Implementing new technology: leveraging success

'The line between failure and success is so fine that we scarcely know when we pass it.'

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The recent editorial by Nick Hird on combinatorial chemistry[1] has highlighted, once again, the difficulties of separating hype from reality where new technology is concerned. It reinforces the statement made by Eric Drexler in his book *Engines of Creation*[2]:

'The promise of technology lures us onward, and the pressure of competition makes stopping virtually impossible. As the technology race quickens, new developments sweep towards us faster...we need to strike a better balance between our foresight and our rate of advance...and with better foresight we will have a better chance to steer the technology race.'

Understanding benefits

I have made my career by researching and applying new technologies to the formulation and manufacture of pharmaceuticals. I have always assumed, like most researchers, that if a technology had certain advantageous features, benefits would flow automatically on implementation; this, of course, being the driving force behind the urge for continuous technological improvement. However, I now know that this is a naive assumption and that the link between the provision of advantageous technological features and successful implementation is, at best, a gross simplification. It is not completely incorrect because there are many examples where the provision of advantageous features have led to real benefits downstream. However, it cannot be taken for granted because, in many cases, no benefits ensue. There is a real need for a model that will enable researchers to understand not only the usage and benefits of a new technology, and hence predict its success or failure on implementation, but also to leverage its successful implementation by fostering those desirable benefits through design at the outset, that is, using foresight.

So if that is the problem, what is the solution? It appears that at least one researcher has been addressing this problem. Andrew Blasden, formerly of ICI and now at the Information Technology Institute (University of Salford, Manchester, UK) has attempted to rationalize and model the link between technological features and benefits, not only to provide an understanding, but also to suggest strategies of predicting and evaluating benefits to ensure successful implementation[3,4]. Although originally proposed for evaluating new technology in the IT area, where it is well known that nearly half of new projects end in failure, the approach should be able to be applied universally.

A model approach

An interesting aspect of this approach is that it is not exclusively based on scientific concepts, but is founded on a philosophical stance provided by the integration of the philosophies of Dooyeweerd[5] and Hart[6]. This is necessary because to understand the link between inserting a new technological artefact into a situation and its successful use, it is necessary not only to have a sound ontological foundation of usage and benefits (Hart's philosophy), but also to recognize the human dimension in its usage (Dooyeweerd's philosophy).

Blasden first applies Hart's philosophy of discerning three levels at which a new technological artefact can be discussed: level one being the features themselves, level two being the tasks carried out using the artefact, either supported or hindered by it, and level three being the roles that the artefact fulfils. Associated with these three levels are the three levels of benefits:

(1) feature benefits that arise from the technological features;
(2) task benefits that arise from using the technology to support a task; and
(3) role benefits that arise from the effect the technology has on the role the user fulfils by carrying out the supported tasks.

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Recognizing these, Blasden then proposes that the link between features and benefits comprises four steps:

(1) provision of technological features enables their use;
(2) use of features supports, hinders or changes tasks;
(3) carrying out tasks helps fulfil or hinder certain roles; and
(4) fulfilling useful roles brings success.

Each step is then augmented by reference to the aspectual ontology of Dooyeweerd[5]. This is based on the proposal that reality, as we experience it, has a number of aspects or dimensions (e.g. physical, analytical, social and economic) that are irreducible to each other, and that each aspect has laws that pertain when an entity functions in that aspect. Each aspect defines a proper science, by which the laws of the aspect can be studied with a degree of precision, thus enabling differentiation to be made between success and failure, desirable change and undesirable change.

Implementation

Blasden's model is exciting in that it provides useful guidance at both the design and development phase of a new technology. The design phase can be focused by first analysing the tasks and roles of the existing situation and suggesting changes that would be beneficial. The development phase can be focused towards those tasks and roles that are a determinant of the success of the technology.

Elbert Hubbard, an American journalist once wrote[7]:

'The line between failure and success is so fine that we scarcely know when we pass it.'

The judicial application of Blasden's approach could decide between the successful implementation of a new technology and its failure. In the current culture of low tolerance of failure, this could also affect the career progression of the scientist involved.

References

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These are the personal views of the author and do not necessarily reflect those of AstraZeneca.

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Nervous system: the next generation

'Recent developments in our understanding of structure and function in the nervous system will open new vistas in drug discovery.'

Terry Hart, The Novartis Institute for Medical Sciences

Science fiction aficionados will, no doubt, be familiar with the three laws of Arthur C. Clarke. The third law, which states that 'Any significantly advanced technology is indistinguishable from magic', is particularly relevant to the current dynamic relationship between new technology and traditional drug discovery. The recent advances that have been made in relating specific genes and protein function to disease risk factors and pathogenic processes, would have been dismissed as pipe dreams by most people 10 years ago, with the exception, perhaps, of a few visionaries. The task now is to devise ways to unravel the interwoven strands of functional genomic and proteomic information. This must happen before we can develop effective strategies to modulate the complicated network of finely tuned operator and feedback mechanisms that control homeostasis, and whose slight malfunctioning can easily result in serious, chronic disease.

These recent technological advances have already made a significant impact on the processes and organization of multidisciplinary research departments in all therapeutic areas. However, it is clear that, in the near future, many

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