
Reduce complexity, increase productivity, recover control, drive innovation: Four steps to profitability

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Abstract Faster, better, more — the technological advances of the last decade make more and more possible and also lead to higher and higher requirements, which lead inevitably to more complex production processes. Nothing other than workflow management can reverse this trend. Therefore, hardly any other buzzword is so popular — and misused. This paper gives information based on real media projects for companies such as Sony, Time Warner, A+E Networks, Red Bull, ARD, etc to show what intelligent workflows are truly capable of and how other ‘hyped-up’ topics such as BPM/SCM, MAM/DAM, SOA/EAI, FIMS/BXF etc all fit into a simple and consistent overall picture.

KEYWORDS: workflow, resource scheduling, business process, system integration, file-based, work order, metadata

WHERE EXACTLY IS THE PROBLEM?

There is no need to lecture at length about the reasons why and how information technology (IT) is always changing the world and at an accelerating pace: what was previously analogue technology, and was rebuilt every three to ten years, is today digital hardware and software, which can easily be updated every couple of months, or worse, re-invented from scratch. What delights kids because of its fantastic possibilities is often a nightmare for companies throughout the supply chain because old

sources of revenue fall away and permanent changes and investments become the new reality. Thus, the entertainment industry worldwide has been rudely awoken from its deep sleep. Today, it is increasingly about efficiency, as it is in most other industries. Anyone who is not continuously improving will become too expensive and too slow — and will very likely lose market share to the competition or, at a minimum, lose profit margin

Efficiency means using the least possible resources, such as money and time, to

produce a product or service with defined quality and consistency. This is the theory. If one looks at most production processes (and it does not matter in which area of the media industry), some of the following characteristics can be found:

- Many people who naturally carry out many activities.
- More and more systems that fulfil different tasks.
- A separation of the production level from the financial level.
- Collaboration with external resources, such as suppliers, clients and freelancers.
- New business models that pose new challenges to all business units.

In all these categories, however, most companies have little efficiency:

- Coordination consumes much of the work (e-mail, meetings, Excel, tools).
- Applications and systems are isolated rather than integrated solutions.
- Production costs are not known in detail — only in total.
- External resources are involved in time-consuming manual processes.
- New challenges can be overcome, but slowly and expensively.

The problem of efficiency is not due to the new tools and systems with which many tasks can be done faster and better, from secured file transfers, through the automated quality control (QC) systems and the elegant editing and animation systems to the efficient encoding frameworks. These applications lead to higher product quality (eg in film, television, radio, video on demand), but not to corresponding greater production efficiency. With more and more tools and ever-increasing complexity, operating expense steadily increases. This is in contrast to increasingly sophisticated customer requirements (eg play-out

formats), continuously demanding higher output — ‘faster — cheaper — better’.

While IT is constantly evolving, neither the capacity of the people nor their daily availability evolve at an equal pace. Everywhere, the workload is increasing for the individual and this becomes the company’s problem. The global 24-hour ‘follow the sun’ production distribution model is meanwhile reaching its natural limits and large companies are already beginning to protect their employees by switching off the mail server in the evenings. Google Docs can barely replace Excel spreadsheets and even more applications will not make working any easier. Virtually nobody needs more meetings, more e-mails and more phone calls.

A NEW, OLD APPROACH

It is therefore, time to think about another category of IT. Not IT to automate individual tasks, but one that automates the coordination of all tasks, one that replaces meetings, Excel spreadsheets, e-mails and other unconnected web tools, simplifies communication and directs the flow of information and filters and integrates systems and applications transparently. An IT that makes time for the actual tasks, operational or administrative, creative and strategic tasks that generate the real added value for the company and its customers. The term that should accurately describe this IT has long been one of the great misconceptions in the media and entertainment industry: *workflow management*.

The workflow concept in IT is not any newer than the related concept of resource scheduling. Tasks can be considered only in the context of an entire business process and no longer individually and separately from each other, so that the coordination of tasks can largely be automated. Scheduling allows accurate planning of the workflow,

namely, who has which tasks to do and when. Only the technology has evolved. Modern solutions today are dynamic and flexible, available as web-based, easier and faster to use and can be deployed and modified with less effort. In addition, if all processes are planned and executed, the corresponding data can be made available for financial reporting as a kind of by-product — this is the kind of ‘real-time’ IT, which again enables productivity.

In order to compensate for the difference between requirements and what is feasible, the aforementioned problems must be solved as follows:

- Automate coordination and unburden staff.
- Integrate applications transparently and flexibly.
- Embed financial layers into the production.
- Involve external resources seamlessly.
- Create processes as more easily adaptable and changeable.

Anyone who goes to trade fairs and clicks through the brochures and webinars is regularly promised all of this. However, almost all solutions come up short — an experience that has taken many companies several years and a lot of money to learn. The reason is that almost all solutions have been developed from technology companies producing applications such as file transfer or media asset management (MAM) solutions. What is being referred to as end-to-end refers mostly to technical, practical steps such as file-based ingest, QC, editing, encoding, transfer, play-out and archiving. The aim of these solutions is complete automation — that is evident from the fact that one cannot design user interfaces; instead subjects such as service-oriented architecture (SOA), framework for interoperable media service (FIMS), etc stand in the foreground (more on that later).

WORKFLOWS WITH EMPLOYEES

Yet if all the steps can be automated so well, then why are so many people still needed? This question presents itself because most companies have far more employees than technical applications. In fact, most processes comprise more human steps than technical steps. A true end-to-end process begins with the customer placing an order — and ends with the accounting. Alternatively, it begins with a budget and a producer’s idea and ends after the final rerun. In between, there is plenty of human administrative activities, such as spreadsheets, proposals, contracts, approvals, productions/programmes as well as release planning, content procurement, quality control, cost and time monitoring, problem solving, customer support, delivery, billing and, above all, the many creative activities, such as graphics creation, editing, colour correction, authoring, subtitling, voice-overs, storyboard, stage, props, makeup, lighting, shooting and so on — the list is endless (Figure 1).

In order to gain efficiency, the many tasks, above all, must be better coordinated within the business processes for their respective employees. True workflows are related, not only the pure content-processing and transformation, but also to optimise all possible areas within a company, such as:

- promo-creation;
- authoring (discs, video on demand);
- post-production;
- content preparation/tracking;
- archiving/recovery;
- broadcasting;
- subtitling/translation;
- distribution;
- resource scheduling;
- supplier coordination;
- syndicated sales;
- customer/subscriber management;
- administration;



Figure 1: A workflow (left) with a form (right) for an operator to select content from a media asset management system
Source: CEITON

- case management;
- formal document management;
- development/product life cycle management;
- quotations;
- master data management;
- compliance;
- quality management, etc.

The multitude of application possibilities is already shown: a workflow system is not a traditional software package that ‘just’ makes a number of functions available, rather it is an open platform on which one can build completely arbitrary processes, forms, reports and interfaces — in modern systems without programming or scripting (Figure 2). Therefore, the workflow concept is the solution to the eternal conflict between ‘expensively programming software oneself’ and ‘unsatisfactorily customising out-of-the-box software’. Instead, one can now ‘design custom software oneself as a

process without programming’. So, each company can incorporate its own specifics (due to size, history, locations, suppliers, systems, etc) into its processes perfectly and so distinguish itself from competitors.

Technical systems are utilised in almost all of these business processes. They are not the primary framework (and this is important), but only a subset. Therefore, the approach inevitably fails if transfer, MAM or encoding systems try to perform business process optimisation with embedded workflow engines. Such a functional system cannot know what a customer actually wants, or everything that is necessary for the production, for example, what budget dollars are available, when and for whom and so on. These are not overarching, generic and process-driven management systems, but functional systems with deep technical knowledge for a number of very specific tasks. The problem is not so much the workflow capabilities of these

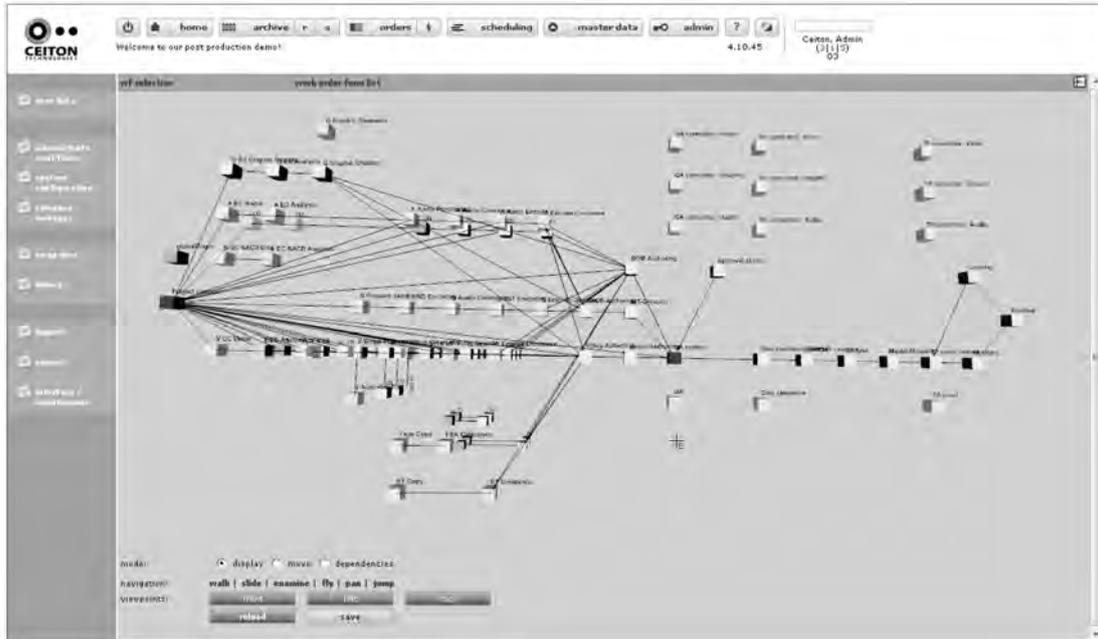


Figure 2: A workflow that manages several work steps within a process
Source: CEITON

programmes, but the promises with which some manufacturers promote them. This will be discussed in the ‘Workflows with technical systems’ section.

HOW WORKFLOWS WORK

How does the optimisation work? What is the efficiency gain? If the previous five points are studied, it can be seen that it is all about information management:

- Coordination is based on knowledge and information processing.
- Application integration means to exchange data.
- To track costs means to collect and share data.
- To integrate external resources means to share information.
- To make workflows adaptable means to be able to define information flows freely.

The usual term for this type of

information is ‘metadata’. It is not the pure content data (which will be used by functional systems) but the description (meta) of miscellaneous things such as projects/orders, requirements, costs, plans etc — and, of course, ‘classical’ metadata, which describe content such as video format, audio encoding, image resolution and so on. Genuine workflows manage up to several thousand pieces of information of this kind (Figure 3).

The point is to manage all this information so that it is available at any time without any additional effort, using e-mail, Excel, meetings, etc. Alternatively one can describe it with the four Rs: the right information at the right time; in the right form; at the right place.

- *The right information:* an employee or system does not usually require all 5,000 pieces of information for a work step, but only the right ones.
- *The right time:* a resource must get the exact information when a task can be

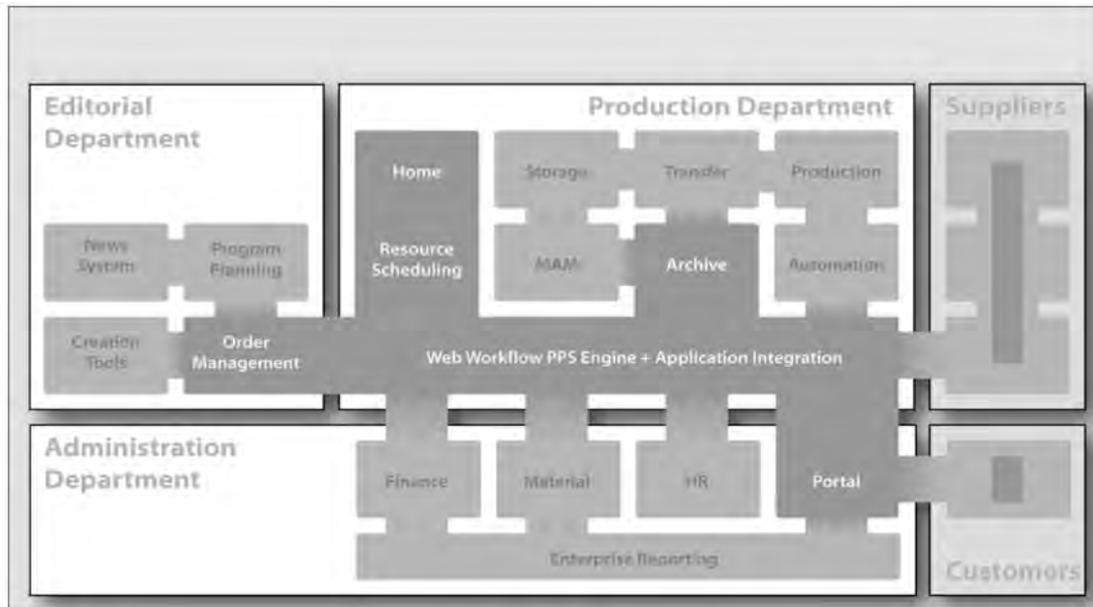


Figure 3: A workflow integrates various departments and their personnel and systems right through to external resources
Source: CEITON

performed, and only if all the necessary preparatory work has been done.

- *In the proper form:* an employee needs a form in which the information is presented in a way that he/she can efficiently work with. A system, on the other hand, requires a very specialised web-service call instead of a web form.
- *The right place:* the information must get to the right employee and the right system, otherwise it is totally useless (Figure 4).

Thus, the principle of a workflow system is almost explained. It manages and automates the flow of information between all involved resources, so they do not have to worry about it anymore. It automates the coordination to a large degree and thereby enables all parties to have uninterrupted focus on the actual value-adding activities — whatever these may be. Therefore, a workflow in a system controls a business process in the real world.

Specifically, a resource (human or not) starts a workflow and enters information.

The workflow consists of many subsequent steps, which are connected to each other based on rules and dependencies. To stay with a trivial example: if a resource enters a value, eg 'asset XY is OK', it goes to the next step, eg 'Encoding'. If 'not OK' is entered, it goes to, eg a correction step or escalation to a manager (Figure 5).

Business process management (BPM) is concerned with standardising and optimising processes — ultimately using workflow software. BPM software is simply just another term for a workflow management system.

WORKFLOWS WITH EXTERNAL RESOURCES

There is an explanation of the so-called 'functional differentiation'. It says that more and more companies (or people) do less and less, but they do it even better. Therefore, companies often specialise in one aspect of a value chain. In this way, they can focus their resources on a

The screenshot shows a software interface for video authoring. At the top, there are tabs for 'Spaichrein', 'Fertigstellen', and 'Dokumente verwalten'. Below this is a form for project information including 'project no.', 'customer', 'comment', 'project id', 'contact', 'pr. - manag.', 'working title', 'BI-project', 'classific.', 'title', 'DVD-size', 'projectMD', 'year', 'tv system', 'IA Compleat', 'MasterShip', 'aA compleat', and 'gA compleat'. There are also fields for 'read time' and 'view'. Below the project info is a 'Workstation' section with 'Workstation' and 'Filename' fields. A 'CPM list' table has 16 rows. The 'Dummy PGC' section has two rows with 'Name', 'Function', and 'Position' fields. The 'Masterization and file' section has two rows with 'Caption', 'Filename', 'Filename pub.', and 'Format' fields. Below this are two tables: 'Video assets' and 'Audio assets'. The 'Video assets' table has columns: Track, Caption, Aspect ratio, Length, Exist, Created, Inserted, Comment, Analysis, and Comment. It contains two rows for 'Film1' and 'Film4'. The 'Audio assets' table has columns: Track, Caption, Enc. Format, Length, Exist, Created, Inserted, Comment, Analysis, and Comment. It contains two rows for 'Film4 - Audio2' and 'Film1 - Audio1'. Below these is a 'Subtitle assets' table with columns: Caption, lang, Asp.Ratio, 4:3 16:9 Count, OK, Inserted, and Comment. It contains five rows for various subtitle tracks. At the bottom, there is a 'Subtitle error list' with two rows for 'Title' and 'Lang'. The bottom section features a tree view under 'Inhalt' showing a hierarchy: 'Box1' -> 'SACD-Album1' -> 'SACD-Disc1' -> 'SACD-Area Stereo1 (Stereo, CEITON)', 'SACD-Area Stereo2 (Stereo, CEITON)', 'CD-ROM-Part1 (PC) ISO 9660', 'SACD-Disc2' -> 'SACD-Area Mult1 (5 Channels, CEITON)', 'SACD-Area Mult2 (5 Channels, CEITON)', 'DVD2 (5GB)', 'Video Part1' -> 'Menu Std.1 (still)', and 'Audio Part1'. At the very bottom, there are fields for 'Typ', 'ID', 'Neuer Vater zuordnen', 'Neuer Untereintrag', 'Name', and 'Typ', along with a 'Bezeichnung' field and a 'Kommentar' field.

Figure 4: An order form for an employee with all the information that he/she needs as well as fields for new input
 Source: CEITON

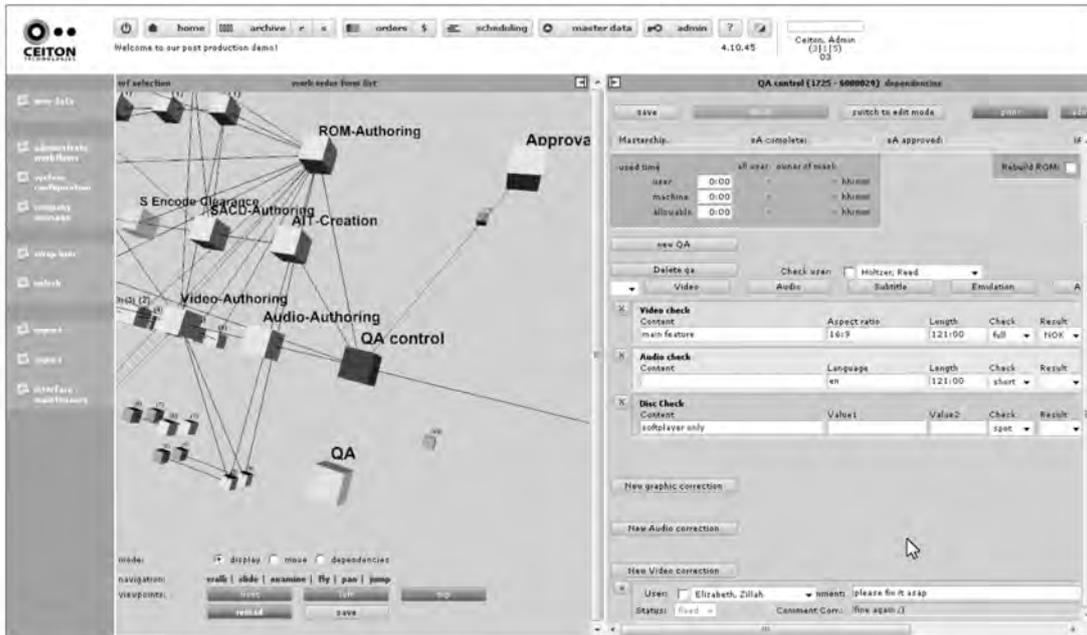


Figure 5: Part of a workflow for quality control with a dynamic form on the right-hand side
Source: CEITON

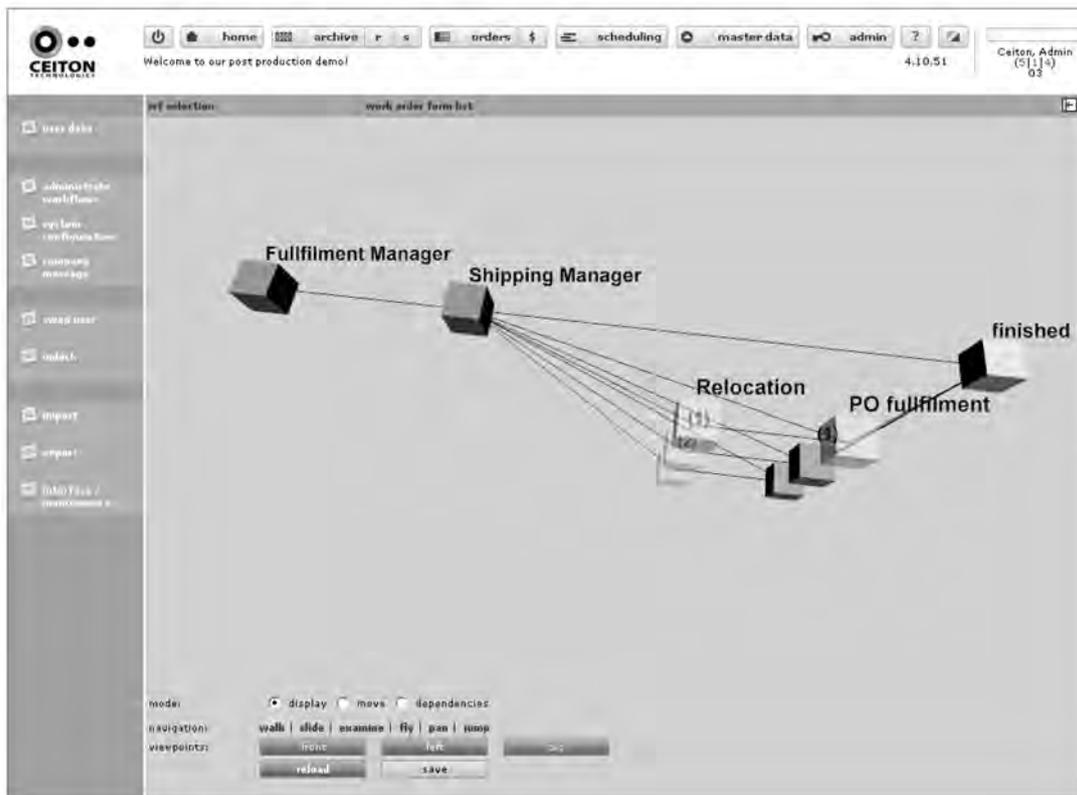


Figure 6: A simple workflow in which external suppliers are part of a larger workflow
Source: CEITON

reduced number of activities better than generalists can. Very few large firms still try to do it all themselves or even to control an entire value chain (Figure 6).

If one looks at business processes today, interactions between different companies can often be seen, be they customer or supplier relationships. Often, these relationships are recurring and there are even framework agreements. Information processing across corporate boundaries is based on these agreements, yet usually takes the form of e-mail with attached documents — which is manual and opaque. The reason is obvious. Every company is working with its own solutions and these are not compatible with each other via standards such as electronic data interchange, because the creative media industry is not as ‘industrialised’ as, say, the chemical or automotive industries — and probably never will be.

Nevertheless, the workflow management concept can be used in exactly the same way as it is for in-house resources: the suppliers of a company Television Corp. receive their assignments, not in an e-mail with a pdf attachment but in a workflow form. Whether it comes from the cloud, a data centre, or from the Television Corp. server, it is completely irrelevant for now. The advantage for the company is clear: they can actually integrate an external resource into the production process just like an internal one — no extra effort is required and no more wasting time. At the exact instant in which a task is to be done by a supplier, he/she has it on his/her desk, or rather PC or Mac. A resource, whether internal or external, whether human or not, is to be regarded as a black box: it can be given different inputs (task description, etc) and return values are expected (eg job completed as follows). How exactly the resource has done this might be interesting for analysis and accounting purposes, but is

actually of no interest for the workflow system itself.

The advantage for the supplier is the same. It reduces coordination costs, not only in receiving orders, but also in accounting, which can be done directly through the workflow instead of a paper or pdf invoice; the amount, invoice number, etc; are simply added to the form and on activation land immediately with the Television Corp. If not only the suppliers but also customers are involved, the activation may even be omitted, if: (1) the invoice value is equal to the value of the purchase order; (2) the customer has confirmed the full receipt and quality by automated e-mail or form. The advantages for involvement of the customer (whether it be an internal or external department, the same company or in fact a fully independent, external firm) are faster delivery times, lower production costs and real-time tracking of the production process.

Integration is worthwhile only above a certain volume that justifies the effort of designing a process and implementing a workflow. All possibilities are open: from the small solution that perhaps only optimises the internal assignment to real integration. The whole thing is called supply chain management (SCM). Workflow management is an appropriate means to improve the efficiency of SCM. As previously mentioned, interface standards would be another means — leading, eventually, to the next two topics.

WORKFLOWS WITH TECHNICAL SYSTEMS

More and more different applications today come for use in all types of productions. They must be integrated into workflows to eliminate manual control, monitoring and copy and paste. The game, as already described, is the same: resource (system) gets a task, performs it

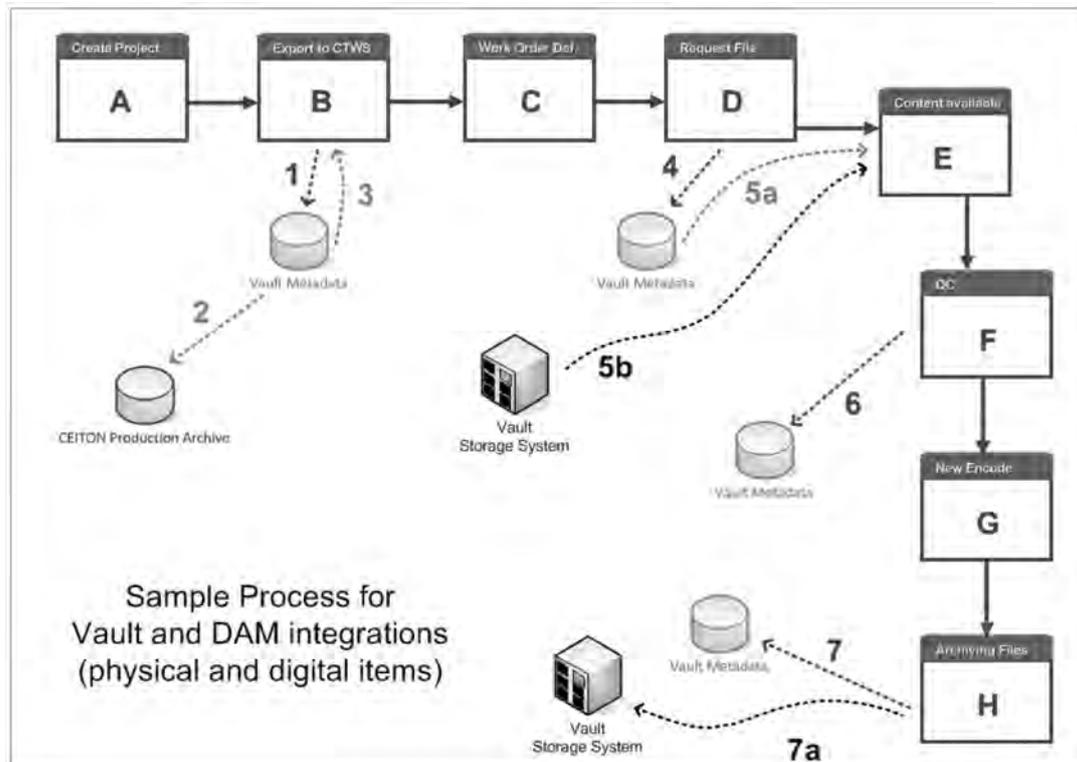


Figure 7: A possible way to integrate a MAM into a workflow
Source: CEITON

self-sufficiently (possibly with feedback) and reports back with results. The workflow system decides what the next task is, based on the modelled rules (dependencies) (Figure 7).

Most systems, although not all, have a so-called application programming interface (API), through which the system can be controlled automatically; therefore, a person is not needed to control the system manually via a graphical user interface (GUI). APIs are based on different protocols (languages) and today typically on web services (formerly known as SOAP), but derivatives such as XML-RPC or REST are also preferably used. In modern systems, virtually all the features of the GUI are available via the API, so there are hardly any restrictions in the capability for integration (Figure 8).

As each system ultimately speaks a different dialect, and has its own API, an

integration of many systems is quite complex. Each system, in the worst case, must integrate the APIs of all the other systems in order to communicate (Figure 9). Because different approaches are often confused with one another or even interchanged, the following will be discussed:

1. standards;
2. SOA;
3. enterprise application integration (EAI).

1. If standards are implemented by the systems, all speak a common language with no misunderstandings. These are therefore a great boon to users. Projects such as Broadcast Exchange Format (BXF) or FIMS are about trying to develop such standards. The problem with standards is that not all manufacturers realise the advantages for

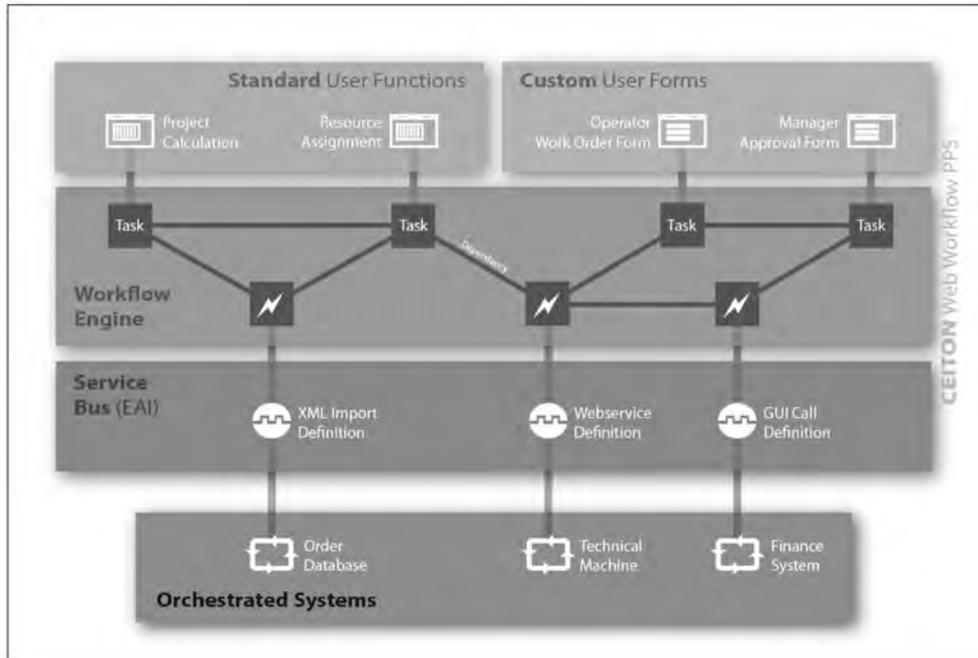


Figure 8: External systems are integrated into the workflow through an integration layer
Source: CEITON

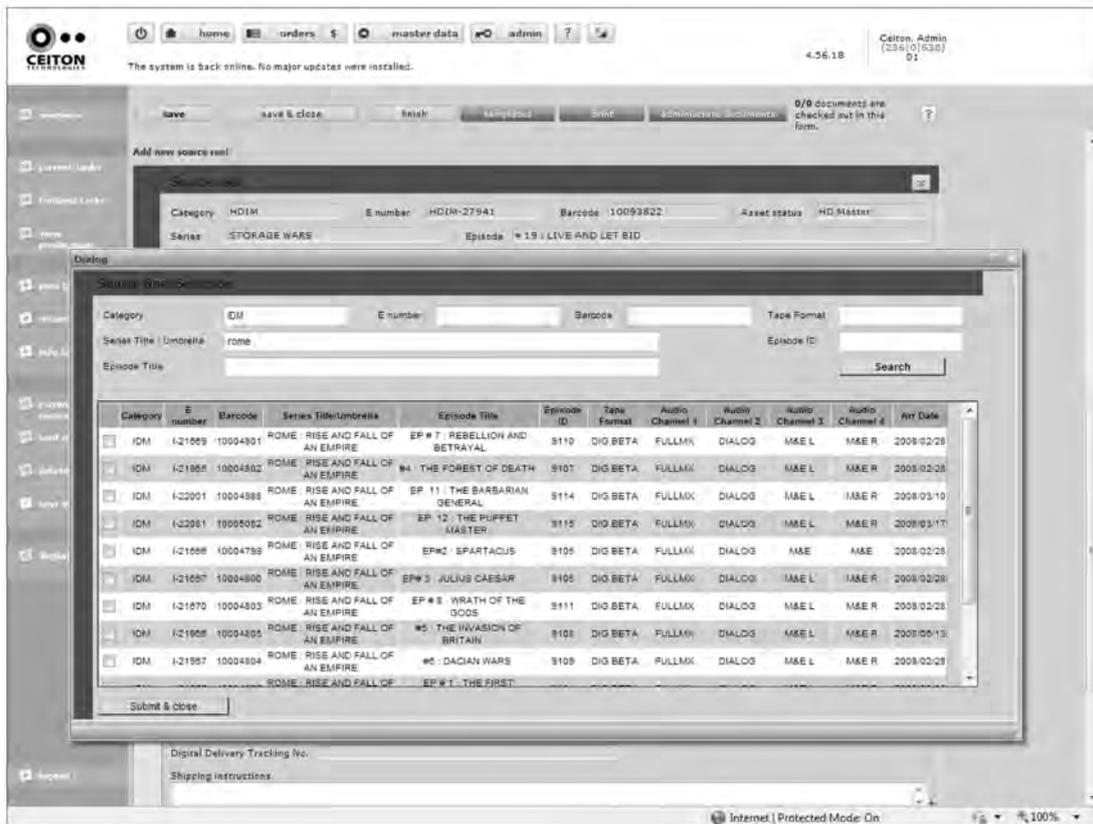


Figure 9: A workflow form integrates a search on a MAM system and shows the list of results for selection
Source: CEITON

themselves in implementing the standards and standards may take a long time to develop and thus lag behind the latest developments. Because there will always be a variety of scenarios beyond standardisation, there are other approaches.

2. SOA is a concept whereby the functionality of systems are disassembled into smaller individual services that are available via API, so that they can be reused by other systems in new combinations. Thus, a MAM system offers a function such as 'asset search', which can be used by very different systems, such as a customer ordering system, an editing system or the workflow system. One cannot buy a SOA, but can only use it if one re-purposes existing services of systems in other systems. In a workflow, one can easily replace such a service with another without changing the whole workflow, eg one internal encoding service from manufacturer XY is simply replaced with one in the cloud from manufacturer AB.
3. EAI is a category of software that has two main goals: (1) the simple definition of interfaces (whether standard or proprietary does not matter); (2) the centralisation of the interface traffic on one system. The former is achieved by modelling tools with which a mapping between the two languages (something like a translation) can be defined. The value '0' in the 'status' field is translated into 'OK' in the 'result' field. One result of centralisation is that it is no longer necessary for each system to talk to every other system, but all of them need only speak with the EAI system as the 'orchestrator'. If, for example, a system must be replaced, it is not necessary to change ten other systems, but only the configuration with a central EAI system (Figure 10).

A current workflow system thus includes an EAI component (also known as service bus), with the help of which it can model all types of proprietary system APIs and standards like FIMS, in order to include as many services as possible from multiple applications into workflows and thus allow a SOA to be created, providing the demystification of buzzwords.

Now, however, increasingly many functional systems are appearing on the market, which are bringing workflow capabilities of their own, eg via so-called 'embedded workflow engines' or third-party components. If, however, people expect to perform some kind of business process optimisation or workflow management, they will be disappointed. These workflow components (not always formally worthy of the name) have only two justifications for their existence: (1) for the optimisation of internal processes, such as when one wants to automate recurring processes, including decisions in a MAM or encoding framework to save the user some time and clicks; (2) to perform pre- or post-process steps, for example, if a file transfer can be initiated immediately after a QC and encoding job.

These sub-workflows typically make sense, if a lot of specific detailed knowledge is required, which does not already exist in the parent workflow system (such as about ways of frame rate conversion) and processes have been modelled already or can be modelled more easily than in a generic workflow system. Sub-workflows are also included in an overarching workflow system, just like any other black boxes, whereby single-state information on the progress of activities can also be received, if so desired. From an architectural point of view, one must always distinguish between the higher-level management entity (the workflow system), which automates the coordination, and the functional systems that automate certain technical tasks or sub-processes.

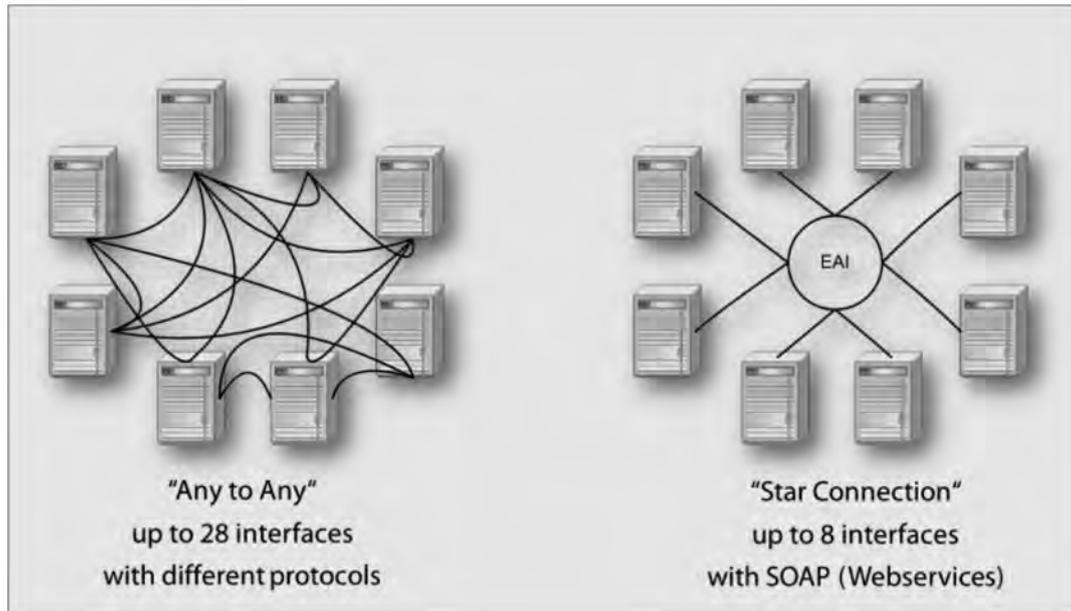


Figure 10: EAI systems reduce the interface complexity by centralisation
Source: CEITON

WORKFLOWS WITH BUSINESS SYSTEMS

To summarise, it is not only the technical systems but also the people that must be coordinated in order to gain efficiency, as well as business systems, such as shops, customer relationship management, finance, human resources, order systems, reporting, and so on. Often, these systems are several categories more complex than some purely technical systems. For example, to carry out an order process or budget planning process, a variety of price list information from an enterprise resource planning (ERP) system (in this regard, the leading system) must be synchronised with the workflow system (secondary in this regard). Therefore, it is not done with a simple call. More examples are the detailed accounting of service packages to a financial system or the settlement of various timesheets from a personnel system — these types of integration are inherently far more complex than to give 20 metadata files to a QC, transfer or encoding system (Figure 11).

These so-called back-end interfaces can be distinguished in a variety of ways. This may be differentiation into synchronous interfaces, which are then executed immediately (eg a check order), and asynchronously, which are decoupled from the user action, eg in order to be performed at night. A special type of asynchronous back-end interfaces are known as bulk loads, where data in the order of gigabytes are exported — usually to reporting systems, which aggregate huge amounts of data from various sources, as well as enabling ad hoc reporting, without having to resort to pre-defined reports.

Another form is the so-called front-end interface, in which systems are integrated with each other not only on the server side, but also on the user's computer. These interfaces usually also use back-end interfaces in the background. Consider the following example where: the ordering processes from suppliers take place in a company's specific ERP system. These are integrated into an overall process. If a dispatcher now gets, for

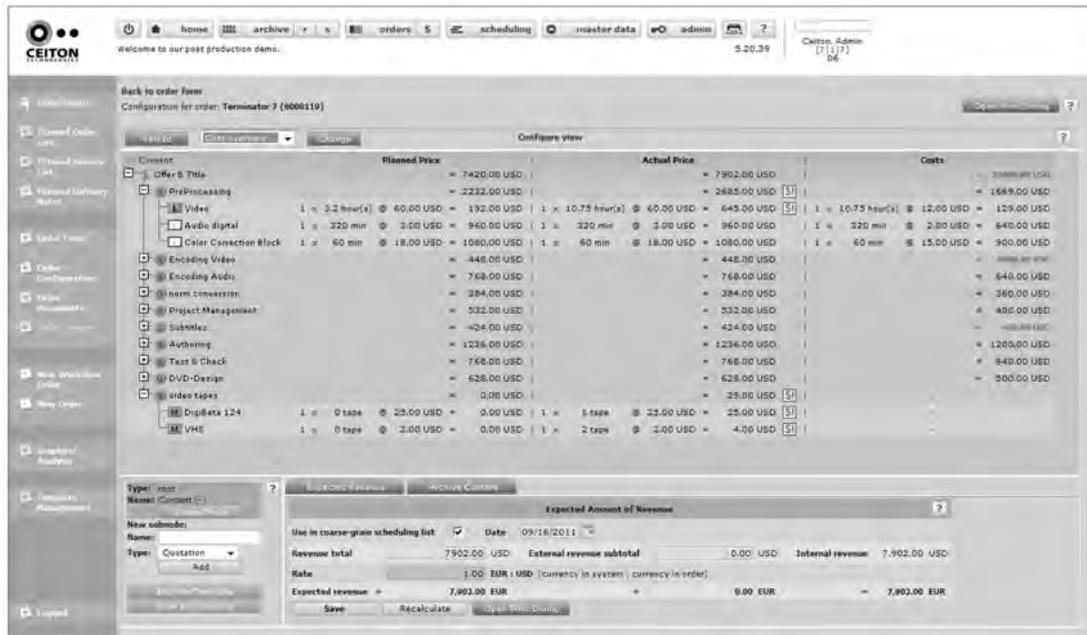


Figure 11: Comparison display of the planned and actual costs for all the activities in groups in a project
Source: CEITON

example, a query about various activities in the workflow system, which cannot be performed in-house, the ERP system must be automatically opened — with single sign-on without entering a password — with the correct form pre-filled. After completion of the order in the external system, this information must immediately be available in the workflow system, so the work step can be completed (Figure 12).

The whole thing may also have to work the other way around. One example is when a programme planning or MAM system would like to get an overview of the status of a production; then the workflow system should let itself be opened and controlled by the external system.

With workflow systems, a range of smaller management systems, tools and portals can be replaced. Specialised business systems must however be integrated into workflows via the EAI system. Such interfaces, as is particularly

the case in technical integrations, can often be very individualised. This clarifies a view of the usual APIs — they often consist of hundreds of parameters and possible calls. One can do many different things with the API — just as with the GUI. Therefore, one should be careful with hard-coded interfaces or standards. All too often one hears ‘yes, we have an interface’, but then when it comes to integration, a different implementation is needed. The flexible integration capabilities (EAI) of a workflow system are critical not only for complex business systems, but also for technical systems.

SCHEDULING PROJECTS, PEOPLE AND EQUIPMENT

One last — but very important — aspect for this paper will be briefly illuminated here: resource scheduling (not to be confused with programme planning). If a workflow system coordinates thousands of jobs, two important pieces of information

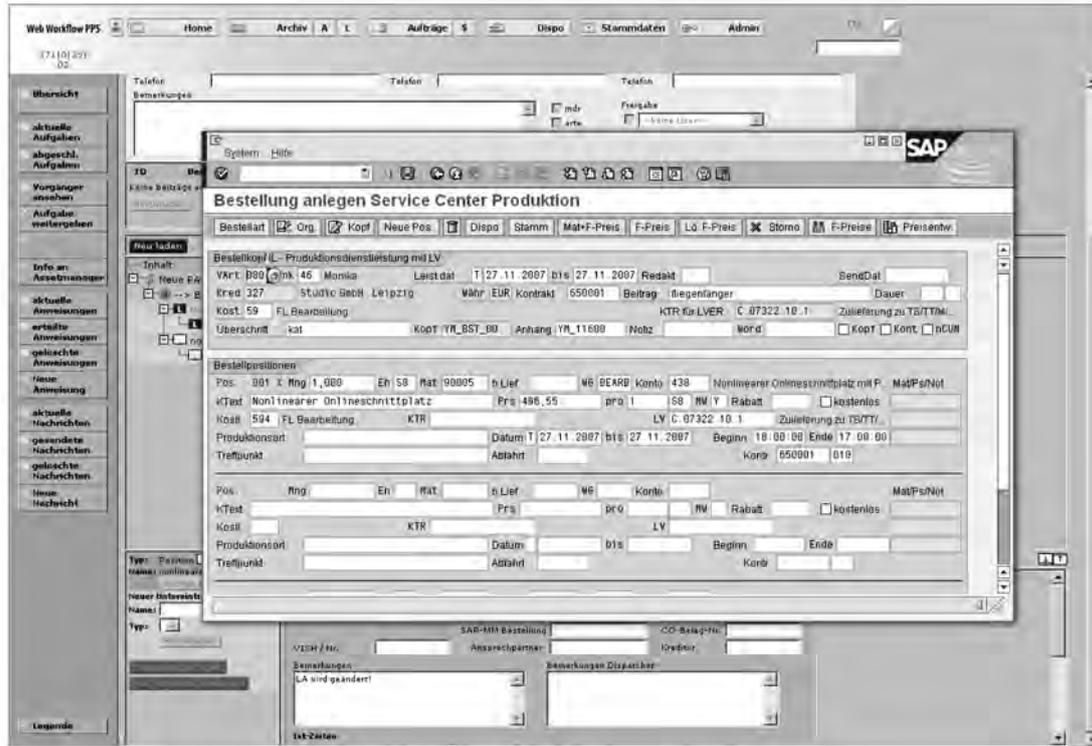


Figure 12: Calling a SAP system from within the workflow system
 Source: CEITON

are still missing: who does the job — and by when? Although this can be automated in part or even ad hoc by the departments, it must often be performed in detail. Many things must be taken into account, Such as employee and department utilisation, delivery, availability of freelancers and suppliers, cost of external resources, surcharges, legal and union regulations for staffing, availability of specific necessary equipment, rooms/studios, the planning of regular or frequent productions and so much more (Figure 13).

If new workflow systems do not fail on the human workflows, or on the modelling of business functions, then they ultimately fail on the scheduling of resources. In the absence of their own planning and accounting functions, integration capabilities to scheduling systems will simply be referenced. However, this is a dangerous fallacy. One

must understand that the ‘new kids on the block’ are either very simple script or .NET-based systems, or from other industries, such as insurance companies, and possibly come with an interface framework and a new GUI to be made ‘media-ready’. These systems are not designed for production of materials management/media archive, resource scheduling and order management and so on. Productions, and in particular media productions, are dynamically and constantly changing during the process depending on requirements, content, status, resource feedback. That is much different to a document-driven workflow for a bank loan application, which can take as much time as necessary (Figure 14).

The four Rs (the right information at the right time in the right form at the right place) represent one of the core management tasks and cannot be

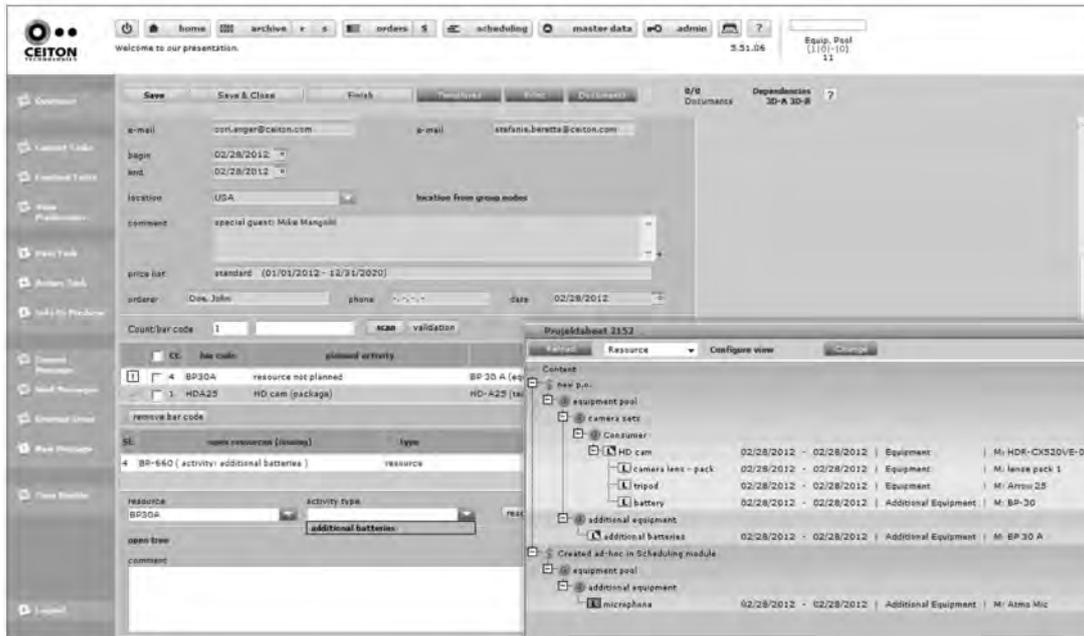


Figure 13: Equipment output from queried resources in a production workflow
Source: CEITON

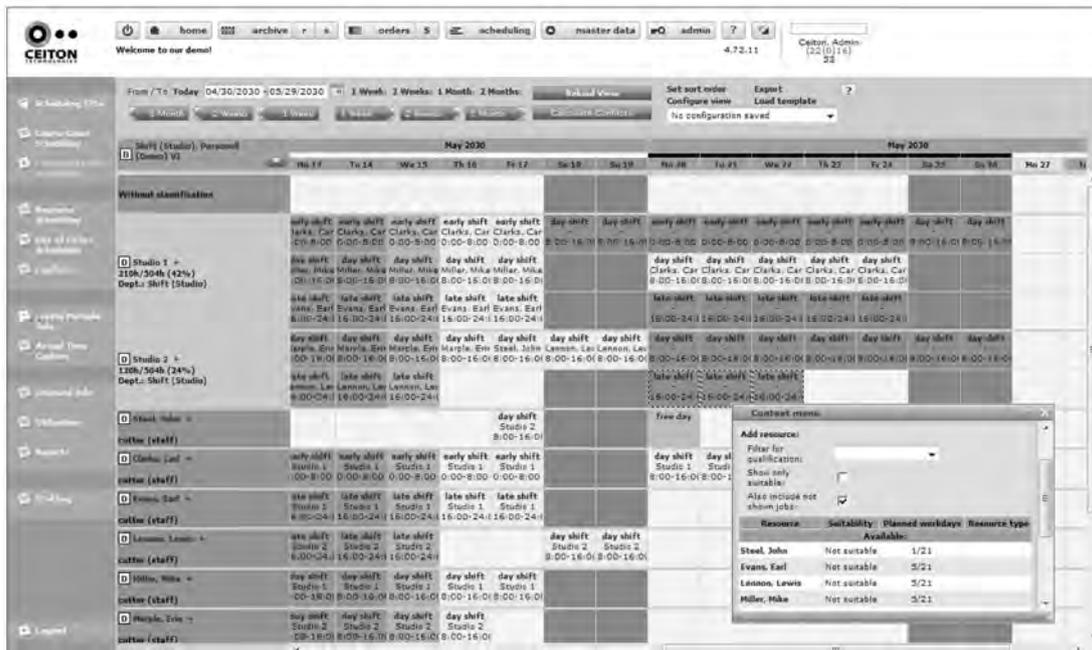


Figure 14: Scheduling of unassigned jobs in a studio to employees (bottom)
Source: CEITON

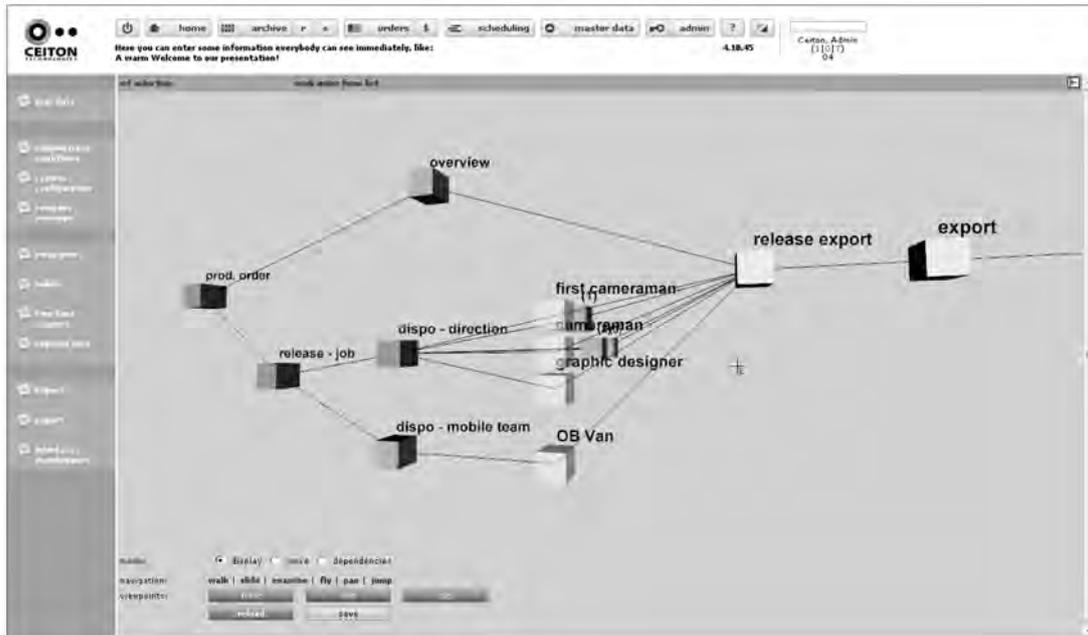


Figure 15: A scheduling workflow composed of various work steps
Source: CEITON

distributed to different systems. The workflow system must know, for every job, what sort of resource (machine, studio, equipment, employees, freelancers, supplier or customer) is possible to prepare, authorise, distribute and schedule the task. Therefore, an export to a manual scheduling system in which thousands of jobs land, are manually sifted, assigned and recorded, cannot be made before the actual job can at some point be delivered to the right resource in the proper form.

As a further example, a department manager who needs an overview cannot first get the workflow system to enquire of the scheduling system, who has what jobs for now — or let the scheduling system look up the workflow system, to see which job is actually already done. In addition, this is not about simple overviews, but a real means of production, which must if required immediately perform template-based changes ad hoc and in bulk. In the somewhat naive notion of separation of the ‘what’ and ‘how’

(workflow) from the ‘who’ and ‘when’ (resource scheduling), e-mail and Excel would be actually faster again.

Nevertheless, not only do workflows need scheduling — even resource scheduling itself is often its own small, but often very complex workflow. The typical steps are registration/order, approval, assignment of various crews (parallel or interdependent), the subsequent actual collection of job data from the resources, the transfer from a variety of accounting jobs to the financial (budgets/invoices) and personnel (layers/salaries) systems. Any way it is looked at, workflow and scheduling belong together if processes are to be optimised (Figure 15).

CONCLUSION

The core problem of lack of efficiency is the information management of the ever-escalating flood of information and tasks. One can coordinate the flood with a system, so one can win time for real

Figure 16: A workflow form that can be built according to requirements without programming
Source: CEITON

business. Reduce the complexity systematically through intelligent workflows that remove manual, administrative coordination activities. This increases the productivity, profitability and transparency, making it possible to manage proactively and drive innovations forward. Here are some examples of established improvements:

- *Working time savings:* co-workers are relieved of the effort of manual coordination, information gathering, office or paperwork, etc.
- *Increased transparency:* this results in better business control and decision making every day.
- *Faster processes:* improvements are made to running time for productions in order to provide better customer service.
- *Avoiding mistakes:* avoid errors through quality checks and avoid missed deadlines through clear visualisation.
- *Supply chain improvements:* improvement

is possible through integrating branch offices, customers and suppliers.

- *Automated accurate settlement:* no services or additional working time can get lost at invoicing or internal accounting.
- *Improved control and flexibility:* change workflows quickly and as needed to cover new business models or outsource (sub)processes on demand.

The essential elements of a solution that will help are the following:

- Dynamic production workflows for people have the greatest potential.
- Workflows must be overarching and detached from business applications.
- EAI for technical and complex business systems (SOA and standards or not).
- Workflow scheduling utilises the resources optimally (Figure 16).

Do not be dazzled or cajoled in the selection of the solution, but compare closely based on requirements and the

aspects presented here. Many manufacturers are entering new territory with this issue and have not really thought through and tested solutions. The company should not be the alpha tester. People would instead surely prefer to be shown real, live workflows that control hundreds of millions of dollars per year and that have already demonstrated their

value across several years. Make sure a prototype is built in a couple of days before making a decision and learn what is truly possible and what is just marketing hyperbole.

For questions, comments or experiences, particularly about the structured approach to an implementation, please contact the author.