

# tessellanews

## The quest for better R&D decisions

R&D leaders receive diverse advice on possible ways to improve productivity. Management cannot afford to ignore the human dimension – are their teams making the best possible decisions given the information available to them, or that could be available given the right experiments? Tessella is now combining technology and consulting efforts with other pioneering suppliers to address this need.

By Dr Andrew T. Chadwick (Tessella plc) with contributions from Dr Matthew D. Segall (CEO, Optibrium Ltd)

### The challenge of reaching the best possible decisions in the conduct of R&D projects

Within life sciences and many other industries, some of the most expensive outputs are decisions: for example, in life sciences, which targets and compounds to progress at each stage of work. Excellence in decision-making requires anticipating where the future risks may lie, paying attention to the costs of late development failure, and guarding against on the one hand overconfidence, and on the other, premature rejection of options that with more effort might be pursued to a profitable outcome. This requires excellence not only in the process and supporting technology but also in the skills, understanding and team-working of the people involved.

Objectivity and balance can be hard to achieve, especially in the earlier 'discovery' stages of work where knowledge of the product potential is still building, and there are many gaps in knowledge of market and competitive potential. Good decision making is often frustrated by natural human cognitive biases: in handling uncertain information, in balancing multiple competing objectives, and in responding correctly to the variety between projects in their goals and constraints (see Drug Discovery Today, "Overcoming Psychological Barriers to Good Discovery Decisions" <http://tinyurl.com/37qnh3v>). Such variety means there can be no universal 'recipe' for reaching a decision, nor for setting a screening cascade and so teams may need support to find the right way forward for their current project.

### How can teams make the best decisions in projects?

The right tools and accelerated learning approaches can help teams effectively apply and balance their latest knowledge, business and scientific goals, and understand where to take risks and adopt original experimental designs, or to stick to precedent from past projects.

A past client of Tessella's mathematical algorithms and software development work, Optibrium, with support from the East of England Development Agency, recently commissioned Tessella to carry out a life sciences market survey. Through interviews with over 25 scientists and managers, this sought to establish common needs in the industry for tools and information that can support improved decision making and planning.

The survey has ratified that strong industry concerns exist about objectivity in decision making, and revealed wide diversity in the way that teams currently operate. While in-house tools and commercial software such as Optibrium's StarDrop™ do meet



many of the needs, there remain important questions to be addressed in future products. The ultimate goal is to help teams more dynamically make the best choices of new compounds and the best choices of testing on these compounds, at each stage of the discovery process, taking into account all the information available to them.

### Simulated environments for larger-scale planning

Managers in late Discovery and early Development are seeking a rational way to choose predictive technologies (e.g. whole cells, use of biomarkers) and to determine the best overall sequence of screening, trials and commitment within a given project. Different projects encounter good luck or bad luck, and so good judgment favours, but cannot guarantee, ultimate success. The right skills to plan well despite complexity can be hard to learn 'on the job'. It is not possible for individuals to gain direct experience, even in a lifetime, of all the possible outcomes along a project path.

R&D decision-making and planning skills can be built up from exploring problems that capture key elements of the structure of the real-world challenges; for example the need to consider impact of possible errors in predictions. Many scientists prefer to learn by doing rather than from theory. If feedback is sufficiently rapid, this will also be more effective in overcoming built-in biases.

Our consultancy service in continuous improvement of decision-making builds training simulators to achieve this. A free-access working example of an interactive simulation, set up for a typical class of problem encountered in drug discovery screening, can be found at: <http://www.tessella.com/screening-strategy-explorer>.

# UK Nuclear Decommissioning Authority (NDA) delivers major new Data Management System Technical Specification with Tessella expertise

When the NDA Radioactive Waste Management Directorate (RWMD) identified the importance of data integrity to their site characterisation programme, they selected Tessella to develop a technical specification for a major new data management system. The resulting solution will ensure that the large volume of characterisation data gathered by a wide range of scientific disciplines can be accurately assimilated, compared, manipulated, visualised, traced and preserved for decades to come.

By Chris Hawkins



## Background and Challenge

The NDA Radioactive Waste Management Directorate (RWMD) is responsible for researching, developing and implementing a long-term environmentally responsible solution for the disposal of the UK's higher activity radioactive waste in a geological facility.

In 2004 the NDA launched the site characterisation programme in preparation for undertaking detailed surface and subsurface investigations into geological, hydrogeological and environmental conditions at one or more sites, for the purpose of the geological disposal of higher activity wastes, as set out in "Managing Radioactive Waste Safely, A Framework for Implementing Geological Disposal" White Paper published by the UK Government in June 2008.

Analysing and selecting a site that will remain open for 150+ years, and will provide effective containment for many thousands of years, requires extensive and very costly geological characterisation, so it is vital that the right data standards, procedures and software infrastructure are in place before collecting data in the operational phase of the programme. The data management solution must protect the investment by securing the highest levels of data integrity whilst offering a simple and intuitive system allowing different scientific disciplines to collaborate, share and interpret the data.

The site characterisation programme aims to build detailed 2D and 3D models of the geological suitability of a site. This involves gathering and combining terabytes of data from a wide variety of different sources including geological and geophysical surveys, in-situ testing, regional surveys and laboratory analysis.

As well as needing to manipulate and compare very large volumes of data from a lot of different sources the programme has the additional challenge of maintaining and preserving the data for hundreds of years. Compared to typical characterisation projects in Oil and Gas for example, this solution must incorporate the need for extensive record management in order to provide full traceability and provenance for the data.

The site characterisation team estimated it would take 2 to 3 years to fully specify, design and implement the required Data Management system which put it on the critical path for the

programme. The team went to open tender to find a consulting and technology partner with expertise in developing systems that store and manipulate large volumes of scientific data.

## Solution and Benefits

Tessella was selected for the first stage of the project which involved developing an overall data management strategy covering objectives, scope, data governance, architecture, standards and usage. Tessella was then selected for the second stage which involved working with RWMD to fully specify the system.

We used a Prince 2 project management methodology and iterative requirements elicitation to ensure the system met the needs of the broad community of users and stakeholders - including scientists, academics, government agencies, IT specialists, archivists, regulators, commercial organisations as well as an advisory panel with representation from the NDA and the BGS (British Geological Survey). Specific geoscientific expertise was also supplied by a number of outside consultancies including Jacobs, ESI and Brooks Gamble.

The overall specification and design for the Data Management system covered a wide remit including data standards, modelling, visualisation, operating procedures, security, continuity, backup, support, digital preservation, archiving, and extensive record management.

Having a comprehensive specification will allow the team to utilise off-the-shelf, industry-standard software components for the implementation phase. This not only ensures the system will be easier to maintain in years to come, but will also provide an accelerated implementation phase, to the extent that the system could be ready for the input of characterisation data a year ahead of schedule.

The NDA/RWMD now has a comprehensive Data Management Technical Specification that provides a solid foundation for systems procurement as well as addressing the high data integrity and availability demands required in the operational phase of the site characterisation programme.

The strong focus on information management will also increase the efficiency and cost effectiveness of the operational phase by reducing ambiguity and misinterpretation, minimising the collection of overlapping data and allowing existing data to be better leveraged.

Incorporating record management and digital preservation into the design and operating procedures provides a secure and accessible knowledge base that can be used to aid understanding and scientific collaboration for many years to come.

# Southern boost operational efficiency and passenger service with Tessella

Award winning TAPAS (Train Automatic Performance Analysis System) more than doubles the reliability of Class 455 fleet and improves operational efficiency to deliver a 63% reduction in delays and a 66% reduction in cancellations.

By Nicholas Clarke

## Business Background and Challenge

Southern run an extensive set of train services between London and the South coast including the Gatwick Express. The business carries around 150 million passengers a year, manages 159 stations and a fleet of nearly 300 new and refurbished trains, 7 days a week and up to 24 hours a day.

Simon Green, Chief Engineer at Southern, explains, "As a train operator we are always looking for innovative ways to improve our service. One of the main impacts on passenger performance is obviously the reliability and efficiency of our trains."

In particular, Southern's 46 Class 455 rolling stock units were experiencing reliability and operational issues resulting in 56 cancellations and 2,300 delay minutes in every four week period. So, in partnership with HSBC Rail, Southern embarked on an improvement program with an initial focus on the Class 455 fleet.

When the installation of "black box" recorders was made mandatory for all trains, Southern saw the opportunity to extend the data being collected beyond the minimum required for safety to an enhanced set that would allow them to monitor the behaviour of critical components, as well as track train movements using GPS.

Simon continues, "Our initial focus was increased reliability. We wanted to minimise costly in-service failures by monitoring asset condition and scheduling appropriate preventative maintenance. However, we also wanted a way of profiling train stopping patterns and journey times in order to improve overall efficiency."

Southern realised from the outset that it did not have the in-house expertise to design and deliver the complex data analysis framework required to turn the raw data from multiple trains on multiple journeys into information it could use to improve maintenance regimes and reduce train stoppages and delays.

Simon adds, "We were also keen to engage with a partner that could provide an objective and innovative approach to interpreting the data. Tessella fitted the bill perfectly. They had the requisite software engineering capability, but more importantly proven expertise in the analysis and modelling of large volumes of complex data".



## The Solution

Tessella worked in close partnership with Southern and HSBC Rail to analyse the system requirements and produce a specification. Because of the difficulty in defining exactly which performance information TAPAS (Train Automatic Performance and Analysis System) should be reporting, an application framework was specified that would allow the Southern engineers to develop and refine the system over time as behaviour patterns were captured and re-evaluated.

Simon continues, "I was impressed by the requirements gathering techniques Tessella used. They were absolutely vital in getting this highly abstracted problem into a form we could all understand and agree to."

Working closely with Southern's engineers, Tessella built and refined TAPAS. Phase one of the programme focused on improving train reliability. Using a graphical user interface Southern were able to identify potential failures before they happened, reducing routine maintenance and preventing repeat failures. This translated into increased reliability and less time spent in maintenance, which ultimately benefited Southern's passengers.

## The Benefits

Simon is delighted with the results. "Within a year of the system going live, we were able to exceed our original target of doubling the reliability of the Class 455 Fleet. We have also been able to reduce delay minutes caused by congestion, unnecessary stoppages and reduced traction due to track condition."

TAPAS has also gone on to win several prestigious industry awards for the innovative way it is able to extend asset life, cut in-service failure, boost efficiency and improve passenger service.

Overall it has led to a 63% reduction in delays and a 66% reduction in cancellations which equates to a £1.1M per year saving for the business in franchise fines. The combined benefits more than cover the investment in the system.

## The Future

Following this early success, Southern are looking to extend the TAPAS framework further to reduce the energy consumption of their trains. The aim is to operate a greener, more energy efficient service by maximising the time run at optimum speeds and minimising acceleration and deceleration time caused by unnecessary stoppages. The announcement that Southern's rail franchise has been renewed to 2015 means that they are ideally placed to maximise the benefits from this innovative system.

Simon concludes, "Tessella have brought more to this project than just raw software design and development capability. Their experience in data analysis and complex systems modelling really complemented our detailed rail engineering experience. Together we have built an asset condition and operational management system that has met its aims in a more comprehensive and innovative way than we could ever have envisioned at the outset."

## Getting greener – Tessella recommended for ISO:14001 certification

Tessella recognises that it has a responsibility to manage the environmental impacts which arise through its operations and, for many years has been committed to being an environmentally conscious company, conducting its business in an ethical and socially responsible manner.

Tessella is now making a formal commitment to manage and reduce its environmental impacts by implementing an Environmental Management System and achieving certification of this to the ISO:14001 Environmental Management System Standard. We have just completed our Stage 2 assessment with no non-conformities raised and the assessors will now make a recommendation that we are certified to the standard.

Through our Environmental Management System, we will identify, on an ongoing basis, the activities and operations which result in the most significant environmental impacts and set improvement targets and create management plans to reduce the impacts. In parallel, Tessella will ensure compliance with all applicable environmental legislation and will aim to prevent pollution.

## Finnish National Archives

The Finnish National Archives has selected Tieto and Tessella's Safety Deposit Box (SDB) to deliver their national digital archive.

Päivi Happonen, Development Director of The Finnish Archives, said, "The Finnish Archives' task is to ensure that records belonging to the national cultural heritage are preserved. One of the key reasons for choosing Tessella and Tieto was their proven track record of delivery."

Jon Tilbury, Tessella's Director responsible for archiving technology, said; "We are very pleased to be working with The Finnish Archives and look

forward to their input in the SDB User Group. They will become the ninth organisation to deploy SDB which is proving to be the long term preservation solution of choice in this demanding sector."

## MP visits Stevenage

Tessella welcomed Stephen McPartland, newly elected MP for Stevenage, Hertfordshire, at Tessella's Stevenage offices.

Mr McPartland visited various space technology companies in the Stevenage area as part of a campaign to understand the future of a fast growing UK space industry, currently estimated to add over £6 billion to the UK economy each year.

Commenting on his tour at Tessella, Mr McPartland said: "The visit to Tessella was extremely interesting and it was fascinating to see and understand the company's offerings in the space sector."

Tessella Stevenage has been responsible for the design, analysis and simulation of on-board attitude determination and control algorithms for a number of the European Space Agency's scientific and telecommunications satellites. The company has designed guidance, navigation, control and tracking systems for aerospace applications and has responsibility for radar tracking algorithms on a major defence system.

## Stan Bradbury

Tessella is pleased to announce the appointment of Stan Bradbury as a consultant assisting the Tessella Energy team.

Mr Bradbury has decades of experience in the oil and gas sector: reaching the heights of CIO for Shell Global Solutions. He is now an independent consultant and he is able to provide advice and consultancy to Tessella as part of its drive to expand its energy business over the next two years.



left to right: MP Mr McPartland and Alan Gaby, Director of Tessella

Stan said: "I am very pleased to be helping Tessella with their ambitious growth plans; I believe their mix of technical IT skills, domain knowledge and the ability of Tessella consultants to find novel solutions to technical problems will bring real value to the energy sector".

Alan Gaby, Director at Tessella said: "It is great to have Stan onboard. His wealth of experience in driving the IT of a major energy business will help us focus on what is important to these clients and how we can help them gain real value from technical IT".

## Ovum reviews SDB

Sue Clarke, Senior Analyst at Ovum, a leading authority on telecoms, software and IT services, reviewed Tessella's Digital Archiving offering, SDB. Find out what she had to say at:

<http://tinyurl.com/398zsk8>

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**Tessella – successfully delivering IT and consulting services to world leaders in R&D, science and engineering.**

For decades, Tessella has been successfully delivering IT and consulting services to world leaders in R&D, science, and engineering. Through the application of scientific methods and rigorous quality procedures, we enable clients in life sciences, energy, the public sector, and consumer industries to achieve a wide range of objectives, including, forecasting floods, developing fusion power, enhancing military sensor capability, improving drug discovery and development efficiency, and reducing risk to health and the environment in the extraction and production of oil and gas. With offices in Europe and North America, global companies rely on Tessella for business critical assignments.

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