

Mining for value, but where?

An argument for aggressive application
of Lean and Six Sigma techniques within
Life Sciences R&D

Mining for value, but where?

After a dramatic increase in the use of Lean, Six Sigma, basic planning and control, and other improvement techniques in manufacturing operations, life sciences companies could reap far greater gains by focusing these capabilities on Research and Development. Some may argue that traditional research does not lend itself to planning and control tools at all, but is rather a mix of creative and academic pursuits. However, a significant dimension of all research and development is project management and activities that lend themselves directly to many of the tools and methodologies currently used for operational improvement.

In addition, the current regulatory environment in which life sciences companies operate compounds the need for this type of intervention. The scrutiny of drugs and devices, both for those already approved and for those still in the pipeline, is increasing due to a number of high profile post approval failures and an increasing focus on enforcement by regulators. This has led to an increase in the need for organizations to execute with certainty. As a result, companies may find that it is necessary to demonstrably improve R&D performance in order to stave off unfavorable valuations based on a perception of increased regulatory risk. There are a number of operational improvement steps that life sciences companies can take to reduce this regulatory risk, improve the number of quality candidates in their R&D pipelines and speed time to market.

Companies have been investing Lean Six Sigma in the wrong places

Since the turn of the Century, Life Science companies have focused their investments to pursue a broad range of improvements across their manufacturing operations and supply chains (sometimes termed “Operational Excellence”). As part of these programs they have been employing a number of methodologies including Lean, Six Sigma, and basic planning and control.

While companies have achieved gains from these improvements, their share prices could be influenced to a significantly greater extent if they applied some of the same tools, capabilities and energy to their R&D activities, starting with Development Operations, which are clearly well suited to the use of such methodologies.

Furthermore, as companies turn their focus to the efficiency of their internal R&D efforts, the gap between the best use of appropriate tools and how they are actually put into practice is widening. Company leaders are committed in every sense to stoking the commercial success, but efforts are often fragmented between the distinct arms of basic research, development operations, manufacturing, and sales and marketing. Information is lost from stage to stage, activity is often poorly coordinated and controlled, roles and responsibilities among the workforce are unclear, collaboration and effective decision making are also weak, and the full potential of innovation is struggling to reach the pipeline. Even in the best of worlds, this ineffective communication between departments delays the release of therapies meant to treat, cure, or prevent disease, and improve patients’ quality of life.

The benefits and pay-off of such a change in investment focus is clear and will have an obvious and probably greater impact on the bottom line. Anticipated revenues from successful products can launch a company to new heights on Wall Street and in the public eye. Indeed, BusinessWeek predicted potential for contending products to generate upwards of \$5 billion in sales revenues in 2006.¹ On the other side of the coin, the gap between theory and practice looms as mammoth sales are necessary to compensate for the vast expenditures in R&D.

The Rise of Lean and Six Sigma in Pharma and Med Device Operations

For many years there was insufficient focus on operations within life sciences companies, due to comfortably high operating margins and burdensome regulatory demands. However, in 2004 a study developed by Celerant and the Economist Intelligence Unit, concluded that 24% of life sciences executives surveyed planned to pursue “Lean” or “Six Sigma” as a top priority in the following year. This focus has continued to increase, even today. In fact, a broad majority of the life sciences companies that Celerant has worked with since this time have employed Lean and/or Six Sigma, sometimes along with basic planning and control in pursuit of increased operational performance improvement.

R&D efficiency in decline

R&D Efficiency has been in decline for some time. From 2001, the pharmaceutical sector lost ground to the S&P largely due to declining R&D efficiency. This trend has been driven by increasing regulatory requirements to ensure drug safety which have increased the burden of the approval process and driven up capital expenditure and R&D costs. US R&D costs rose from 11.7% in 1980 to 18.5% in 2002. Drug Development time has increased from 8.1 years on average in the 1960s to 14.2 years in the 1990s. Development costs have risen from \$54 million in 1976 to \$802 million in 2000. In addition, the introduction of new technologies such as genomics is changing the way drugs are discovered, developed, tested and used, and increasing reliance on alliances will continue to drive up the complexity of bringing new products to market.

Valuations based on future value of Intellectual Capital – quantity vs. quality

One of the most significant components of the valuation of Pharmaceutical and Medical Device Companies is their potential to create future value. Of course this is true for any company. However, many early stage life sciences companies have no commercial products. They are therefore in the position of having to derive almost all of their value from intellectual property and drug candidates in their research and development portfolio, the value of which is further refined based on the probability of each delivering future revenue to the firm.

Example of value impact

Consider two fictional companies, LifeCo and SciCo, each with \$1 Billion in current sales and a number of candidates at different stages in the pipeline.

For each company Cost of Goods Sold (COGS) = \$200 million

LifeCo elects to pursue an Operational Excellence program aimed at its Manufacturing, Maintenance and Engineering, Quality, and Supply Chain organizations. Through these efforts LifeCo achieves a 10% net reduction in COGS = \$20 million annually.

Using a weighted average cost of capital of 12% and assuming that LifeCo will sustain these reductions the valuation should increase by roughly \$167 million.

SciCo elects to pursue improvements in execution of it's R&D activities.

In this second scenario, we'll assume a 10% increase in R&D efficiency translates into an additional \$100 million in revenue going forward. Assuming the same 20% COGS and 35% on Sales and Marketing cost and the net impact of the marginal product is roughly \$45 million in additional income

Using a weighted average cost of capital of 12% and assuming that SciCo will sustain these gains the valuation should increase by roughly \$375 million.

This simple example makes broad assumptions, however, it illustrates that improved performance within R&D can generate significantly greater value than focusing solely on operational excellence. Furthermore, the impact of 10% higher probability of success at each stage can have a staggering impact on potential future value that these figures do not begin to capture.

Valuations

To understand why energy would be better spent applying structured improvement methodologies to R&D versus Operations or other functional areas, it is first necessary to understand the factors that drive valuations for Life Sciences businesses. As a result, to date Life Science companies and the research around them has often focused on the quantity of output from their R&D. In a broad study of the Pharmaceutical sector, the most cited measure of company value was the number of patents secured to protect intellectual property, a crude measure at best, because simply counting the number of patents owned by a company may give an inaccurate impression of the value of its technology. In many cases, the value of patents is skewed, with a great deal of value residing in a small number of breakthrough inventions.

However it is quality that really counts. In their paper titled "Using patent citation analysis to target/value M&A candidates", Breitzman and Thomas argue that "...it is necessary to examine not only the quantity of a company's patents, but also their quality."¹

The state of the art in valuing NDAs (New Drug Applications) is using real options which attempt not only to assess the expected value of cash flows from sales of a new drug but also the option value associated with having the choice of future investment in second generation drugs or additional indications. In their paper on Valuation of NDAs, Cassimon, Engelen, Thomassen, and Van Wouwe advocate the use of 6-fold compound option methodology² for valuing new drug applications, arguing that options based valuation methods do a better job of assessing the value of R&D.

A Company's ability to effectively manage each step of the R&D process, coordinate activity across functional groups and execute with certainty is essential to the creation of this value and Lean and Six Sigma provide a great set of tools driving these quality improvements.

Are the tools applicable?

There is definitely something to the fact that the less routine, repetitive and predictable an activity is, the more challenging it is to apply these types of tools. However it is also true that at its heart, a significant dimension of all research and development is project management and activity which is in the crosshairs of many of the tools and methodologies currently used for operational improvement. The further candidates progress from basic research into the development process, the more routine, repetitive, and predictable the measurement of progress can become.

1 Using patent citation analysis to target/value M&A candidates
Anthony Breitzman, Patrick Thomas. Research Technology Management Washington:Sep/Oct 2002. Vol. 45, Iss. 5, p. 28-36 (9 pp.)

2 The valuation of a NDA using a 6-fold compound option
D Cassimon, P J Engelen, L Thomassen, M Van Wouwe. Research Policy Amsterdam:Jan 2004. Vol. 33, Iss. 1, p. 41-51

The art of capturing potential

There are hordes of tools heralded as the keys to a streamlined organization, which have historically focused on the manufacturing process. But the true value comes from the way in which firms' biggest assets – its people – are enabled, i.e. how they behave. Staff capabilities need to be aligned with corporate goals throughout the development process to ensure that every activity is unique and helps to move the business forward. This seems intuitive, yet a quick study of the facts usually brings to light a lack of congruency between a company's strategic imperatives and day-to-day execution.

The first step to rectifying this situation is to assess the talent within the company and to direct it appropriately. Today the people with the knowledge to drive improvement with such tools as Lean, Six Sigma, and Integrated Planning often reside within manufacturing or supply chain organizations. Companies need to tap into these resident capabilities and bring them upstream into development operations.

Using this existing expertise will allow rapid dissemination of these skill sets. The different layers of development must then be coordinated to eliminate miscommunications and routinely duplicated tasks. One important tool focused on getting people and process on the same page is the "Stage-Gate" or pipeline management process which includes clear decision points at which companies determine if a product is viable to advance to the next development level. Well-executed Stage-Gate can make a profound difference in pipeline effectiveness, and serve as the focal point around which processes are organized.

A reliable Stage-Gate process incorporates clear advancement constraints and criteria. It uses strategic objectives or business imperatives together with accurate measurement and tracking tools. This provides visibility and effective decision making forums involves the right people in the decision making process, and provides designated accountability and responsibilities for each stage in the process. Getting this right means:

- fostering innovation rather than stifling it
- making better decisions about what research to commercialize
- making better decisions about how to commercialize it
- more effective collaboration across the value chain
- greater ownership of clinical, commercial and operational success of new projects
- more timely decisions on when to kill a project that is not viable
- shorter overall development cycle-times
- more effective resource allocation
- lower spending on Development operations for any given project allowing reinvestment into additional projects

Many tools and techniques used in manufacturing are also applicable in development operations:

- Development of streamlined processes
 - Value Stream Mapping
 - Value Add vs. Non-Value Add
 - SIPOC¹
 - OFD (Opportunities for Defect) Analysis
- MCRS[®] (Management Control and Reporting System[®])
- Quality Function Deployment (The House of Quality)
- Benchmarking
- Measures such as: Milestone Attainment, Right First Time %, Plan Attainment, Resource Utilization Productivity, Cycle time
- Basic Problem Solving Tools
- Short Interval Control
- Loss/Delay Accounting Systems
- Detailed planning tools
- Level Loading
- Hoshin Planning²

1 SIPOC is a high-level picture of the process that depicts how the given process is servicing the customer. It is an acronym for Suppliers, Inputs, Process, Outputs, and Customers.

2 Hoshin Planning is a two-prong planning approach that covers the organization's strategy to achieve breakthrough results through its long-term objectives and ensure continual improvement through its short-term business fundamentals.

Any organization worth their salt will tell you that they have already established this type of process, however for Stage-Gates to have the desired effect, the right people must be in the right roles with the right information to make the best decisions. This is not always the case; leaders often face organizational divides that stand in the way of information sharing. Research is conducted, breakthroughs are made, and as projects move to the next stage or are delivered to a new department, information is lost in the transition.

The industry is aware of the issue and is taking steps to correct it through reorganization, as documented in a recent report by Cutting Edge Information. The report centers on how the interface between development and marketing is complicated by a degree of misinformation. The article goes on to iterate the steps necessary to improve communication. Some companies have gained momentum by combining aspects of research and development operations with marketing, encouraging widespread participation in critical information sharing meetings.¹

When these companies take steps to improve the communication between departments (such as introducing the concept of product ownership to research staff), they can achieve benefits by linking accountability with the commercial success of products. Whereas the current environment often encourages pre-clinical staff to wash their hands of projects once they move on to development, by linking incentives to the outcome of these projects in the market, leaders can elicit more results-oriented interest from their upstream staff.

In addition to organizational structure, management tools need to be extended and formalized with universal understanding of cause-and-effect from top down and bottom up: a well-defined management approach can ensure targeted measures are achieved. Specifically, Management Control and Reporting Systems (MCRS®) can set the standard by putting in place structure, information, and decision making tools that clearly delineate how the pipeline should be managed.

1 Pharma Business Week, The pharma industry's R&D and marketing gap is a big obstacle, October 10, 2005

Results: bolstering the pipeline

Implementing MCRS® as a way of corporate life takes an increased level of commitment – especially in life sciences companies – but typically delivers measurable financial benefits in two to three months and operational benefits sooner still. The benefits go beyond simply straightening out an organization and breaking down silos; they directly impact critical areas of operation.

First and foremost, aligning staff roles and responsibilities will lead to reduced cycle times and more effective collaboration across initial process development stages and into manufacturing scale-up and marketing. With the right information to support decisions, qualifying viable projects becomes a matter of logic over emotion; even the most devoted of researchers cannot argue with data that demonstrates a candidate is floundering through the pipeline.

These coordinated efforts add up to increased productivity across the board, more repeatable processes, and shorter development cycle times -- which in turn lowers costs for labor, materials, service providers and researchers on any one project. Companies experience fewer delays and their executives can make better, more well-informed decisions about which projects to pursue and which to terminate. Saved resources can then be re-invested in additional projects, indications, intellectual property or in other areas as necessary.

It sounds simple enough: align the processes and behavior of the workforce with corporate strategy, and the business prospers. However, the most daunting challenge is the corporate culture itself. Behavioral change is never an easily attained goal, and the effort must begin with leadership that acknowledges that organizational adjustments are not always associated with bad news. On the contrary, such activity is an opportunity to support faith in innovation with the best practice necessary to produce more viable projects and increase their speed-to-market.

In the end, companies can quite simply do more with less when they put their resources to work in the right place. Medical Device, Pharmaceutical, and Biotech companies can change, they can evolve, and their leaders can ensure they are equipped to achieve improvements as market conditions and global demands evolve around them.

What is MCRS®?

MCRS® encompasses the totality of all of the measures, meetings, forecasting and planning tools, reports, execution control tools, and other decision-making tools that exist within an area of a business from the front line up to senior management. Having the right information within the management ecosystem supported by effective forums for coordination, performance review and decision making focused on driving action can have an enormous effect on the behaviors within an organization; this is strikingly clear in the realm of Development Operations.

When driving improvement, organizations tend to focus on only a few system elements or on performance measures in isolation without considering the totality of information flowing through an area of the business. MCRS® is built on the knowledge that good information drives the best decisions, and will enable sustained behavioral change and substantial performance gains. The strategy combines measurement of progress, cross-departmental communication, and consistent reinforcement of both day-to-day and overall goals to deliver an organization unified in its thinking and processes.

An effective management system involves a number of essential elements that align and focus the workforce:

- Key Performance Indicator (KPI) Trees

Organizing KPIs into “KPI Trees” has a profound effect on the everyday attitudes and actions of the workforce. The highest level in the tree would typically link with the organization’s business plan, strategic objectives or business imperatives. The lowest level in the tree would measure activity and outcomes at the front line day to day. By linking these activities, KPI trees demonstrate how each result impacts other operations and the performance of the entire business. Firms who attempt a flat set of measures for the business end up with such a large number of measures that it is sure to overwhelm them. Alternatively, in an attempt to counter this proliferation of measures, management cuts back on data that is critical at some level within the organization.

- Decision Making Tools

Using tools such as delay tracking systems, or short interval controls that create transparency and capture progress allows teams to immediately register where their focus should lie. This step also contributes to the goal of breaking down silos by ensuring that reporting language is consistent, accessible via a single entry point, and delivered at strategically scheduled intervals – too much time is lost debating which data is up to date and which metrics are most accurate. The numbers alone are not enough though. There is a need to step back and review all forecasting, planning, execution, and reporting elements to ensure that critical gaps in information or decision making capacity do not exist. Often this type of review will highlight significant redundancy of information which adds little or no value in addition to gaps, or the need to upgrade system elements.

- Cross-functional Review Forums

Accurate, consistent reporting serves as the backbone of the review process – regularly scheduled meetings that subject all important decisions to rigorous peer management scrutiny. Effective forums forge a clear picture of the company’s current direction in comparison with its goals by focusing on the KPIs. One common sentiment in most businesses is a sense of “time better spent” on the job than in preparatory or review sessions. As a rule, not all staff need to participate in every meeting; leaders should look to limit attendance and give those who don’t need to be there some of their valuable time back – a consideration they will surely appreciate.

About Celerant Consulting

Celerant Consulting (Celerant) is a leading global management consultancy specialising in delivering operational transformation across a broad range of industry sectors. Celerant works with some of the world's leading companies to create more profitable, more capable, and more competitive organisations. Our people help companies - and the people within these companies - achieve and sustain real gains in top- and bottom-line performance. Celerant works closely at all levels of an organisation (from the boardroom to the business front-line) to build capability and understanding across the workforce, developing and implementing appropriate management systems and business processes to sustain long-term gains in performance. Celerant employs some 600 consultants working in 50 languages worldwide.

Americas	+ 1 781 674 0400
Canada	+ 1 403 668 6000
Belgium	+ 32 (0) 2 762 52 38
Denmark	+ 45 35 45 90 01
Finland	+ 358 10 396 8800
France	+ 33 (0) 1 56 69 53 00
Germany	+ 49 (0) 211 58 33 00 33
The Netherlands	+ 31 (0) 20 570 5400
Norway	+ 47 22 43 29 23
Sweden	+ 46 (0) 8 670 6579
United Arab Emirates	+971 (0)2 406 98 77
United Kingdom	+ 44 (0) 20 8338 5000

www.celerantconsulting.com

