higher flexibility is available at the expense of volume and speed. Before choosing a certain product, a company must examine the nature of its work: Does it consist of large numbers of identical, repeated procedures, as with an insurance company, or do procedures vary? Regarding this variable, it should be

[2] Homepage of "The Workflow Portal" (www.e-workflow.org)
[3] David Hollingsworth, The Workflow Reference Model, WfMC 1995

noted that some workflow packages now offers both more and less flexible options within the same package.

Before going into greater detail, we take a look at the historical development of workflow management systems.

How did workflow systems evolve over the past 20 years?

In the 1980's, insurance companies started working with imaging systems, i.e. they scanned and classified their incoming mail, contracts, policies, etc. It was in conjunction with these imaging systems that large scale workflow systems were first developed, often as an integral module of the imaging system. The first mover in this area was FileNet. Soon thereafter, producers of document management systems such as Open Text, as well as the big groupware developers like Lotus, added workflow components to their core products (in these examples, Livelink and Lotus Notes, respectively). Some ERP and CRM systems, such as those of SAP, also have built-in workflow components. These systems are typically designed for easy integration with existing applications such as databases, groupware, etc.

Workflow software development has been given a major boost by the rise of the Internet. Now, workflows can be released from their captivity inside companies' LANs or WANs. Not surprisingly, many of today's workflow systems are browser-based and thus independent of local software installation.

Workflow systems have improved significantly over the past few years and the available products have achieved a certain level of maturity and sophistication. The workflow industry is very active because the demand for automatic workflow solutions is continuously increasing, In fact, "[w]orkflow technology today is at the threshold of mainstream adoption".[4]

How does it work?

Figure 1 provides a model of a WMS. A crucial element in any workflow system is the *process definition tool*. Typically, this is a graphical tool that allows the workflow designer to "see" the workflow during the development or modification process. The workflow designer will incorporate management decisions regarding workflows into the workflow system. Examples of the workflow designer's tasks include:

- setting up different workflows (for different services or different products)
- coding the sequence of work steps for each workflow, establishing the required processing times, and determining the individuals or work units responsible for each step in the process
- describing and defining the task(s) at each individual step
- specifying the handling and storage procedures for documents and files associated with the workflow
- establishing decision and approval nodes
- designing parallel procedure nodes (one node where the work for an item is split up and another node where the two sub-procedures join again)

[4] Mordechai Beizer, Interesting Times for Workflow Technology (year of publication not indicated)

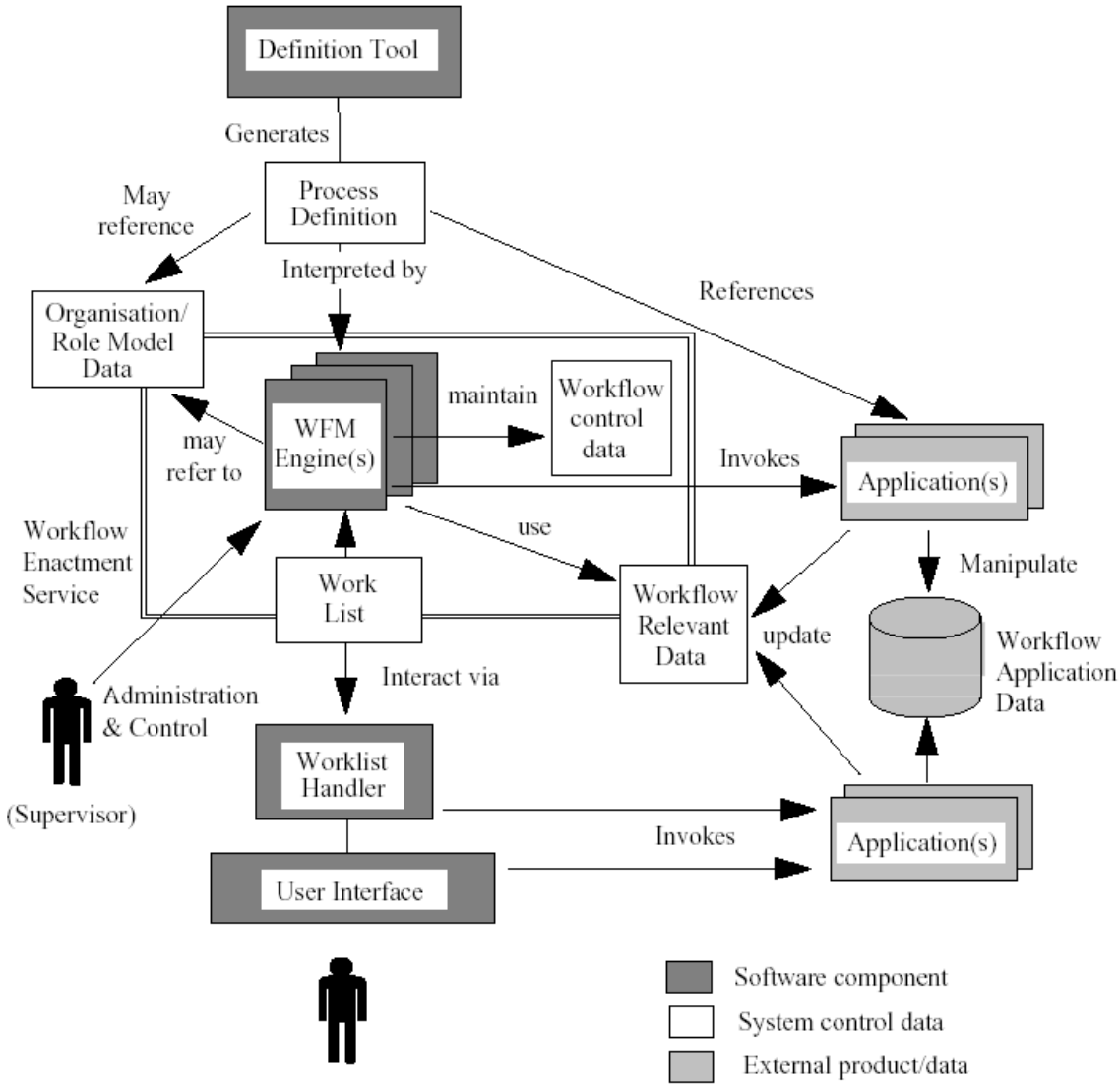

Figure 1: Model of workflow management system[5]

The key to allocating work to individuals or groups is the *organization and role model data*, usually stored in an internal or external database:

- Each staff member is assigned to one or more units and is given a defined role in each unit.
- Rights and duties are based on role and unit information.
- Each workstep is allocated to a unit.

The *work lists* contain the pending tasks of an individual or unit. Usually, they are in the intray (inbox) of the individual. Alternatively, individuals can pick a task out of a group intray after they have finished the previous task.

The built-in *supervising and control facilities* are particularly helpful for managers.. These features allow for the immediate detection of improper processing, for performance measurement via pre-defined and customizable reports, and for analyzing and addressing flaws in performance.

[5] David Hollingsworth, The Workflow Reference Model, WfMC 1995

Those workflow modules that are part of an imaging or document management system have a *document repository*, where finalized documents and documents in process are stored and can be viewed by anyone with appropriate access rights.

What is the IT architecture?

IT architecture for workflow systems is generally a standard web-based client-server architecture. Figure 2 shows the architecture for Livelink (see below). It runs on one or more central servers containing the data repositories (the most important being a built-in Oracle database). Servers can be replicated in different locations, if needed, and/or clustered to increase safety and availability. A web server facilitates connection to the internet. The client-server architecture provides distinct advantages: On the client end, only an Internet browser and supporting applications such as word processing are needed. Additionally, maintenance and updating are simplified because the software is in one place, the application server.

Livelink API allows for customization of the out-of-the-box software. Figure 2 shows that the workflow module (called “Business Process Automation”) is integrated with a number of other service modules, including virtual team modules and information retrieval.

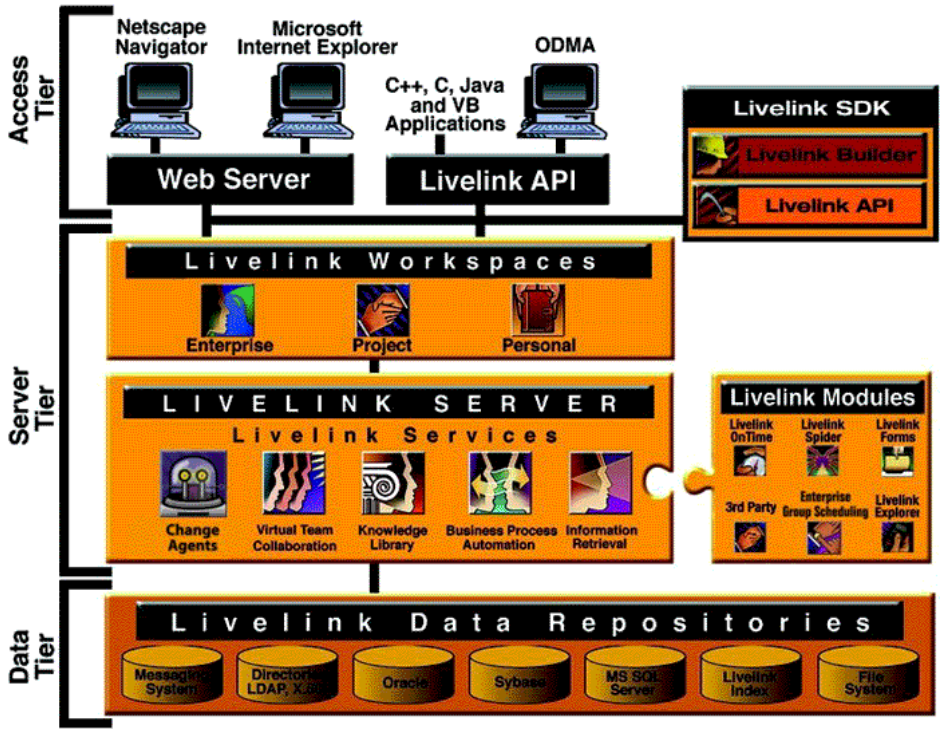

Figure 2: IT model of Livelink

Products on the market

The following list contains some of the best known workflow management systems in a market of about 100 products. Links to product descriptions can be found at www.joe3000.de.

- Visual WorkFlo and Panagon by FileNet
- SERProcess by SER
- TeamWare Flow and Dolphin by Fujitsu
- MQ-Series Workflow by IBM
- Eastman Software Enterprise Workflow by Eastman Software
- BizFlow2000 by Handysoft
- Lotus Notes by Lotus
- Livelink by OpenText

What are the criteria for choosing the right product?

Selecting a product from the more than 100 available is not an easy task. When choosing software, one of the most important questions concerns the predicted lifetime of the software producer. A software decision of this nature is generally one that a company must live with for at least a decade. Experience shows that many software products are supported by the vendor for only a relatively short period of time, either because the product is not successful or because the vendor goes out of business.

"Workflow is continuing to be embedded in application software products, and this trend will continue. In the large majority of instances, the application software vendors are building their own capabilities, rather than licensing a third party workflow engine. This will continue for one or two years and we expect that this trend will reverse when those vendors see the enormous costs related to maintenance, qualification and continuing developments of a workflow …."[6] Thus, opting for a stand-alone product may be the better choice in the long run.

Other important questions that managers must address include:

What is the total cost of ownership (TCO)? It is important to look beyond the price of the software licenses. Some products offer ready-to-use features, whereas others need a great deal of customizing before they work. The implementation of a workflow system also differs with regard to the amount and expense of required employee training.

How does the workflow management system integrate with our legacy systems?

What kind of system best suits our business: *collaborative* or *productive*, *administrative* or *ad hoc*? Should we buy a new system, or should we buy a module building upon software we already use (e.g. ERP software from SAP). If we choose the latter option, does this module also address our workflow needs outside the ERP context?

Is the capacity in terms of throughput, speed and number of users suited for our company? Is the system scalable? What is the maximum capacity?

Is the system location-independent? Is it internet-based? Does it allow remote access and working from home?

If the company or organization is international: Do the user interface and process definition tool support different languages?

[6] Martin Ader, Workflow Comparative Study, 2001 edition

Does the system conform to the specifications of the international standard setting body in this field, the “Workflow Management Coalition”? Is the system able to communicate with other workflow systems? This issue can be particularly significant when establishing inter-organizational workflows or when two companies merge.

What does it cost?

It is difficult to give detailed information about the TCO, which will depend upon the chosen product and the level of integration with existing systems. The following calculation provides a general idea of costs:

Example: A company with 700 employees in seven locations around the world chooses Livelink as its document management system with built-in workflow functionality. The company also uses Livelink Intranet/Extranet features. Hardware, software and the helpdesk are outsourced to an Application Service Provider (ASP).

One time expense:

700 Licenses (at $250 each)	$175,000

Annual expenses:

Maintenance Fee (for licenses)	$ 35,000
Server/Webserver	$250,000
Administration/Development	$150,000
Helpdesk	$200,000
Total annual expenses	$635,000

Additionally, a company will have significant costs related to the introduction of an electronic workflow system that only can be estimated on a case-by-case basis. These include costs for:

- dealing with the ASP (contract costs, billing, supervising, etc.)
- training staff members
- documenting individual steps in the work process and defining roles
- coding information into the electronic workflow system
- keeping procedural rules in the system up-to-date
- creating digital documents from incoming paper documents (whether in-house or outsourced)

For companies whose operations are ISO 9000 certified, documentation of workflows and the roles of individuals, teams, groups, departments, etc. should already exist. For these types of companies, new documentation costs should be quite low. For non-certified companies, preparing this documentation could be a step toward ISO 9000 certification. The important point here is that these documentation costs are not attributable solely to the introduction or use of a workflow system.

What is the business value?

"Considering a large number of workflow installations, the 30 percent productivity improvement is pretty common".[7] For enterprises that decide to make an "all-at-once" jump from paper-based to electronic workflows, the productivity improvement may be even higher. In paper-based workflows, the time that an item spends in a queue or in transit is often much higher than the pure processing time itself. Because electronic workflows allow for allocating resources optimally and reducing transportation times to milliseconds, electronic workflows will significantly reduce total processing times. In cases where the actual processing time, as opposed to the waiting or transit time, is rather long, this processing can be accelerated by simultaneous performance of worksteps. This type of *parallel processing* of an item is extremely difficult in the traditional system, whereas it is a built-in feature of electronic workflow systems.

A well set-up workflow system ensures that a task is always given to the person who is best qualified to do the specific task and never assigned to a person who is absent. Because the system knows the status of any item, order cancellations and changes can be processed by the person who takes a call without the need to search for the file. Furthermore, companies with subsidiaries in different locations can balance their workload. Subsidiaries located in different time zones can obtain amazing results: a workflow initiated by a customer in New York at midnight (e.g. an order via the internet) could be handled in San Diego during normal business hours and completed before the customer wakes up the next morning.

Time-consuming manual tracking of lost files becomes unnecessary because files are no longer lost or misplaced. The system is able to give automatic warnings whenever any item is not processed correctly or is behind schedule. Reports on performance can be generated automatically. Additionally, access controls based upon designated individual and unit roles ensure that confidentiality is maintained because employees are prevented from viewing or manipulating files that they are not authorized to see.

Direct cost savings from installing an electronic workflow system are primarily related to a reduction in support staff. Additionally, as paper files vanish, the space created can be used for other purposes. These savings alone will not always justify the expense of an electronic workflow system. While quantifying the business value beyond the 30% productivity increase mentioned above is difficult, the overall quality of service will certainly be improved, because failures are rare and efficiency greatly increased. For a long-term oriented firm, the resultant increase in client satisfaction and loyalty is an important element of business value.

What are the drawbacks?

When the implementation is carried out "all at once," typical problems encountered are that:

- The extremely high volume of incoming paper documents entails considerable effort and costs for scanning. If customers and business partners are approached and encouraged to use electronic means of communication, e.g. the company website and email, the volume of incoming paper can be dramatically reduced.

- Mistakes in the process description input can lead to expensive work interruptions or, in a worst-case scenario, total failure. Therefore, the input process must be meticulous and carefully monitored.

[7] Charles Plesums, Introduction to Workflow, The Workflow Handbook 2002, Layna Fischer

- Older employees and others without computer experience may be resistant to working with a computer instead of paper.

The introduction of electronic workflows means a radical restructuring of the way a firm works. As a consequence, it may be necessary to completely revise the organizational structure. One example is a possible need to modify the composition of teams or departments (which is not a drawback *per se*, but requires substantial effort by management and employees).

The integration of legacy systems such as databases, groupware and mailing systems is mission-critical. Experience has shown that controlling programming costs can be difficult. Additionally, productivity may decrease during implementation. It may take a number of months before a system functions satisfactorily under full load.

Electronic workflows are often thought of as being too inflexible and of fostering bureaucracy. On the one hand, inflexibility guarantees that items are processed in the provided manner, usually leading to a permanently high level of quality. On the other, workflow systems should also be able to handle exceptions; increasing flexibility, however, also increases expense. Therefore, workflow systems (as with any standardization) tend to reduce variation, which has both positive and negative aspects.

Finally, in some European countries (e.g. Germany), trade unions must agree to the establishment of systems capable of measuring individual performance. This can slow down the implementation or even make it impossible.

Conclusion

When properly implemented, a workflow system will streamline work processes, increase efficiency, and result in improved customer satisfaction. Businesses wishing to implement a workflow system must first understand the intricacies of their work procedures and of employee roles within the organization. Critical variables to consider, as with any IT investment, include cost, flexibility, integration with legacy systems and scalability.

Businesses successfully converting to workflow systems will see almost immediate improvements in speed and efficiency and longer-term benefits in terms of competitive advantage.