TONY DAVIES COLUMN

Fitting people into your model

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As a community we have spent enormous amounts of time and money researching, discussing, publishing and patenting new ideas. We drive forward technology revolutions in spectroscopy, chemometric data handling, machine learning, libraries, near-line, at-line, online strategies, targeted vs non-targeted analysis—supporting the "omics" revolution—and everything that makes spectroscopy one of the most widely relevant and exciting fields in analytical science. However, are we paying enough attention to one component whose interaction in the dynamic environment is often taken for granted: are we including the human factor?

Human capital and state-of-the-art

Many articles published here over the years have focused on wonderful new discoveries. These have ranged from new hardware inventions, ways to obtain concrete, robust, validatable results where, at first glance, the data shows no initial promise, all the way to the training levels we would like to see in our future spectroscopists. But, looking at the overall picture, I am beginning to feel the glue which binds all these topics together has been rather overlooked.

We are blessed with a strong community of experts who are capable of delivering a pipeline of good ideas which result in innovation. We would clearly like to have more. Some areas of scientific endeavour bloom spectacularly, grab all the headlines only to vanish after a relatively short period in the spotlight. The field of analytical spectroscopy, however, has the very major benefit of being a vital enabler delivering long-term solutions to much of societal and industrial areas of concern. These can be as diverse as global warming, building a sustainable planet through increased use of renewables or our own biosecurity.

For the benefits of these innovations to be fully realised, I think we need to be far more aware of the environments into which they are being deployed. In the medical field, many promising developments never make it as far as the patient. This is not just due to cost, but often due to a failure, at an early stage in the development, to assess the skill sets, pressures and globally accepted working practises of the people who will need to be responsible for the deployment. Quite often you hear complaints and frustrations when an innovator's big idea does not meet with the expected acceptance and praise from those required to implement it. Terms like "they just don't get it" or "are they too stupid to see….?" bounce around meeting rooms.

When the "Broader Picture" phrase used to be used in meetings I was attending, I always knew immediately someone had run out arguments explaining why they were going to block a course of action I was trying to propose. I must admit that more recently I have developed greater sympathy for that annoyingly over-used phase and tend, if the situation demands it, to interpret it slightly differently. The older me now looks at the person bringing that argument and I ask myself—what did we miss when assessing the benefits case? Quite often we have been focussing far too much on the technical aspects of the innovation and leaving out of our models the existing status quo. All organisations, whether governmental, medical, chemical industry or academic have substantial investments in acquiring, developing and maintaining their human capital. Efficiency gains are far too often expressed in terms of reduced headcount to deliver the same output rather than better or more output with the same resources.

If you take a step back, it is often a very useful exercise to decide whether the organisation you are presenting your

ideas to requires, by its very nature, incremental improvements through sustainable technology deployments. Hopefully they are flexible enough to embrace the acquisition of more challenging disruptive technologies without risking the fundamentals of the business.

One area where this can be seen in many research papers is the descriptions of the State-of-the-Art. Almost always, these sections deal purely with the existing technical position couched in terms which shows it to be out-of-date and ripe for replacement. When have you ever seen an author use phrases like "the state-of-the-art technology benefits from years of undisturbed success across many application fields, has proven itself to be robust and is much loved by its operators as it can unreservedly be relied upon to give the correct answer on even difficult samples". Well I have never seen an example but if you have, please send them to me. If an author would think about the "bigger picture", then these issues may be addressed better in the following research and the inevitable publications promoting the results of this research would have provide some thought around its future deployment challenges and what strategies the authors propose to overcome strongly experience-based acceptance hurdles. The Humans would have entered the Model!

Emotional intelligence and change management

Right at the beginning of the process of innovation somebody has convinced someone that the work needs to be carried out. This may be through discussions with your line manager or academic superior or even an international panel of experts—but there will have been some human interaction where you are required to present arguments, written or verbally that a course of action is worth supporting.

There are two areas of Emotional Intelligence in action here:

- Empathy: the ability to understand the wants and needs of those around you… if you do not understand what the people on a funding body or simply your line manager wants, you will never be granted the funds which they control to do your work…
- Social skills: typically team players who do not need to focus exclusively on their own success, they have a reputation of helping others to develop and achieve their own advancements.

So, you have displayed that you have these skills in getting the funding for your work—so why lock them away when it comes to being able to assess and mitigate the impact your innovation will cause in the environment you are targeting for its deployment?

In an industrial setting we can often find fully mature and effective Change Management systems in place which take into consideration not only how a technological deployment will impact processes, and systems but also very strongly focus on the employees within the organisation. Good change management always includes processes for planning, testing and communicating change.

A classic example is in the area of deploying process analytical spectroscopy. As spectroscopists we have a superb array of sensor technologies covering many wavelengths and capable of being deployed in the harshest of environments. We have computers now capable of processing the most complex hyperspectral data sets with advanced algorithms. We teach this at universities and have research teams driving forward innovation. We enjoy the support of multidisciplinary teams consisting of chemists, mechanical, electrical and chemical engineers, and not forgetting the financial gurus who work out our Return of Investment calculations. Altogether we are quite capable of deploying process analytics across numerous chemical and pharmaceutical processes.

The financial benefits case of deploying process analysers is inescapable, yet to fully realise these benefits we must take into account and exploit the years of experience and investment in the human capital of our "conventional" quality control (QC) organisations. We almost always need top-quality calibrations for our analysers and these calibrations are delivered by our more conventional laboratories. The people in the QC environment have also to be won over to the new approaches. It is natural that they may be sceptical and worried that the impending changes, brought on by what is a truly disruptive technological advance, potentially could leave them out of work. It is clear that any successful deployment has to be built on their active involvement and embracing of change. Their roles may move forward, as one colleague put it, to working more to deliver product quality in the plant control room or monitor the outputs of complex sensors than living with their hands in a fume cupboard in a laboratory on the edge of the site – but their contribution will continue to be critical to the deployment of the advanced spectroscopic tools and their long-term success.

Summary

So, what do I mean to achieve with the title "Fitting people into your model", apart from the rather unsubtle chemometrics pun? Total Cost of Ownership is used frequently, for example in purchasing new pieces of hardware or changing a process. The Total Cost of Ownership calculations are commonplace and often cover not only the initial capital expenditure and deployment figures, but also long-term consumables requirements and end-life considerations. If you look for example at the Wikipedia page for Total Cost of Ownership there are some very long lists of things which need to be considered, but you will be hard pressed to find any human costs listed except for Corporate Management Time. I think we should add a few more! If properly handled, with the right amount of emotional intelligence, I strongly believe experience will show that the Total Cost of Ownership figures will probably fall! So, by adding people into your model, you will not only be increasing your chances of achieving your goals by delivering a successful project, but there is also a greater chance of delivering the project at a reduced overall long-term cost as well as retaining a happy workforce!