Creating a productive R&D culture

Increasing R&D productivity is the current mantra of pharmaceutical industry executives. The promise of new technologies and process improvements has been extensively discussed. However, fundamental culture change within research organisations remains the final unexplored frontier to increased productivity. This article introduces the concepts of organisational culture and describes some of the unique attributes of the culture within pharmaceutical research and development. Environmental and organisational levers that can be used to change culture and increase R&D productivity are also presented.

By Janet White

Why is culture important? The fit between an organisation's culture and the values of the individuals that work there is a key factor in determining whether employees feel that they 'belong'. *The Gallup Management Journal*'s semi-annual Employee Engagement Index showed that in a typical employee population, 29% are engaged (loyal and productive), 54% are not engaged (productive but not always committed to the company) and 17% are actively disengaged (unhappy with their work situation and psychologically checked out). The annual US cost of lost productivity from disengaged employees is estimated by Gallup researchers at between $254 and $363 billion per year.

Culture is key in sustaining delivery of business objectives. The culture of an organisation determines both how decisions are made and also drives the way that people behave in implementing decisions. New technologies hold the promise of increasing R&D productivity, but often require an organisation to adapt its culture before the full benefits of the technology can be realised. Similarly, process improvements may offer the prospect of enhanced efficiency, but if they don't fit with corporate culture then informal processes may continue to dominate. The presence of subcultures within corporations, functions and scientific disciplines can lead to communication breakdown, infighting and delays. Culture eats strategy every day for breakfast!

Organisational culture is the set of shared beliefs and assumptions among those within the organisation about its fundamental purpose and workings[1]. Culture is insidious as these beliefs are not usually written down or explicitly discussed, and managers and scientists are often not even consciously aware that they are operating on these assumptions and beliefs. Only newcomers to an organisation notice the 'different' culture, and are quickly assimilated into the unwritten rules of 'how things work around here'. Culture is what a new employee needs to learn to be accepted. The formal aspects

Figure 1
What constitutes culture?

of new hire orientation are merely the tip of the iceberg – what really drives the company is the unwritten rulebook that lies beneath the surface[2]. Woe betide any research leader who tries to change the direction and increase productivity without being aware of the massive inertia of the cultural iceberg!

Elements of R&D culture

Shared beliefs

Though scientists are trained to be rational, we still cling to certain beliefs about our work, although we may not have the data to prove them. For example, in drug discovery, individuals have different beliefs around attrition. Some scientists believe that attrition is 'baked in' to a drug candidate molecule, in other words that the intrinsic properties of the molecule render it unsuitable as a drug and it is only a matter of time before research comes up with evidence that bears it out. Other scientists will argue that creative approaches and fixes can be used to enhance the characteristics of a molecule so that it can be developed into a successful drug product. These fundamental beliefs drive the way that different organisations conduct drug discovery – the first group argue that if attrition is baked in, their purpose is to find it as fast as possible. The second group focuses instead on avoiding attrition at all costs. Neither approach is right nor wrong but culture is clearly determining R&D productivity.

Scientific sub-cultures

Different scientific disciplines are almost like different tribes, each with their own common language, customs and taboos. *Life Amongst the Scientists*[3] describes an anthropological and sociological study of the immunology department at the Hall Institute of Medical Research in Melbourne, Australia, in the 1980s. Ironically this study concluded that it is very difficult for an outsider to penetrate the culture of a scientific tribe without also going through the same, lengthy rituals of indoctrination. Is it any surprise that chemists and biologists don't always see eye to eye?

One of the most visible sub-cultural differences first appears when academic scientists are recruited to work in pharmaceutical research and development. The academic virtues of publication of results and competition with co-workers for resource and recognition conflict with industrial values of safeguarding intellectual property and competitive advantage, and of teamwork and collaboration between scientists.

Most scientists can identify with the culture clash between disciplines. The differences begin with higher education and are reinforced by very different working practices. While chemists focus at the molecular level, biologists deal with systems, cells and organisms. A chemist can carry out a synthetic step in a few hours, while biological experiments tend to require much longer incubation. This in turn leads to very different working hours

– biologists arrive early and take long lunch breaks while chemists wonder at their 'inefficient time management'. Different disciplines require different kinds of laboratories and consequently end up working in different buildings. All these factors contribute to rising barriers and lack of understanding between scientific disciplines, and us-and-them attitudes.

Research and Development too have clashing cultures. How many times have you heard each group complain bitterly about the other 'tossing' a drug candidate over the wall that divides the silos each occupies? Research drives for elegant science while Development has a more pragmatic approach, seeking medicines that patients can use and payers will purchase.

Ultimately, cultural dysfunction leads to unproductive R&D organisations. Infighting and conflicting priorities between lines and teams drive projects forward in fits and starts. Decision making becomes slow, irrational and defective – unfruitful projects never die, decisions don't get made, or decisions, once made, don't stick. Suspicion of other tribes makes researchers resistant to change and protective of their own projects – not-invented-here syndrome becomes rife.

Driving cultural change

Fortunately no R&D organisation need be held hostage by its own culture. A number of levers can be pulled to create R&D cultures that are innovative and productive.

Organisational structure

Biotech has not suffered the same productivity crisis in recent years as Big Pharma. Certainly the entrepreneurial, biotech-like culture seems to encourage innovation and risk taking. Size also matters – the optimal size of an R&D facility seems to be around 400 scientists, balancing the need for scale and multidisciplinarity with less bureaucracy and better information flow.

GlaxoSmithKline (GSK) restructured its research organisation into six therapeutically focused Centers of Excellence in Drug Discovery (CEDDs). Each CEDD is an autonomous, accountable and entrepreneurial unit of about 250-400 scientists (biologists, chemists, pharmacologists, toxicologists and clinicians) that competes with the other CEDDs for resources. The CEDD is responsible for its own portfolio and budget for all studies up to and including clinical proof of concept (POC). Decision-making is devolved with each CEDD having complete accountability for taking drug candidates from lead optimisation through to POC. In just a few years, the new organisation has already increased productivity – GSK's Phase 1 starts doubled from 10 in 1999 to 20 in 2003, and Phase 2 starts trebled from five in 1999 to 15 in 2003[4,5].

Novartis has created a biotech-like Institute for Biomedical Research focused on drug discovery for diabetes, cardiovascular and infectious diseases in the biotech heartland of Cambridge, MA, recruiting Mark Fishman, professor at Harvard Medical School and chief of cardiology at Massachusetts General Hospital as Head of Research, and hiring an initial 400 scientists. It is too early to tell whether this new Research group will outstrip more traditional pharmaceutical R&D groups in productivity[5].

Beyond organisation structure, a number of other factors have been shown to correlate with a high performance culture in biomedical research organisations[6]:

- Effective human resource policies
- Speedy implementation of reorganisations
- Extensive co-operation with external collaborators
- Intensive cross-functional communication within discovery research and drug development

Effective policies

Leaders in pharmaceutical R&D organisations both establish and embody, through their own actions, policies that support innovation and productivity. Policies should empower teams, push decision-making down to the appropriate level in the organisation and encourage calculated risk taking. Leaders must ensure that these policies are effectively communicated and understood up and down the organisation, must illustrate them by personal example and must enforce them with appropriate rewards and recognition.

SOPs and processes need to have enough flexibility to provide guidance on general strategy and direction while allowing scientists to use common sense thinking and multiple approaches to problem solving. A one-size-fits all approach is likely to stifle innovation and engender risk aversion.

Some pharmaceutical companies have introduced innovation programmes that offer cash for ideas. Lilly's InnoCentive[7] website poses real life chemical and biological problems and offers monetary rewards to freelance researchers who submit solutions. Pfizer has an employee suggestion scheme that rewards the originators of successfully implemented ideas that address targeted aspects of the R&D enterprise.

Career development

Effective career development structures and processes play a vital role in enabling productive R&D culture. Most pharmaceutical and biotech companies have well-defined dual career ladders, where scientists can choose to climb through the organisation on either a Technical/Professional track if they wish to remain active in the lab as a Research Fellow, or on a Managerial track if they are happy to advance into a more administrative/supervisory role as a Director.

Each rung of the ladder is described in terms of the level of functional expertise, extent of decision-making, degree of innovation and creativity expected, scope of team influence, and the autonomy and leadership required. Career ladders have several benefits including role clarity, clear expectations on what is required for promotion to next level, and consistent criteria to compare and identify career and development opportunities.

Formal and informal reward systems

What management pays attention to and rewards is what gets done, in any organisation. Most pharmaceutical companies use similar macro-measures to track overall organisational R&D productivity:

- R&D spend
- Project risk and return
- Pipeline volume (numbers of projects at every stage)
- Project survival rates
- Project milestones and cycle times

However these well-intended metrics can motivate dysfunctional and unproductive behaviour. Measuring absolute R&D spend can lead to spending sprees at the end of the year, driven by fear of having unspent monies taken away. Revenue forecasts for early stage drug candidates are notoriously inaccurate, but are still used in decision making and portfolio prioritisation. Undue emphasis on the quantity not quality of NCEs in the pipeline, and measurement of survival rates drives a reluctance to kill projects. Focus on reducing cycle times between two particular milestones can lead to increases in cycle time either earlier or later in the drug development process. The end result can be an overall lengthening of the drug development process or late and expensive project attrition.

Teamwork and collaboration

Strong teams are an essential component of a productive R&D culture. Effective teams need[8]:

- Adequate support and resources from the organisation
- Agreed goals
- Clear roles and responsibilities
- Effective processes for meeting, decision making, communication and problem solving
- Good interpersonal relationships

Physical environment

Physical design of laboratory space is a tool that can enable collaborative research. In Pfizer, laboratory lay-outs are designed with an emphasis on key adjacencies between groups, so that different functions that need to interact are located close to one another, in the same building if possible. Providing common 'touch down' areas where different disciplines can interact also supports cross-functional working, for example shared break rooms, cafeterias or library areas where talking is encouraged. Some R&D organisations have designed rooms to stimulate creative thinking, incorporating bright colours, tactile objects and plenty of whiteboards and flip chart paper to capture brainstorming ideas.

Knowledge management

Drug discovery involves large, multidisciplinary teams, many of them with members located in different countries, on different time zones. Knowledge management processes and tools play a vital role in helping the teams capture, organise and disseminate information and make effective decisions that move their projects forward. Each team member needs to understand how his or her work contributes to the overall drug discovery process.

To overcome the tendency towards reluctance of scientific disciplines to work across boundaries, team leaders must actively champion knowledge building and sharing and encourage the formation of knowledge communities, virtual teams that cut across traditional business and geographic boundaries. Informal networks are increasingly important in finding information and getting work done, as much as, or more than formal hierarchies and processes. Recognition by R&D project team leaders of individuals who contribute knowledge to others in the team, can reinforce a change in culture from knowledge-hoarding or 'information-is-power' to knowledge-sharing. Team leaders should also acknowledge and reward the central connectors who spend time helping team members navigate through the informal networks in organisation to find the expertise they need.

Technology is a big enabler of knowledge-sharing culture. Web-based applications and portals allow geographically dispersed drug discovery teams to share documents and data in a single

repository – for example physicochemical, toxicological and pharmacological data on a chemical series can be stored in a common database and interrogated by any member of the team to narrow down the lead compound. Internet publishing of scientific papers is allowing all drug discovery companies, regardless of size, better and faster access to new scientific developments in the external environment. Videoconferencing and audioconferencing together with Internet meeting software enable virtual meetings and decision making, as teams can view and discuss data in real time, reducing the need for expensive and time-consuming travel for face-to-face meetings.

New technology implementation

Knowledge management aside, new technologies that industrialise laboratory techniques, such as high throughput screening, molecular modelling and combinatorial chemistry libraries are revolutionising the R&D process. These technologies offer the promise of enhanced R&D productivity through automation and reducing labour, and through miniaturisation, which saves reagents, space and analysis time. However, successful technological change depends on simultaneous culture change for successful implementation and integration of the new tools into research.

Implementation of new technologies is rarely smooth. Users may feel threatened by the introduction of new technologies, for fear their skills will be downgraded or their jobs eliminated. If users are motivated or trained adequately to use the new technologies, new systems may go underutilised and the old manual systems are retained rather than retired. This can lead at worst to duplication of work if both old and new systems are used in parallel. New technologies may not be compatible with existing operating procedures and this can create bottlenecks elsewhere in the research process.

Managing lasting change

I have described how the levers of organisational structure, policies, career development, rewards, teamwork, environment, knowledge management and new technologies can be pulled to chart a course for culture change. However an overall change management programme is needed to successfully integrate these factors, to produce lasting change that results in increased productivity.

John Kotter[9] outlines an eight-stage process for successful change. Step one is to establish a sense of urgency – most organisations need a jolt to move them out of inertia or complacency and motivate them to change. The next step is to create a guiding coalition of 20-50 people, primarily line heads rather than staff groups, who can co-create and lead change efforts. Third, the leader must develop a compelling vision of what the culture is to become and a strategy for achieving the desired culture. Step four involves communicating the change vision – communicate, communicate, communicate. Organisational structures, policies and rewards must then change to empower broad-based action by many in the organisation to drive the new culture. Creating and recognising short term wins in the first 12-24 months starts to reinforce the new culture. However leaders need to keep up momentum by consolidating gains and producing more change. Culture change does not happen overnight, so leaders must be patient, keep driving and not claim victory too early. Finally, new approaches are anchored in the culture through new processes, metrics and technologies, for lasting culture change. DDW

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