

Workflow Management in Media Productions

The demands on media enterprises are continuously increasing due to general technological progress. Workflow management systems generally support all kinds of working processes, reduce complexity and secure quality durably. Whether it concerns newscasts, entertainment shows or film productions, one finds planners, secretaries, editors, cameramen, cutters, stage hands, illuminators and others, who organize themselves with different aids (telephone, forms, fax, mail, Excel tables etc.) and software programs. In the past work was usually directed at one particular transmission format; today outputs are usual for the Internet, Digital TV, radio, SMS/WAP/i-mode, VHS and DVD. Concepts such as workflow, process optimization and application integration become more important. This article examines a modern, software based process planning and controlling environment.



Dr. Joachim Paech,
Project Manager, T-Systems GmbH,
Media&Broadcast, Bonn, Germany

Tobias Soppa,
Owner and managing director, CEITON
technologies GmbH, Leipzig, Germany

1. Typical Operational Sequences in a Broadcast and Production Environment

Despite all individuality, it is nevertheless common to find similarities in most production processes, which can even repeat themselves several times daily. These processes are usually performed by established teams and thus depend on the experience and the know-how of the team members. Occasionally these processes are even formally documented - e.g. in ISO9000 process manuals or in simpler problem descriptions. Usually these processes have not been planned beforehand, but have grown over time.

For instance, an example of a typical process could be the idea of an editor for a particular contribution, which would lead to a number of further work procedures, e.g. a discussion in the editorial conference, followed by some investigations, ENG, editing, approval, play out, and archiving. Each of these steps can be decomposed further and presupposes a set of interfaces: resource inspection and reservation in the scheduling department, planning in the editorial system, the EDL transfer and the cut, commentating and the feedback to the planning systems up to automation, should the contribution be aired.

A live interview in the studio is very similar. For example, the decision to interview a caller during a live broadcast inevitably leads to co-ordination duties like notification of the parking lot and reception,

exchange of address and telephone number, giving detailed instructions to the camera, lighting and make-up and the assignment of a journalist to prepare and co-ordinate questions and so on.

In addition, small, apparently trivial processes also lead to expenses and tying up of resources if repeated often enough. An example of such a small process with high frequency would be the planning and realization of crawls during broadcasts. The starting points here would be the formulation of the idea for, let's say, a raffle, the further processing and granting the permission, if necessary resetting or revision, the input of time codes and page numbers for the font generator and afterwards the deletion and perhaps an evaluation. This is clearly a trivial process, which however can become quite a complex affair without standardization and without a supporting system due to its recurring nature and the involvement of various individuals. Such simple processes are by no means limited to media-specific applications, but can be found in commonplace administrative procedures like applications for leave etc. Central coordination can lead to bureaucratic nightmares even with only a few hundred co-workers.

Let's go back to our crawl example: Workflow management first of all means nothing more than ensuring that an appropriate screen in the system is at the disposal of the co-worker with the idea for the crawl and that the information entered therein is automatically forwarded in a structured way to the coordinator in charge of the broadcast. If

necessary, this person approves the proposal electronically and the workflow engine ensures that the time codes can be registered by the responsible co-worker. As soon as somebody activates a predefined process, the Workflow System thus ensures that the following tasks are correctly accomplished at the right

is effective and also very comfortable. With more complex and extensive processes, for instance news productions, there are naturally more functionalities, more sophisticated workflows and some interfaces needed. A function often required, for

normal MS Office documents or pictures in a uniform way.

2. Workflows and the Importance of Scheduling

Contrary to static operational sequences, as they occur in a typical administration or in banks and insurance companies, procedures in TV or radio productions are usually more complex and even more individual and creative and thus more difficult to plan and standardize. For this reason modern systems are in a position to adapt dynamically to the specific and/or personal operational sequences without stubbornly following only a given, rigid path.

In order to ensure the transparency of the CEITON Workflow Engine, despite countless individual work steps, all activities can be viewed and supervised in different views and can additionally be manually adjusted. Thus the pair Workflow and Scheduling is able to fulfill two essential functions: 1. The *monitoring* of all processes independent of locality and 2. The *coordination* of all decentralized tasks by a central control instance.

Due to the fact that in a production process co-workers do not only receive their information and input masks from the Workflow engine, but also have to work in many other systems (editing, newsroom, content management system, play out, archives etc.), one further important task is added to the duties of a Workflow System: 3. *Application integration*. If an editor or an ENG team comes in from a take outdoors and transmits the material onto the server system, then the Ingest can be confirmed by the operator in a simple mask. The system subsequently graphically visualizes the current status accordingly, activates the production of a browsing copy, gives orders for browsing sighting, reserves an edit suite

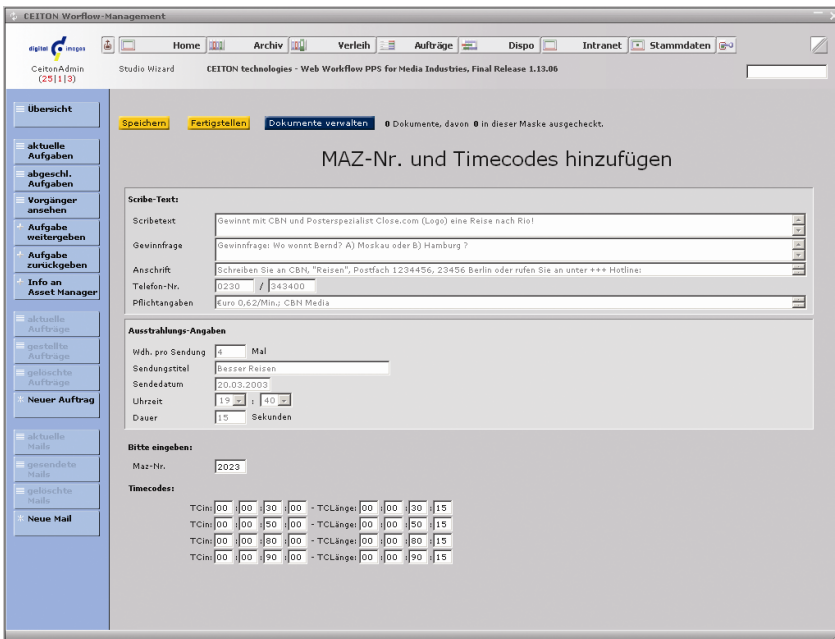


Fig.1 – Signature: The Workflow engine coordinates the tasks of a process

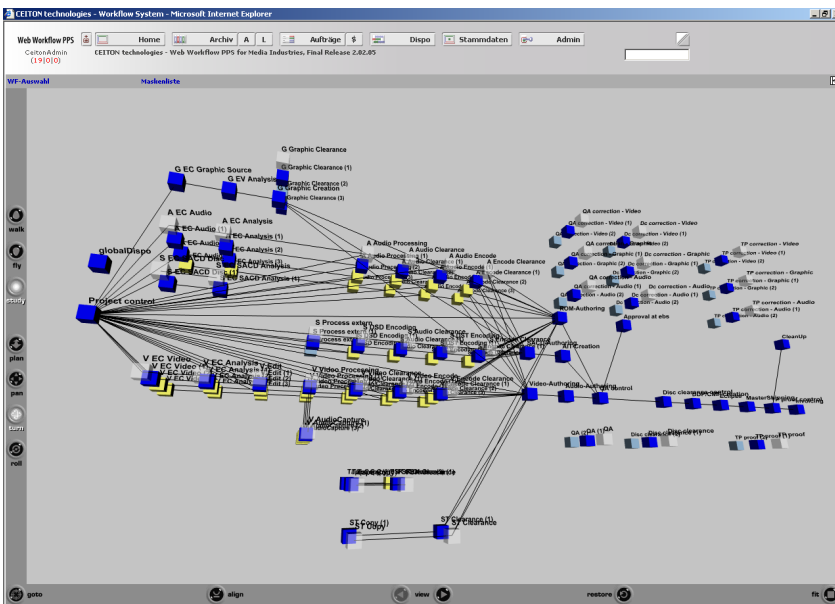


Fig.2 – Signature: Co-workers work on a job in freely definable masks

time by the correct co-workers – until the crawls are shown. Thus the staff members can concentrate on their actual duties and less time is consumed by co-ordination and flow control. That

example, is the integration of documents and simple content management, so that not only forms can be worked on, but also ideas and concepts can be exchanged world-wide through

Proj.Nr	Arbeitstitel	Prio	Assets	RS	HDD	Audio	Authoring	Eingangsscheck	MediaDesign	Test&Check	Video	allg. Bem.
57	Antonias Welt	3		23.03.2002	06.04.2002	n/a	fertig	n/a	10.06.2002 -83 Tage [A]	17.04.2002 0 Tage [A]	25.04.2002 0 Tage [A]	keine
72	Replacements_Sell_BMG	3		29.04.2002	19.05.2002	n/a	n/a	n/a	21.05.2002 0 Tage [A]	23.05.2002 0 Tage [A]	n/a	keine
17	Orient_Express	3		12.04.2002	02.05.2002	02.05.2002 0 Tage	fertig	30.04.2002 0 Tage	26.04.2002 0 Tage	22.05.2002 0 Tage	30.04.2002 0 Tage	keine
23	Hida_Seek	3		12.04.2002	02.05.2002	20.05.2002 0 Tage	19.08.2002 0 Tage	n/a	n/a	07.04.2002 0 Tage	n/a	keine
21	Blackmail	3		24.04.2002	14.05.2002	fertig	29.08.2002 0 Tage	fertig	n/a	fertig	n/a	keine
27	Silver_Bullet	3		24.04.2002	14.05.2002	n/a	29.08.2002 0 Tage	fertig	fertig	fertig	fertig	keine
24	Out_of_Rosenheim	3		01.05.2002	21.05.2002	06.06.2002 0 Tage	05.09.2002 0 Tage	10.06.2002 0 Tage	n/a	26.06.2002 0 Tage [A]	n/a	keine
18	Death_Wish	3		02.05.2002	22.05.2002	22.05.2002 0 Tage	06.09.2002 0 Tage	20.05.2002 0 Tage	16.05.2002 0 Tage	11.06.2002 0 Tage	20.05.2002 0 Tage	keine
79	Ext_Drink	3		28.05.2002	11.06.2002	Mindestens ein Schritt des Projekts enthält keine Von-Bzw. Bis-Zeit.						keine
22	Texas_Funeral	3		09.05.2002	29.05.2002	14.06.2002 0 Tage	13.09.2002 0 Tage	18.06.2002 0 Tage	n/a	04.07.2002 0 Tage [A]	n/a	keine
14	Death_Nile	3		09.05.2002	29.05.2002	n/a	13.09.2002 0 Tage	fertig	n/a	fertig	n/a	keine
26	Chaplin	3		14.05.2002	03.06.2002	n/a	18.09.2002 0 Tage	14.05.2002 0 Tage	fertig	fertig	n/a	keine
16	Minor_Cracked	3		21.05.2002	10.06.2002	n/a	25.09.2002 0 Tage	0 Tage	n/a	26.06.2002 0 Tage [A]	n/a	keine
25	Orca	3		23.05.2002	12.06.2002	n/a	27.09.2002 0 Tage	23.05.2002 0 Tage	06.06.2002 0 Tage	25.09.2002 0 Tage	16.07.2002 0 Tage [A]	keine
10	Tamerlano_Full [NTSC]	3		23.05.2002	12.06.2002	12.06.2002 0 Tage	27.09.2002 0 Tage	10.06.2002 0 Tage	06.06.2002 0 Tage	02.07.2002 0 Tage	10.06.2002 0 Tage	keine
11	Aardmann_BMG_Sell	3		23.05.2002	12.06.2002	12.06.2002 0 Tage	27.09.2002 0 Tage	10.06.2002 0 Tage	06.06.2002 0 Tage	02.07.2002 0 Tage	10.06.2002 0 Tage	keine
28	Evil_Death_2	3		24.05.2002	13.06.2002	n/a	30.09.2002 0 Tage [A]	24.05.2002 0 Tage	07.06.2002 0 Tage	26.09.2002 0 Tage [A]	fertig	keine
12	Crocodile_Renta_BMG	3		27.05.2002	14.06.2002	14.06.2002 0 Tage	01.10.2002 0 Tage	12.06.2002 0 Tage	10.06.2002 0 Tage	04.07.2002 0 Tage	12.06.2002 0 Tage	keine
19	Minner	3		27.05.2002	14.06.2002	14.06.2002 0 Tage	01.10.2002 0 Tage	12.06.2002 0 Tage	10.06.2002 0 Tage	04.07.2002 0 Tage	fertig	keine

Fig.3 – Signature: Scheduling screens can display each processes differently

and releases the further handling of the contribution. Thus there are usually a number of processes, which lend themselves to be depicted electronically so that the workload becomes manageable and simpler. In particular for 24 hours productions with 3-shift operations, it is essential that all information is organized transparently and can easily be found by everybody - whether on the job next door, in the mobile broadcasting unit somewhere or even by external suppliers.

3. Description of Workflows

In principle workflows consist of two components: 1. The description of the functions involved (e.g. screen/masks for co-workers or interfaces for machines and software systems) and 2. The structure of these functionalities, meaning the rules which describe the dependencies by themselves and between each

other. The description of the functions can be accomplished by graphic front ends, similar to the customization of applications. All required data (field type, range of values, storage place, coordinates, authorizations etc.) is saved to a database in a repository.

The structure of the workflows can also be stored in the database, be that mathematically as a Petri net or simply as an array of rules. If an event occurs (e.g. saving of a mask or receipt of an XML file), the Workflow engine examines whether the associated rules are fulfilled and whether a particular action is needed. Needless to mention that this depiction is somewhat simplified with regard to dynamic masks, self-adapting workflows with rollback functionality etc. If, for example, under standard conditions a particular sub process can be processed further only if the associated quality check was successful or

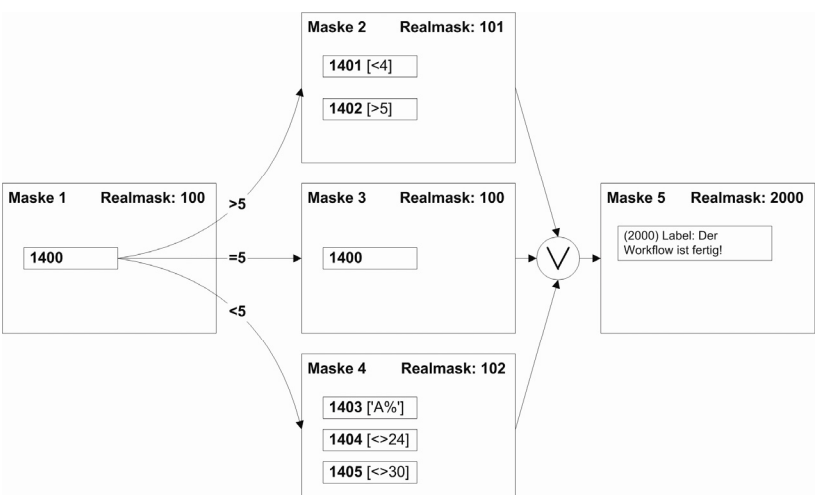


Fig.4 – Signature: Simple sub-workflow example of a media production

if some inputs are mandatory, the system can automatically take over the control mechanisms and monitor, for instance, time or costs. Thus the completeness and validity of the inputs can be guaranteed and the information distribution process helps to avoid repeated, superfluous input of already collected data.

With the introduction of a Workflow Management solution, first of all the operational sequences, which can be improved, must be identified and captured. With this information at hand, one can conceptualize a workflow which details the functions and interdependence in the correct form according to the requirements. These two steps usually represent the biggest challenge and are typically accomplished either in-house by process managers or by consulting houses specialized in process design. Once these steps have been completed, the technical implementation of the workflows in the respective workflow specifications and the adjustment of the interfaces follow.

4. Application Integration

As mentioned before a multiplicity of systems has to work together by accessing common data and exchanging information. This usually happens by means of direct interfaces between the

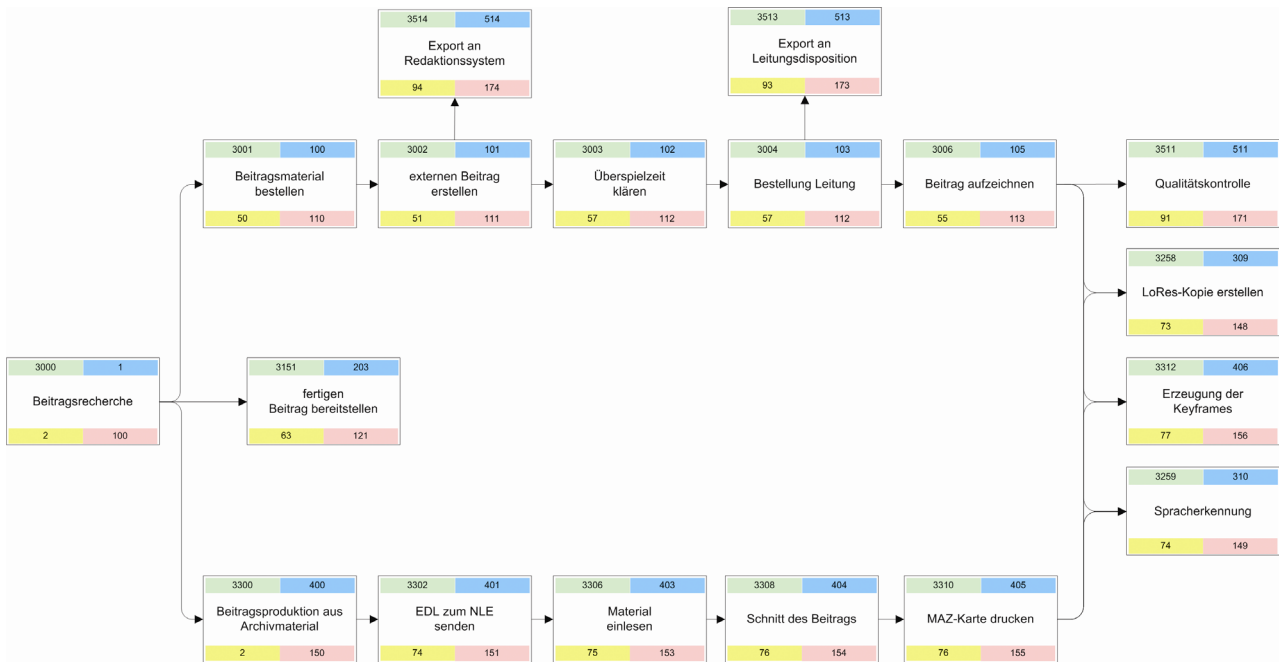


Fig.5 – Signature: four masks with a simple Split and Join dependence

programs or manual input and/or renewed input of data. The latter should certainly always be avoided, because it is error-prone, inefficient and frustrating for the user. But direct interfaces are not the silver bullet either. There is a number of reasons:

1. With an any-to-any connection of 8 systems, one has up to 28 interfaces. If however the traffic runs through message brokers, only 8 interfaces are needed (see fig.6).
2. In CEITON's Web Workflow system one can deposit rules of transformation for the data, which are dependent on the process states and further variables, instead of simply exchanging data.
3. Central interfaces are simpler to maintain than decentralized ones, where the interface logic lies within the application.
4. If one can process arbitrary interfaces in the message broker (service bus) of the Workflow System itself, the dependency on the original software producers is reduced.

Benefits of Workflows

Increase of transparency in the enterprise for management, staff and customers

For the persons in charge, the fundamental function of real-time monitoring is made possible while the overall process with its goals and current states is understood intuitively by co-workers.

Improvement of Control

Changes in the workflow can be implemented easily and instantly, without elaborate briefings of co-workers and renewed definition of forms or interfaces.

Standardization of processes, process times and documents

Standardization brings continuity into complex processes and is therefore an important tool for quality assurance and planning.

Lowering of the process and communication costs

Superfluous agreements, enquiries, forms, faxes, mails etc. can be reduced because the system controls the important information flows automatically. Work becomes less stress-prone and communication more comfortable.

Prevention of errors during service rendering

Effective controlling of quality management by workflows avoids errors or visualizes these in time.

Optimization of turn-around times

Smooth interlinking of work procedures and their coordination by the system reduces production times.

Enabling of IT supported reports

All data collected during a process can be archived automatically and can subsequently be evaluated for standardized or individual reports

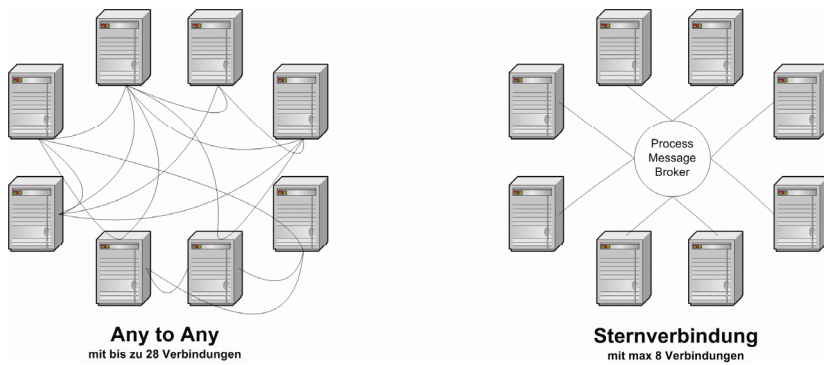


Fig.6 – Signature: Simplification of the interface variety by a broker

Applications can thus concentrate on the provision of functions again, instead of being involved with process functions and interoperability to other vendors' systems. A universal interface suffices which, if standardized, obviously means the least amount of work.

In principle the integration capacity is thus expected of the Workflow System.

As an interface, different procedures are supported; some of them will briefly be discussed below. The exchange of ASCII files (asynchronous) e.g. through a file system is the most frequently used procedure because of its simplicity (XML), universality and compatibility. A database-based exchange through the database level/SQL (asynchronous) on special tables is very safe because of its transaction security and automatic validity examination, but the manufacturers however

often don't permit this. A very accepted procedure is the exchange of data by SMTP (asynchronous), particularly since one can communicate through temporary off-line connections. However, delivery is not controllable, which limits the employment to non-time critical interfaces. Exchange of data through HTTP/HTML (synchronous) is becoming even more popular - it is an uncomplicated procedure, which can be used through firewalls and over long distances. Even encoding is very simple through SSL. Function calls (synchronous) are the most direct, but in addition also the most special way (e.g. through SOAP, COM+ or CORBA) and are used only with strongly integrated systems.

There are a number of further interface types; some of them can handle distributed transactions for example, which

sometimes can be very significant. In practice, various combinations are employed, for instance the exchange of XML files via e-mail. They all have different characteristics concerning universality, simplicity, scalability, availability, efficiency etc. and must therefore be differentiated for each individual use. If bandwidth is no consideration, the use of XML formats is surely recommendable today, because they can be processed automatically and are structured in an obvious way.

5. Flexibility of Architecture

A Workflow Management System is software, which is installed on one or more servers with various interfaces for the most different purposes, e.g. a complete and dynamic user interface for humans or XML interfaces such as MOS to other applications and machines. The system runs centrally and communicates among other things over TCP/IP and requires in principle no interference into the existing infrastructure - neither on the server nor on client side.

Modern software is developed today at least in a 3-tier-architecture, i.e. one separates the GUI from the application logic and this in turn again from the database. The GUI should also not be defined rigidly, but be

Results of past implementations	
Before	After
Decentralized forms and Word documents	Centralized and standardized basis for all kinds of data
Costly manual arrangements in Excel and Outlook	Transparent, supporting and partly automated scheduling
Continuous coordination of projects with all employees	Workflow system takes over the exact coordination
No systematic Quality Management (QM)	QM and Tracking is an integrated part of processes
Non-standardized archive in Access	Data is available for research anywhere
Costly and error-prone coordination with customers	Standardized language by visualisation
No complete and up-to-date information	Production is absolutely transparent in every little detail
Changes in the work process are connected with costs and errors	Even bigger changes can be implemented without any problem
Installation of different programmes on Client PCs	A simple Web browser is sufficient for working on the Server
Time-consuming backups on different computers	Centralized and simple Backup for all data and documents
Complex, non-transparent processes	Simplified, modular structures

derived from customizable records from the database (repository). Through this mechanism enterprises can arrange their own applications and can, if necessary, even completely exchange the GUI. The surface should be web based, so that production can take place in a decentralized way and without installation expenditure, and even the sales force, the field service and other external staff can participate in the defined workflows without hassles. Scalability and reliability (e.g. through availability clusters) are attained by the component-based architecture, which brings about

almost any possible distribution of application parts.

Conclusion

Through the means of a Workflow System arbitrary processes can be modeled and managed. Workflow Management means co-ordination, integration and at the same time monitoring of all jobs. Thus Workflow Management is not only a component of the automation of play-out servers, teleprompters, VTRs, cameras, font generators, lighting etc., but is suitable in particular also for the complex communication

processes that lie before those tasks. In consequence users can concentrate on their conceptual and creative duties and are not distracted by questions of technology or structure. Nevertheless they can be informed comprehensively about all materials, processes and their current states. The technologies involved are established and are being used comprehensively in other industries. For a deployment in an enterprise, it is always sensible to begin with a manageable sub-area first and to learn from this experiences. Workflow Systems simply grow along.