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IT Strategy for Rich Data Management

Science and engineering research increasingly involves exploring very large volumes of rich data generated by sophisticated sensor technologies. This trend means IT teams must focus on cost effective ways to manage the data deluge. An important first step is to develop a clear scientific and IT roadmap.

By Scott Shepard

The IT challenges of sensor technologies

Modern sensor technologies use sensitive acquisition devices and advanced signal processing capabilities to resolve, interpret and display digital sensor information. These systems are finely tuned for specific purposes and even subtle differences in scientific need can justify purchasing new technology platforms. As a result, the sheer number and diversity of platforms required to support R&D activities continues to expand rapidly.

These platforms have significant IT requirements, from databases, servers to disk stores. The rapid maturation of technologies from standalone systems to sophisticated computational platforms has often made it difficult for IT organizations to control technology support and integration costs. Even more importantly, the challenges of incompatible technology platforms, proprietary file types, technology limitations and the lack of frameworks to integrate this information in a meaningful way with other corporate knowledge databases went unexplored.

Key points for an IT strategy

What is needed is a global strategy for managing this kind of data that not only copes with the current situation but is also planning ahead for what is inevitably going to be an ever growing volume and increasing diversity of data. Any strategy must address the following four points:

IT Infrastructure. Most IT systems handling sensor data have been pieced together over time. These fragmented solutions frequently include vendor specific platforms that don't play well together. There are many internally developed solutions, which tend not to scale well. Rich data storage is often scattered and disconnected. Enabling and managing collaboration around rich data use is another thorny issue and can be difficult.

Conflicting Needs. Scientists and business decision makers often have different requirements. Cultural and technical issues often impede data sharing throughout the enterprise.

Standardization & Governance. Standardizing platforms and suppliers is a worthy goal but difficult to achieve and often at odds with rapidly delivering a system to meet scientific needs. Rich data retention policies are often lacking. Workflow policies usually need strengthening.

Cost. Decisions made in virtually any of the forgoing areas impact cost. Software and hardware costs are the most obvious. Support costs are also often higher because of the fragmented nature of most rich data management systems.

Generating a roadmap

Generating a comprehensive IT roadmap for rich data management is a challenging task that requires deep domain knowledge and IT expertise. To help companies assess options, Tessella uses a proven consulting process (Figure 1) to generate an IT roadmap tailored to their specific business requirements.

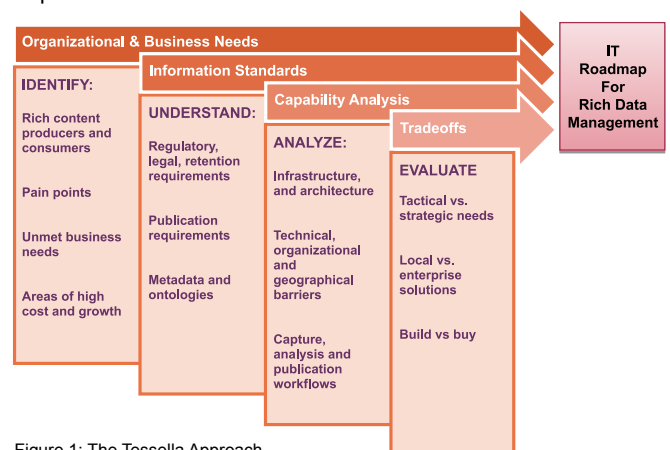


Figure 1: The Tessella Approach

The reward is worth the effort. Reducing the cost to exploit the value of rich data from across functions and improving knowledge interchange helps project teams. Effective long term scientific data management and knowledge planning offers R&D teams sustained, faster access to rich data for exploration.

If you would like help with your IT strategy for rich data then contact Tessella. If you would like to read more about IT strategy for rich data and image management in pharmaceuticals download our white paper (PDF): <http://tinyurl.com/6yrxmk>

AstraZeneca Accelerate Drug Discovery with Tessella Software Engineering & Image Analysis Expertise

When AstraZeneca needed skilled resource to develop custom rule sets for their Definiens image analysis system they called on Tessella's unique blend of experience in data management, image analysis, life sciences R&D, and professional software development. The solution has cut the time needed to accurately analyse tissue samples by up to two thirds compared with manual counting. This, combined with improved consistency and the ability to process higher levels of cellular resolution, has enabled AstraZeneca to accelerate the overall drug discovery process.

By Jennifer Cohen

Background and Challenge

AstraZeneca is one of the world's leading pharmaceutical companies, with the mission to make a meaningful difference to patient health through the development of innovative and effective medicines. The company employs nearly 62,000 people and is active in over 100 countries, including major R&D facilities and corporate headquarters in the UK.

AstraZeneca invests \$4 billion each year in the discovery and development of prescription medicines for six important areas of healthcare, which include some of the world's most serious illnesses: cancer, cardiovascular, gastrointestinal, infection, neuroscience, respiratory and inflammation.

Jo Francis, Associate Principal Scientist, at AstraZeneca's Advanced Science Technology Laboratory takes up the story "Automated image analysis of tissue samples now plays an important role in speeding up our drug discovery process. As well as significantly increasing the number of samples we can analyse compared to working manually, it also provides us with more quantifiable and consistent results".

AstraZeneca were already using Definiens' image analysis software, but as demand for the service increased as well as the requirement to undertake more complex analysis, such as detailed cell morphology, the team realised they needed additional expertise to help them develop and properly document advanced rules sets, as well as expertise in storing, archiving and managing the large volumes of image data being captured.

Jo continues, "The increased demand was going beyond our ability to keep up, and as pathologists we felt our time was better spent on the science rather than programming and data management. We also needed a resource that could be flexible, sometimes working full-time on the system, and then less at other times, depending on where we were in the drug discovery cycle."

Solution and Benefits

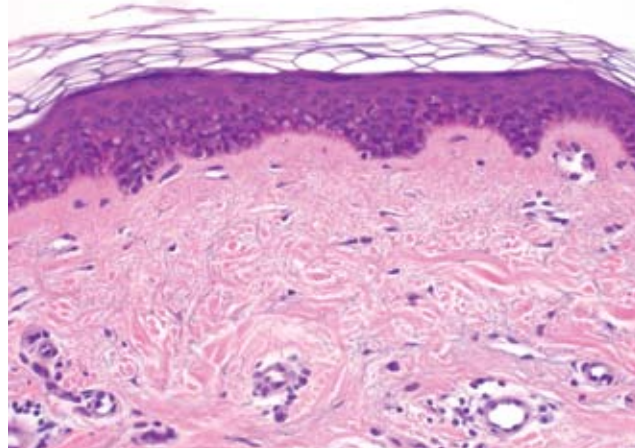
Following a short selection process, Tessella was chosen to work with the AstraZeneca team. Jo adds "Tessella were a natural choice. Not only did they have the professional software development and data management skills we required, but also, more importantly, extensive experience in image/data analysis and life sciences R&D. This enabled them to become part of the team, very quickly contribute new ideas and translate our requirements into reality".

Tessella has developed an extensive library of custom rule sets for the AstraZeneca Definiens system, which is capable of the automated batch analysis of over 5000 different tissue samples. In particular, Tessella's expertise in the analysis and management of large volumes of image data has enabled AstraZeneca to process higher levels of cellular resolution. This means the team can fully analyse morphological changes such as cell shape, size and colour, which provides a deeper insight into how drug candidates are driving change.

Jo continues "As well as being able to significantly increase the throughput of our analysis compared to manual counting, we now have the ability to make earlier, more informed drug prioritisation decisions by analysing and validating drug-target interaction. All this serves to reduce the cost, and increase the speed and accuracy of our drug discovery process".

Future

Jo concludes "With Tessella's support and expertise we have been able to really maximise the value of our Definiens image analysis system. They are very much part of the team, freeing up our time to focus on the science rather than the rule set development, data management and IT house-keeping tasks. We are also beginning to share this vital image analysis resource with our global R&D community in, for example, Sweden and China. This further leverages our investment in the Definiens system as well as Tessella's unique blend of scientific software expertise".



Tessella helps BiOxyDyn meet milestone in commercialisation of Oxygen Enhanced MRI technology

When BiOxyDyn, (www.bioxydyn.com), a spin out company from Manchester University, needed to turn their innovative research and Intellectual Property (IP) in non-invasive medical imaging into a commercially robust, well-architected and fully-documented set of software tools, they called on Tessella's unique blend of expertise in image analysis and scientific software engineering. The collaboration has enabled BiOxyDyn to meet the first critical milestone in the commercialisation of their technology – allowing them to engage more fully with potential partners and customers, capitalise on their market lead, attract additional investment and better meet regulatory requirements.

By Frank Hart

Business Background and Challenge

BiOxyDyn, a spin out from Manchester University, was formed to commercialise innovative research work into non-invasive medical imaging techniques, including a method for imaging lungs called Oxygen Enhanced Magnetic Resonance Imaging (OE-MRI). The company's portfolio of technologies and capabilities includes tools and services to improve the understanding of lung diseases such as chronic obstructive pulmonary disease (COPD) and asthma. BiOxyDyn are also active in the development of new imaging tools for oncology and neuroscience. The technology provides a greater insight into the diagnosis and response to treatment for these diseases, and can be applied to both drug development and clinical use.

BiOxyDyn's imaging technologies, especially OE-MRI, have the potential to change the way in which lung disease is diagnosed and monitored by providing non-invasive regional assessment of lung ventilation/perfusion ratio (V/Q) and measures of changes in pulmonary vascular function. It is also more cost effective, easier to use and safer than traditional methods such as X-ray CT (CAT) scanning.

Prof. Geoff Parker, who heads up a large research group at Manchester University and is Scientific & Founding Director at BiOxyDyn, takes up the story "We could see the value and potential of the new techniques we had developed. However, in order for them to make an impact on the health of patients we knew we had to bridge the gap between academic research and commercial delivery. To this end we founded BiOxyDyn and approached the University's technology office (UMIP) to recommend a software partner to help us turn our Intellectual Property (IP) of image analysis models & algorithms into a robust, well-architected and documented toolset. This critical first step in our product development roadmap would give us the credibility to more fully engage with potential partners, attract additional funding and be ready to meet future regulatory requirements".

Solution and Benefits

The technology office recommended Tessella, and after preliminary discussions they were selected to work on the project. Geoff continues "Because of their background in science, image analysis and complex algorithm development, the Tessella consultants were able to come up to speed quickly. They worked very closely with the research team to document requirements, and iteratively design, build and test a well-architected and auditable solution".

The team identified the need for a number of workflow tools to form a wrapper around the core image analysis algorithms. Geoff adds "The workflow tools Tessella has developed have enabled us to significantly speed up the overall analysis process".

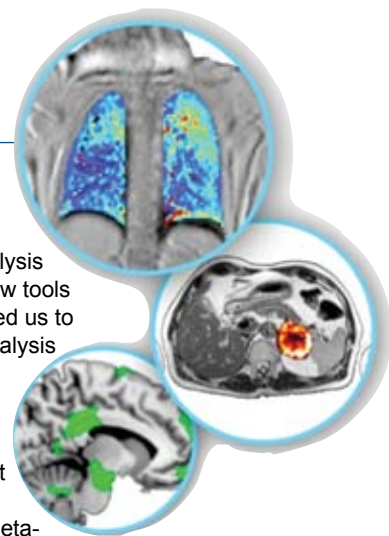
The first three tools in the workflow are used to pre-process the raw image data before analysis. The first of these is a file conversion module that isolates the complexity of the meta-data extraction in the raw MRI image file making it easier to work with and convert into the optimum format for subsequent downstream analysis. The second tool then calculates the difference in the partial pressure of molecular oxygen observed across the lung as oxygen is delivered - as a function of time. The final part of the pre-processing workflow is a region-of-interest and small image tool that allows the computationally intensive modeling to be localised, speeding up downstream analysis.

Finally, in order to speed up the image analysis process itself, Tessella reworked the original mathematical models developed by the research group into C++, including formulating the numerical integrations and parameter fitting. The algorithms were then fully verified by comparing the results against "synthetic" data where the expected values for the fit parameters were known.

Summary and Future

Geoff concludes "Partnering with Tessella has enabled us to take the first vital step in commercialising our research and IP in non-invasive medical imaging technology. We now have a robust, well-documented and very efficient set of verified algorithms and workflow tools that allow us to have meaningful dialogue with potential pharmaceutical and clinical partners and customers. We could not have achieved this so smoothly and quickly without Tessella's background in science and image analysis, and their high quality approach to software engineering."

"From this foundation we can move confidently onto the next steps in our product and commercial development, meeting other critical milestones such as clinical field validation and regulatory approval. Tessella has played a vital role in our success to date, and we are already discussing ways in which they can assist us with this next important phase in our growth."



Tessella presented Queen's Award



On Thursday 15th September 2011, Tessella held a ceremony at St Catherine's College, Oxford to officially receive the Queen's Award for Enterprise in Innovation.

The prestigious Innovation Award was made jointly with The National Archives for developing Safety Deposit Box (SDB), a system for preserving digital information over long periods of time, regardless of changes in technology.

Lord Lieutenant Tim Stevenson of Oxfordshire presented the award on behalf of Her Majesty The Queen to Kevin Gell, Managing Director at Tessella and Oliver Morley, Keeper and Chief Executive of The National Archives.

In a speech praising the work of Tessella and The National Archives, Lord Lieutenant Tim Stevenson said: 'The National Archives' vision combined with the industry and expertise of Tessella is a unique example of a mutually beneficial collaboration between the public and private sectors. It has helped create a new international market for digital preservation systems led by the Safety Deposit Box system which has now been adopted by archives all over the world'.

The awards ceremony was followed by demonstrations showcasing the work of Tessella.

The Queen's Awards are made annually on the Queen's Birthday and are only given for the highest levels of excellence demonstrated in each category. The National Archives is the only public sector organisation among this year's winners.

The Scientist: Balancing Biases

How cognitive prejudices can influence research decisions, and how the pitfalls of human nature can be avoided

In the late 1980s and early 1990s, Merck & Co. was at the height of an epic pharmaceuticals boom. Annual sales doubled and profits tripled, most notably driven by sales of a congestive heart failure treatment that hit the billion-dollar mark just three years after its 1985 introduction. In 1993, Fortune magazine named Merck America's "most admired" company—for the seventh year in a row. Despite the company's unparalleled success, Merck was not immune to the common cognitive biases that can subtly influence everyday research decisions.

<http://tinyurl.com/3qu7sn6>

STFC chooses secure data archive solution

The UK's Science and Technology Facilities Council's (STFC) Rutherford Appleton Laboratory (RAL) is using Tessella's Safety Deposit Box (SDB) to manage part of its scientific data archive. David Corney, head of data services at RAL, said: 'SDB integrates perfectly into our scientific data archive.'

<http://tinyurl.com/4yuuwwq>

Information Age: Digital History

How the Wellcome Library is preserving the history of medical science in digital form

The Wellcome Library holds one of the world's largest collections on the history of medical science and its role in society, and is maintained to support the Wellcome Trust's mission of achieving "extraordinary improvements in health by supporting the brightest minds".

Read more: <http://tinyurl.com/3buedc8>

Meet us at these upcoming events

iPres 2011 – the 8th International Conference on Preservation of Digital Objects; November 1st to 4th, 2011, Singapore

Tessella are sponsors of iPres 2011, taking place on November 1st to 4th 2011 in Singapore. Robert Sharpe, Head of Archiving Solutions at Tessella will be speaking at the event on the scalability of digital archiving systems.

<http://ipres2011.sg/>

9th Annual Deepwater Operations 2011; November 1st to 3rd 2011, Texas USA

Tessella are proudly sponsoring the 9th Annual Deepwater Operations 2011 taking place on the 1st to the 3rd of November 2011 at the Moody Gardens Hotel and Conferencing Center, Galveston, Texas. Tessella will be exhibiting at stand number 319 so please feel free to drop by.

<http://www.deepwateroperations.com/index.html>

GDDIS Summit 2011; November 7th to 8th, Orlando, Florida, US

Tessella are sponsors of the GDDIS Summit 2011 taking place on November 7th – 8th at the prestigious Waldorf Astoria in Orlando, Florida, US. Meet Dr Andrew Chadwick, Principal Consultant for Life Sciences at Tessella and Grant Stephen, CEO of Tessella Inc at stand number 12.

<http://www.gddis.com/index.htm>

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

Founded in 1980, Tessella is the international provider of science powered technology and consulting services. World leading organisations choose our unique blend of science, engineering and sector expertise to deliver innovative and cost-effective solutions to complex real-world commercial and technical challenges. Our people are high achievers from leading universities and are passionate about delivering value to clients. We are proud that our work makes the world a better place to live in: developing smarter drug trials; preserving the digital heritage of nations across the globe; minimizing risk in oil and gas exploration; controlling the orbit and attitude of satellites; researching fusion energy.

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