

tessellanews

R&D IT strategy: the cavalry's coming

Science and technology based organizations must adapt to ever changing market dynamics and fierce competition. Despite these waves of change, your organization's R&D success relies on the implementation of a stable and coherent IT strategy.

By Andrew Chadwick and Richard Craggs

Successful IT strategy has to allocate resources in a way that satisfies the many local and tactical demands for rapid intervention and improvement, while safeguarding progress on a longer timescale towards more difficult-to-meet, collective objectives. Is an IT strategy spanning multiple research areas still a meaningful aim? If so, what should it consist of? To what extent can 'agile' or rapid delivery methods and commercial packages ease this burden without threatening the coherence and span of the information that scientists need?

Strategy – the 'art of war' – is primarily about deploying resources into the right area: fast-moving cavalry to address local challenges in a flexible and responsive way, while slower-moving forces take strategic objectives over longer periods.

Attempts to define multi-year, global IT programmes often struggle to manage changes in research methods, IT standards, and company structure. Agile development helps to compensate for this. It allows rapid delivery of business benefits by allowing information users and creators to collaborate and find the best means to reach a defined and shared business objective. Rapid prototyping and iterative development methods can clarify key requirements quickly, identifying risks in time to overcome them.

However, small, tight and fast-moving teams – the 'light horse regiments' – can find it hard to reach, or even identify, objectives that lie beyond the immediate sight of responsible users. Light cavalry alone cannot win a war. Possibly the most famous military mistake, the 'Charge of the Light Brigade', was not a failure in strategy – it was a failure in communication, the light cavalry charging at the target they could themselves see, instead of the one that their general could see over the hill. Tennyson wrote:

**“Into the valley of Death rode
the six hundred. Cannon to right
of them, Cannon to left of them,
Cannon in front of them...”**

Surprisingly, about 500 of the 673 British cavalry survived this charge, helped by a flank attack on the Russian line by French Algerian troops.

So the longer term aims of an IT strategy need to be both clear and communicated. What should these aims be for a modern organization? Sustained improvement in R&D performance requires use of one project's results, positive or negative, to help improve the conduct and success of future projects. This means pulling information upstream against the flow of the R&D process. Such upstream flow requires active intervention by management to set a strategic intent. For example, a knowledge sharing 'contract' will encourage project teams to release and organize information needed by others. Such cross-project knowledge management can meet resistance, but this can be overcome if the mutual benefits are made clear.

Increasingly we are helping our clients not just with bespoke code, but also in the selection of commercial off-the-shelf packages to save implementation time and reduce demand on in-house specialist informatics effort. Use of such packages might frustrate a purist approach to IT architecture standards, but increasingly we see suppliers providing open access to database views and application programming interfaces designed as web services. Modern packages of this nature, carefully selected within a clear roadmap to span the routine R&D requirements, are a pragmatic way of meeting laboratory support needs. Most R&D groups share very similar requirements for materials and inventory management – activities that support R&D, but do not lead to the kind of innovation that can differentiate R&D performance from the competition.

Putting value on an IT strategy is easier if there is an end-to-end view, from target to market, of the causes and effects of good and bad information and good and bad decisions. This forges the essential link between science, information, IT and the business that must fund the IT investment.



The charge of the Light Brigade at the battle of Balaklava during the Crimean War (1854)

Modelling sun sensor performance for TNO

When TNO needed to tender for two major space missions they selected Tessella to model sun sensor performance.

Picture copyright iStockphoto



TNO and sun sensors

TNO is a leading independent research and development organization, and has more than 30 years of flight heritage. Based in the Netherlands its activities include exploration and space science, earth observation, satellite navigation, satellite telecommunication and human spaceflight. TNO is a market leader in sun sensors, which are used to guide telecoms, earth-observation and scientific satellites.

A quadrant sun sensor measures the direction of the sun with respect to a satellite by comparing the amount of light falling on four separate detectors arranged in a square. However, for a satellite in earth orbit, the reflected 'albedo' light from the earth can also enter the sensor, distorting the measurement and possibly causing false detection of the sun in the field of view.

Modelling sun sensor performance

Tessella supported TNO's tenders for two major space missions, by providing a careful analysis of the response of the sun sensors to such albedo light.

Tessella constructed an analysis framework, which calculated the amount of reflected light falling on each detector by summing up contributions from each patch of the earth in the sensor's field of view. The model takes into account the geometry of the orbit, the earth and the sensor, the angular distribution of light reflecting from the earth, and the earth's albedo factor.

Using the analysis framework, it was possible to calculate the worst-case geometries for false sun detection, and thereby to assess whether a false detection could occur in various phases of the mission. Choice of the threshold light intensity for the sensors allowed TNO to show that false detections were avoided.

Tessella also identified the orientation of the sun and the earth that would cause the maximum error in the measured value of sun angle due to reflected light, allowing a rigorous determination of the worst-case measurement error against the mission requirements.

After delivery of supporting analysis for one tender, TNO requested similar support for a second bid. Work was completed on time and to budget in both cases, and was received enthusiastically by TNO. Results of the analysis are now included in technical notes delivered with the sensor.

Robust solutions to complex problems

The complexity of each space mission gives unique technical challenges. Despite this, the levels of accuracy demanded in the space industry are probably higher than in any other industry sector.

Tessella's expertise in systems engineering, mission analysis, control design, mathematical modelling and detailed analysis provides a unique combination of skills to meet the challenges of the space industry. Tessella's rigour and attention to detail set us apart. Our integrated design approach allows greater efficiency of design, better justification of decisions, and the flexibility to respond rapidly to changes.

Within the space sector, Tessella is Europe's leading independent nonprime specializing in design and analysis for satellites, exploratory missions and components. Our comprehensive skills have been applied successfully across a range of areas. Tessella has built an enviable reputation for excellent technical support in:

- Attitude and Orbit Control Systems
- Entry, Descent and Landing System design and analysis
- Orbital dynamics and mission analysis
- Pointing error analysis
- Hardware modelling

This work is underpinned by staff with outstanding mathematical and engineering skills, and by Tessella's leading expertise in:

- Control design and analysis
- Optimal estimation techniques
- Modelling and simulation
- Systems engineering
- Parametric trade-off studies

To find out how Tessella can use its unique blend of scientific, engineering and IT skills to solve your most complex technical and business problems in a highly cost-effective way, please visit www.tessella.com or email info@tessella.com



David Dugate
Tessella



Dave Gittins
Tessella

Medicinal chemistry knowledge system

Tessella Milestone Tracker is a medicinal chemistry knowledge system, founded on two basic principles: *knowledge management* (maximizing the value of information in your business) and *productivity* (solving a problem once, then letting others benefit from that learning).

In a large pharmaceutical company, a high throughput screening process will typically generate a number of 'hits'; compounds that show activity against a target of interest.

It is the role of *medicinal chemistry* to take these 'hits' and, by making successive alterations to the chemical structure, optimize the medicinal properties of these compounds to the point that they can be passed over to the next stage of the pharmaceutical process as candidate drugs for development. This process will typically span many months, or even years.

Milestone Tracker

Tessella *Milestone Tracker* is a medicinal chemistry knowledge system, founded on two basic principles: *knowledge management* (maximizing the value of information in your business) and *productivity* (solving a problem once, then letting others benefit from that learning to solve their problems faster).

Plotting a course

Typically, every compound synthesized and tested within a company will be recorded, along with test results, in corporate databases. If you could plot these compounds as points in some conceptual 'chemical space', the result would be a multitude of unconnected dots.

Milestone Tracker allows users to plot the course that a particular project has taken in that space, by making the connections between the key compounds.

Milestone Tracker has its own database in which it stores this relationship and learning information. It is, however, designed to integrate with the corporate systems, which contain the definitive information on structures, chemical properties and test results, ensuring consistency of information within your organization.

Key Concepts of Milestone Tracker

Milestone Compounds: The pharmaceutical process has a number of milestones, ranging from identification of a target, through to product withdrawal at the end of its life. Milestone Tracker stores information on the compounds that make it through the checkpoints at each of the milestones occurring in the Medicinal Chemistry phase.

Learning Compounds: Although the optimization process is an evolutionary one, there may be multiple modifications between milestones, or a 'leap of understanding' may result in a more radical structure change. Milestone Tracker caters for this by allowing scientists to record important compounds between milestones. These will generally be the representative compounds where a key structural change was introduced.

Learning Records: Each learning record links a compound with an 'issue', and with another which represents the solution. Associated with the link is information on what change was made, when, why and by whom.

Issue Taxonomy: An important component in Milestone Tracker is the hierarchy of issues and problems which might drive structure changes. This ensures consistency of language across all users, and transforms Milestone Tracker from an information repository into a searchable knowledgebase. The taxonomy is a configurable component, since each company will want to encapsulate their own preferred terminologies and hierarchies.



Picture copyright Digital Vision.

Asking questions of Milestone Tracker

For scientists, a typical question is:

“I have a compound with problem X. Show me all the cases where that problem has been improved for similar compounds.”

Milestone Tracker will search its database and return a set of learning records that will provide some insight into the structural changes that have had the desired effect in previous cases. Importantly, these will also provide information on who did that work, which will allow scientists to tap into the wealth of experience and knowledge that is embodied in individuals around the organization.

Spreading the benefit

Although developed specifically for the medicinal chemistry function, the Milestone Tracker approach could easily be applied to other stepwise optimization processes, for example, when developing and optimizing a production synthesis process.

Tessella Milestone Tracker allows scientists to capture learnings on the important structural changes made as compounds are optimized during the medicinal chemistry process. This information can be efficiently searched to deliver Efficiency, Productivity and Insight.

For more information on Tessella Milestone Tracker, or to discuss your business requirements in general, email info@tessella.com



Alan Bell
Associate Director

Tessella rebrands and launches consultancy

Tessella has launched the Tessella consultancy services and has rolled out a new visual identity to reflect this broader business capability. As part of the initiative the company name has been changed from Tessella Support Services plc to Tessella plc. Tessella Inc continues with its name. Kevin Gell, managing director, said:

"Since our foundation in 1980, Tessella has successfully delivered many application development and system integration projects to R&D, science and engineering leaders. Over time, however, our assignments have deepened both in scope and nature. Increasingly we provide clients a wider range of services like consultancy and outsourcing. We expect this part of our business to grow and want our name and brand to reflect this."

Peter Townsend, commercial director at Tessella commented:

"The new brand shows our ongoing focus on R&D, science, and engineering, but also reflects the wider scope of services that Tessella provides clients."

The new Tessella logo has a strong scientific heritage. It is based on a trefoil knot tessellated with different coloured tiles. In mathematics the trefoil knot is the simplest non-trivial knot. In drug discovery, the trefoil knot fold is a structure found in proteins where it is part of the active site or a ligand-binding site and is critical to the activity of the enzyme in which it appears.

Green Xmas

In December, Tessella decided not to send out the usual Season's Greetings paper cards but instead sent eCards to help towards saving the environment. With each eCard sent, Tessella pledged to pay £1 to Cancer Research UK. A grand total of £1,000 was raised for Cancer Research UK!



Office opening: K. Gell and Prof. G. Richards



Tessella staff demonstrate project work

Tessella relocates headquarters

Tessella has relocated its headquarters and largest branch to the Abingdon Science Park, Oxfordshire. The move to larger offices is a natural response to the continued growth of the business. Repeatedly delivering business value to our clients in R&D, science and engineering is key to our expansion. Even in these troubled times we believe that we can continue to grow by maintaining this focus.

Abingdon is close to several major UK scientific and academic establishments including Oxford University, UKAEA, Harwell Laboratory, STFC Rutherford Appleton Laboratory, and the new Diamond Light Source synchrotron.

Strategic partnership

Tessella has formed a systems integration partnership with Definiens – the number one Enterprise Image Intelligence® company for analyzing and interpreting images on every scale, from microscopic cell structures to satellite images.

Definiens will train Tessella consultants to deploy and integrate the image analysis technology into clients' IT infrastructures.

Another award for TAPAS

In December 2008, Southern, HSBC Rail and Tessella celebrated when Southern's Class 455 fleet won the 'Silver Spanner' award.

Each year, the trade and technical magazine 'Modern Railways', and the rail industry representative body the Railway Forum, recognizes achievement in the reliability of train fleets across a variety of categories.

Over the last year, Southern has increased the Class 455 reliability from 6,000 to over 15,000 miles per failure, making it the most improved fleet in its class.

A significant factor in this improvement was the introduction into the fleet of the groundbreaking technology TAPAS (Train Automatic Performance Analysis System), designed and developed by Tessella. This enabled a transition from traditional train maintenance to an information-centred, condition-based maintenance approach, with very impressive results.

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UK OFFICES

Abingdon	+44 (0)1235 555511
Burton upon Trent	+44 (0)1283 559150
Cambridge	+44 (0)1223 897770
Stevenage	+44 (0)1438 749886
Warrington	+44 (0)1925 286800

NETHERLANDS OFFICE

Den Haag +31 70 354 2296

US OFFICES

Boston +1 617 454 1220
Washington DC +1 240 235 6052



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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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