



## Workflow

# Automating Business Processes

**As businesses evolve, the way that business is conducted changes. Processes that have been fundamental to how organizations operate can suddenly become error-prone, inefficient, or expensive. Our customers have found a need to constantly assess and refine the processes that define their work.**

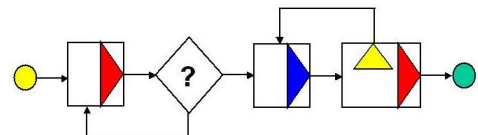
This is not always a problem that can be solved by software alone, and Tessella has considerable experience in process specification, design and implementation. Our goals are to:

- Improve efficiency and productivity
- Reduce our customers' costs
- Help target under-utilized resources
- Reduce administration
- Help satisfy regulatory requirements without them being a burden to our customers

To achieve these goals we utilize our expertise in workflow. Workflow is the automation of a business or laboratory process in which documents, information or tasks are passed from one machine or person to another for action according to a set of procedural rules.

The key drivers for business process automation are improved efficiency and compliance. The former has always been a concern and current IT platforms offer even more benefits. Compliance is an area of ever-

increasing importance. Each industry must comply with external agencies such as the FDA who need to examine adherence to operational rules. As time goes by corporate governance regulations such as Sarbanes-Oxley and Basel II will force organizations to invest heavily in proving that their processes are sound. The needs of the compliance make workflow systems essential.



Tessella has helped many customers automate business critical processes with workflow-based systems, using a variety of technologies.



### Global Manuscript Tracking System

T&F Informa Journals is a major publisher of academic journals with production offices around the world. Although they had already implemented several systems to track manuscripts and issues through the publication process, ranging from simple spreadsheets to complex client-server systems, they recognized a need to consolidate their existing systems into a single global system.

The Central Article Tracking System (CATS) was specified, designed and developed by Tessella working in close partnership with T&F Informa staff. CATS allows production staff to store manuscript files in a central repository, and maintain related data in a flexible, web-based environment. CATS manages all data about manuscripts and issues, and allows consolidated tracking of articles through the production process, from initial receipt (either electronically through CATS, or via email or post), to copyediting, typesetting, quality control and printing.

CATS supports a range of workflows for manuscripts and issues, and allows a great deal of flexibility in terms of schedule setup and control. All the complications that this entails are entirely removed from the user. The system automatically generates correspondence to external suppliers at the correct point in the workflow, and provides an external interface to this group of users.

CATS is implemented in J2EE with an Oracle metadata database, and separate filestore. To enable us to implement the required flexibility in the workflows, the system is entirely bespoke.

For the first time, T&F Informa staff are able to access journal tracking information across the whole company, simplifying reporting, improving efficiency and making T&F Informa more competitive.

### Active Ingredient Chemical Research System

Tessella created a logistics workflow system as part of a large Active Ingredient chemical research system for a global agrochemical company. The company needed a system to allow its scientists to create custom vials containing samples using a set of small unit operations that could be joined together to create a workflow. The system supports identification of vials that can be run through

automated rules without human intervention, as well as allowing the manual creation of custom workflows.

The system is part of a larger system of related modules and has multiple tiers for data, business logic and presentation. It was built using Microsoft .NET technology, and communication with the business logic tier uses .NET remoting. The Business Layer is implemented in C# and controls the storage of workflow information into an Oracle database. Microsoft Message Queues co-ordinate the asynchronous processing of workflows with automated rules.

This part of the system was new to the organization, and has been well received by users, who appreciate the power of being able to create the ad-hoc workflows, as well as the labour savings provided by the automated rules.

### National Flow Forecasting System

Tessella has teamed up with WL | Delft Hydraulics to deliver a National Flow Forecasting System for the UK Environment Agency. The requirement is for a resilient flow forecasting system that can operate under stress during a flood.

Data from river gauges, rainfall and tidal measurements are automatically passed to a software model of a river network. The model predicts water levels and flows at different locations. For operational forecasting the predictions must be for a large number of key locations. If water levels exceed threshold values then alarms are automatically raised and well-defined procedures are in place to disseminate flood warnings.

The system consists of a centralized scheduling/task dispatcher component and multiple execution servers, which receive and perform the tasks. A task is a set of instructions, defining a workflow. It is an XML description of what data to get, where to get it from and where to put the results. Tasks and data are distributed throughout the system via asynchronous messaging.

An example of task might be 'run the entire river flow forecast for the North East'. This would actually involve a large number of subtasks, each of which would define a particular subset of the North East forecast. In effect, the task acts as a description of the workflow process to follow.



### Automated Salt and Polymorph Screening

Salt and polymorph screening is an important step in the drug development process, in which appropriate versions (salts) of a drug are identified along with polymorphic forms that will be stable over the intended shelf life.

For a major pharmaceutical company, this screening process was a labour-intensive bottleneck in the drug development pipeline. Tessella worked closely with a team of users to analyze the process and define the requirements for a workflow solution to automate it. Tessella designed and delivered a system that gives improved data quality and throughput.

The workflow was implemented entirely as a bespoke system, using Microsoft .NET technology for the web-based and desktop client user interfaces, and an Oracle database for storage.

As well as removing the bottleneck, the workflow system delivers improved data quality and accessibility, which in turn give the business greater confidence in the decision making process.

### Laboratory Information Management Systems

Laboratory Information Management Systems (LIMS) have traditionally been sample-centric applications, but vendors are increasingly responding to user demand for workflow-based software. A workflow system maps more closely to the way people work in laboratories - typically samples pass through several processes, and people are associated with these processes, rather than with specific samples. A workflow-based system is therefore more intuitive to use.

Tessella has helped a number of clients to choose a LIMS product, including the National Genetic Reference Labs and the Veterinary Labs Association. Using workflow analysis, we look at the processes involved and the objects and data that flow between them. This helps us highlight bottlenecks, such as manual data entry and duplication, and thus the areas that would most benefit from automation.

### Biotechnology Data Pipeline

A global agribusiness needed a workflow-based software system to track genetically modified plant material through the research pipeline. The process is driven by trait-scientists. Plant material is genetically transformed and then sent to a glasshouse to be grown, analyzed and harvested. There are multiple stages to the process with many people involved. A workflow-based system was needed that would track each biological sample, pass on tasks to the appropriate individuals as triggered by certain events, store all recorded experimental data, and assist in the archiving of harvested seed.

Tessella provided project management assistance in the development of a Java-based workflow system with an Oracle database. For part of the system the Drala Workflow Engine was used; this is an embeddable Java component for automating business processes. This was eventually replaced for technical reasons, and the final system is an entirely bespoke application implemented in J2EE.

The system is live at the client's biotechnology research centre in the US, where it provides a globally-accessible system for tracking and reporting on all experiments in the research pipeline.

### Chemical Formulation Innovation

A large global supplier of chemical products has recently significantly improved the speed and effectiveness of their product development by using Tessella.

Their processes varied significantly across the organization and included slow, handcrafted calculations of formulations and a workflow based on informal email collaboration. Interaction between the roles was slow, data on the underlying chemicals and materials was uncontrolled, and detailed calculations were error-prone. These problems were compounded by an increasing reliance on global methods of working.



To address these problems, Tessella developed a global, web-based formulation system, within which the entire development process can be managed. The system incorporates all the key workflows, including:

- The definition and approval of key chemicals and materials
- The lifecycle of a product from inception, to production, to being superseded
- The definition and approval of intermediate test products, either from the laboratory or from pilot, chemical production facilities

These workflows, coupled with automated calculations, integrated modelling tools and the easy generation of reports, have led to a powerful, leading-edge formulation system tailored to their specific needs. It is being rolled-out for use worldwide.

### Adverse Drug Reaction Report Tracking

The prompt and accurate recording and processing of all reported adverse reactions to their products is a key obligation placed on modern pharmaceutical companies.

Tessella was asked by one such company to build a bespoke report handling and tracking system to ensure that reports were reliably stored and then assessed and processed in both a consistent and timely manner.

The system guides the user through a series of easy-to-use data input screens and reporting functions, to ensure that each reported case is handled correctly. A strict workflow appropriate to each case is enforced, enabling the drug safety staff to process the case in the correct order. The initial categorization of the case determines the minimum level of information required, and the case cannot be further progressed until all data has been supplied.

Case details cannot be passed on to the necessary Regulatory Authorities until they have been assessed in detail ('triaged') and then checked by authorized staff. Document templates are used to automatically generate the correct form of correspondence for each situation, and follow-up reminders are created to ensure that all reporting sequences are followed through to completion.

Reports detailing outstanding tasks against each case are easily produced, allowing staff to prioritize the cases in order of those that require the most immediate attention. The

close control of the case handling workflow allows the company to be confident that they are handling their adverse reaction reports in a fully compliant fashion that will stand up to external scrutiny by the regulating bodies.

### UKERNA business process management

UKERNA manages the operation and development of JANET, the government-funded network for education and research within the UK. Tessella is developing a system for UKERNA that reflects its business processes, some of which involve complex workflows for installing and upgrading the connections to customer organizations. This will enable UKERNA to initiate and track the many actions that are needed for successful completion of these processes reliably and efficiently within the required timescales. The system uses an Oracle database server with a web user interface developed on Oracle Application Server with Java Server Pages and Servlets.

Oracle Workflow is used as the workflow engine. Tessella has closely integrated the user interface with the workflow to provide relevant and timely feedback to the users on the current state of each process, e.g. which steps are complete and which currently require action. The interface automatically shows the correct page depending on the step in the process and user's role. This close integration is essential because the processes have many pages and notifications, and comparably large numbers of conditions and branches into parallel activities. Tessella has also developed functionality to ensure that the correct data is set at the correct step by authorized users. The database holds these rules, giving it the flexibility to change as UKERNA's processes evolve.

Using the system, UKERNA will be able to provide an improved service to its customers, increase automation of repetitive tasks and better track and monitor its work.



### AstraZeneca R&D Charnwood

AstraZeneca is one of the world's leading pharmaceutical companies. They wished to save time in the testing of compounds by automating the laboratory process. Tessella developed a suite of Excel templates designed as workflow tools for a number of physical chemistry and pharmacokinetic assays. The adds automate various stages of data import, analysis and presentation. They interact with global Oracle databases. A typical workflow includes:

- Study setup – a worksheet in which compounds to be tested and test parameters are entered. Automatic connection to compound databases retrieves additional information
- Sequence generation – a sequence file required to drive the mass spectrometer is automatically generated
- Result import – mass spec results are automatically imported
- Analysis – tables are produced and printable graphs are automatically generated
- Data upload – data can be uploaded to a database directly from the workbook

The completed workbook provides a complete record of the test.

The tools are designed to be as flexible as possible; the templates are not fixed format and worksheets are generated dynamically as required by the study setup.

### Flux-View for the Centre Ecology Hydrology

The Centre for Ecology and Hydrology (CEH) is the UK's leading research centre in terrestrial and freshwater environmental sciences. CEH had developed a new field instrument, the Hydra 4, for measuring the turbulent fluxes of heat, water vapour and CO<sub>2</sub> from the land surface. Raw data processing was carried out by scientists using a range of programs. This typically had several stages and a lengthy quality control process before a dataset could be released. CEH required a streamlined process to cope with an increasing volume of data. The challenge for Tessella was to develop a workflow system for downloading, preliminary processing, quality control and archiving of field data.

Tessella developed the Flux-View system, which allows a user to set up data processing workflows for specific instrumental setups. Each workflow consists of modules which are strung together, for example to carry out initial processing, then to apply corrections and quality control before finally archiving the data.

A relatively inexperienced user in the field can download and process data simply by selecting the instrumental setup, entering some metadata such as the height of the crop or vegetation, and starting the process. A visualization tool, also configurable by the project manager for a particular instrumental setup, allows processed data to be quickly displayed as time series and XY scatter plots, providing feedback on data quality and helping to highlight problems with the instrumentation.



## Lotus Notes at Tessella

As part of Tessella's commitment to improving efficiency and reducing costs to our customers, we have developed a number of key workflow systems for our internal processes. These range from the implementation of our project lifecycles, to absence request handling, to our staff appraisal system. To take a specific example, at each stage in a project lifecycle key documents require review from various people. The workflow follows procedural rules set out in Tessella's Quality Manual. Workflow progress requires the completion of all supporting documents and an electronic signature from each reviewer. The technology employed by Tessella to perform these workflows is Lotus Notes. All project documents in the workflow are stored centrally in a Notes database and reviewers are automatically notified by email when their approval is required. The reviewer can access the document using a Notes client on their local computer. Access is also provided through a secure, web-based interface. Workflow rules are implemented by scripts, written in LotusScript or JavaScript, which are associated with the document in the Notes database. Security mechanisms, built into Lotus Notes, control access to the document and electronically sign it after approval. At any stage in the workflow a reviewer can see the progress of the document by the date and electronic signature of each reviewer who has already approved the document.

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